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DIVERSITY OF SYNANTHROPIC MITES IN KOLKATA METROPOLIS, INDIA

S. CHAUDHURY, I. ROY, S. PODDER, S. K. GUPTA AND G. K. SAHA*

Entomology & Wildlife Biology Research Laboratory,
Department of Zoology, University of Calcutta,
35, Ballygunge Circular Road, Kolkata-700 019

INTRODUCTION

The synanthropic mites are those which regularly inhabit human settlements and human constructions where they form permanent or intermittent, independent or semi independent population (Kucheruk, 1965 and Rosicky, 1991). The group chiefly consisting of mite fauna inhabiting house dust (floor dust and bed dust), stored product, house hold storages and granaries, bird's nest, cattle sheds and those occuring in roof gardens. The dust mites are of great concern to human health as they are directly responsible for causing nasobronchial allergic disorders like allergic rhinitis, eczema, bronchial asthma etc. Stored product mites are important as majority of those directly feed upon the grain contents or on food staffs making those unsuitable for human consumption or make those unmarketable. Some of the mites inhabiting cattle sheds cause nuisance and are of great veterinary importance. The nest associated mites may act as vectors of some viral diseases while roof garden mites cause damage to ornamental plants.

Despite the manifold importance of synanthropic mites, no holistic approach has so far been made in India to explore these mites, though, of course, efforts were made by a number of workers to study separately either the house dust mites (Saha, 1994, 1997; Saha *et al.*, 1995; Modak *et al.*, 1991, 2004) or nest mites (Gupta and Paul, 1989; Bhattacharya, 1995) or stored product mites (Nangia and Channa Basvanna 1989; Putatunda *et al.*, 1999; Gupta and Chatterjee 2004). The present work was undertaken to explore the diversity of synanthropic mites from Kolkata metropolis and adjoining areas.

*Corresponding Author : Dr. G. K. Saha, Department of Zoology, University of Calcutta, Kolkata-700 019.

MATERIAL AND METHODS

The methodologies which were adopted in this study for collecting synanthropic mites from five different habitats associated with human dwellings like house dust, stored products, bird nests, cattle sheds and roof gardens in Kolkata metropolis and adjoining areas during the period from July, 2001 to December, 2003 are as below :

Dust mites : The dust samples from bed and bedroom floor were collected periodically by dusting the mattresses, bed linens and pillows on clean sheets of newspaper and by sweeping the floor. The dust samples were directly examined under stereobinocular microscope and mites were picked up by a fine sable hair brush moistened with 70% alcohol.

Storage mites : Samples of stored grains (wheat, rice, pulses), bakery products (biscuits, breads crump, cakes), other food stuff stored in houses (sujii, potato chips, puffed rice, pressed rice, papad, etc.) were brought to the laboratory and examined under stereobinocular microscope. Mites were picked up by fine sable hair brush moistened with alcohol.

Cattle shed mites : The debris of cattle sheds, hay, dry dung, cattle food *etc.* were examined for mites and collection was made by subjecting those to heat desiccation method in Tullgren Funnel Apparatus using 40 w electric bulb as heat and light source. The mites were collected in the collecting vial containing 70% alcohol fitted with the stem of the funnel.

Birds nest mites : Four nests of birds one each of Baya (*Ploceus manyar flaviceps*) and Bulbul (*Pycnonotus cafer*) and two of Crow (*Corvus splendens*) which were constructed inside buildings were brought to the laboratory and were subjected to heat treatment in Tullgren Funnel Apparatus as described earlier.

Roof garden mites : Leaves from ornamental plants *viz.* rose, dahlia, china rose, chrysanthemum *etc.* which were maintained in roof gardens were plucked, brought to the laboratory in polythene bags, examined under stereo binocular microscope and mites were picked up with moistened sable hair brush.

Temporary mounting was done in lactic acid on microslide covered with broken piece of cover slip and then heated gently over an electric bulb (40 w) for clearing and stretching of appendages. For permanent mounting in all cases, Heinze's medium was used. Taxonomic identification was done under a good research microscope and, wherever necessary, illustrations of body parts of taxonomic importance were prepared.

RESULTS AND DISCUSSION

The identification of all the groups of mites revealed the occurrence of 88 species belonging to 56 genera and 25 families under 3 orders as given in Table 1. Among those, ten species marked

Table 1. : List of synathropic mite species distributed in five different habitats in Kolkata metropolis.

	HD	SP	BN	CS	RG
Order : ASTIGMATA **Acaridae**					
Suidasia medanensis Oudemans		+	+		
S. nesbitti Hughes		+			
Tyrophagus putrescentiae (Schrank)	+	+	+		
T. longior (Gervais)	+	+			
Tyroborus lini Oudemans	+				
Acarus siro Linn.	+				
Caloglyphus sp.					+
Pyroglyphidae					
Hirstia domicola Hughes	+	+			
Dermatophagoides farinae Hughes	+	+		+	
D. pteronyssinus (Trouessart)	+	+		+	
Glycyphagidae					
Glycyphagus ornartus (Kramer)	+	+	+	+	
Glycyphagus sp.	+	+	+		+
**Blomia tropicalis* Bronswijk *et al.*	+	+		+	
**B. kulagini* Zachvatkin	+	+			
**B. tijiboda*	+	+			
Austroglycyphagus geniculatus (Vitzthum)	+	+		+	+
Anoetidae					
Histiostoma sp.				+	
Order : MESOSTIGMATA **Ascidae**					
Melichares sp. (nymph)			+	+	
Blattisocius dentriticus (Berlese)		+		+	
B. tarsalis (Berlese)		+		+	
Lasioseius sp.	+		+	+	+
L. mcgregori Chant	+		+	+	
L. berlesei (Oudemans)				+	
**L. ometes* (Oudemans)			+	+	
**L. americanus* Chant	+		+	+	
**L. phytoseioides* Chant				+	
***Leioseius* sp.			+		
Asca biswasi Bhattacharya				+	
**Proctolaelaps scolyti* Evans				+	
**P. pygmaeus* (Muller)				+	
P. curtipilis (Chant)				+	
Antennoseius sp.				+	

Table 1. : *(Cont'd.).*

	HD	SP	BN	CS	RG
Macrochelidae					
Macrocheles indicus Bhattacharya			+	+	
M. palniensis Roy				+	
Laelapidae					
Hypoaspis vacua (Michael)			+	+	
Ololaelaps veneta (Berlese)				+	
Ololaelaps sp.				+	
Hirstionyssus sp. (deutonymph)				+	
Uropodidae					
***Trematura* sp.				+	
Fuscuropoda marginata (Koch)				+	
**Uroseius acuminatus* (Koch)				+	
Uroseius sp.				+	
Parasitidae					
**Eugamasus butleri* Hughes				+	
Ameroseiidae					
Ameroseius sp.		+			
Kleemania plumigera (Oudemans)				+	
K. plumosus (Oudemans)				+	
Protodinychidae					
***Protodinychus* sp.				+	
Phytoseiidae					
Amblyseius alstoniae Gupta					+
Eviphidae					
Eviphis sp.				+	
Order : PROSTIGMATA **Tydeidae**					
Pronematus elongates Baker		+	+	+	
P. bengalensis Gupta & Paul		+	+	+	
P. fleschneri Baker					+
P. mcgregori Baker					+
Lorryia sp.					+
Tydeus sp.				+	+
T. cumini Gupta			+	+	
Stigmaeidae					
Cheylostigmaeus sp.	+				
Mediolata sp.	+				
Mediolata simplex Wood	+				
Stigmaeus petilus Ueckermann & Smith-Meyer				+	
Stigmaeus raneyi Summers				+	
Agistemus edulis Gupta					+

Table 1. : *(Cont'd.).*

	HD	SP	BN	CS	RG
Tetranychidae					
Tetranychus ludeni Zacher					+
Cheyletidae					
Cheyletus aversor Rohdendorf	+				
C. fortis Oudemans	+				
Cheyletus sp.	+				
C. trouessarti Oudemans	+				
C. malaccensis Oudemans	+				
Chelacaropsis moorei Baker	+				
Acaropsis sollers Kuzin			+		
Eucheyletia womersleyi Volgin				+	
Cunaxidae					
Cunaxa womersleyi Baker & Hoffmann			+		
C. setirostris (Hermann)				+	
Neocunaxoides biswasi Gupta & Chattopadhay				+	
N. andrei (Baker & Hoffmann)				+	
** *Pulaeus americanus* (Baker & Hoffmann)				+	
Trombidiidae					
Trombidium sp.				+	
Raphignathidae					
Raphignathus sp.		+			
Tarsonemidae					
Tarsonemus sp.				+	
Pyemotidae					
Acarophenax triboli Newstead & Duvall		+			
** *Siteroptes* sp.				+	
S. reniformis Krantz				+	
Pyemotes herfsi Oudemans				+	
** *Resinacarus* sp.				+	
Eriophyidae					
Aceria sp.					+
Tenuipalpidae					
Brevipalpus cucurbitae Mohansundaram					+
B. chilensis Baker					+
Syringophilidae					
Syringophilus sp.			+		

HD = House dust; SP = Stored product; BN = Bird nest; CS = Cattle shed; RG = Roof garden.

* New species reported from India.

** New genera reported from India.

with asterisks and six genera marked with double asterisks are reported here for the first time from India. Regarding faunal composition, the maximum taxal diversity and density were seen in cattle shed, wherefrom 52 species (57%) belonging to 34 genera and 18 families under 3 orders could be recorded. This was followed by house dust (25 species (28%) under 13 genera, 6 families and 3 orders), stored products (20 species (23%) belonging to 12 genera, 8 families and 3 orders), bird nests (18 species (20%) belonging to 13 genera, 9 families and 3 orders) and roof gardens (14 species (16%) under 12 genera, 9 families and 3 orders).

So far as novelty with regard to genus is concerned, six genera *viz. Leioseius, Trematura, Protodinychus, Pulaeus, Resinacarus* and *Siteroptes* could be recorded which were hitherto unreported from India. Ten species, *viz. Blomia tropicalis* (from house dust, stored product and cattle shed), *B. tijiboda* (house dust and stored product), *B. kulagini* (house dust and stored product), *Lasioseius americanus* (house dust, nest and cattle shed), *L. phytoseioides* (cattle shed), *L. ometus* (nest and cattle shed), *Proctolaelaps scolyti* (cattle shed), *P. pygmaeus* (cattle shed), *Uroseius acuminatus* (cattle shed) and *Eugamasus butleri* (cattle shed) were new records from India. None could be recorded from all the five habitats, however, 4 species, *viz. Glycyphagus omatus, Glycyphagus* sp., *Austroglycyphagus geniculatus* and *Lasioseius* sp. were recorded from four out of five habitats studied. There were 63 species (73%) which could be recorded only from a single habitat, of those the cattle shed harboured the maximum number of such species 34 (39%) followed by house dust 11 (13%), roof garden 10 (11%), stored products and bird nest 4 each (5%). Among the ten species recorded here for the first time from India, 8 were from cattle shed, 3 from stored products, 4 from house dust and 2 from bird nests. It may be noted that out of these ten species, there were 5 species which were found in more than one habitats, though in different combinations.

Among the orders, Prostigmata is represented by the maximum number of species, families and genera (39 species, 12 families, 25 genera) followed by Mesostigmata (32 species, 9 families, 20 genera) and Astigmata (17 species, 4 families, 11 genera). Although several specimens of Cryptostigmata were in the collection, their identification is still not complete and will be reported later in the subsequent papers.

Dust mites : Among the 25 species of mites encountered from house dust, *Cheylostigmaeus* sp., *Mediolata* sp., *Chelacaropsis moorei, Glycyphagus* sp. were not recorded earlier in house dust in India. Family Pyroglyphidae (*Dermatophagoides pteronyssinus* and *D. farinae*), *Glycyphagidae* (*Blomia tropicalis, Austroglycyphagus geniculatus*), Acaridae (*Tyrophagus putrescentiae*) and Cheylitidae (*Cheyletus* sp.) were dominant. The pyroglyphids are known to be responsible for causing respiratory allergies in Kolkata (Saha, 1993, 1994, 1997). Preliminary observations indicate the abundance of pyroglyphids in the houses of asthmatic patients as compared to those of normal persons, which corroborated well with the earlier observations (Modak *et al.*, 2004). The cheyletids, stigmaeids, cunaxids and ascids were predatory mites and mainly fed upon acarids and pyroglyphids.

Surprisingly, some of the other common house dust mites like Chortoglyphidae, Pyemotidae, Tydeidae, Bdellidae, Raphignathidae, Scutacaridae, Tarsonemidae, Anoetidae, *etc.* which were earlier recorded from India, could not be encountered so far in the present study. Among the 25 species of house dust mites recorded in this study, the relative number of Astigmata mites was more (13 spp.) followed by Prostigmata (9 spp.) and Mesostigmata (3 spp.).

Stored product mites : A total of 20 species of mites were collected from various stored products, of which, *Hirstia domicola, Pronematus elongates, P. bengalensis* and *Raphignathus* sp. are recorded here for the first time in India from stored products. In some of the samples examined, the acarids were found in astronomical numbers specially on potato chips, rice, wheat etc. doing considerable damage. The glycyphagids were mostly fungal feeders while Cheyletidae and Ascidae were main predators of acarid mites. Astigmata represented the highest number of species (13 spp.) followed by Prostigmata (4 spp.) and Mesostigmata (3 spp.).

Nest mites : Among the 18 species recorded from nests, the occurrence of *Suidasia medanensis, Hypoaspis vacua, Cunaxa womersleyi, Pronematus elongates, Lasioseius mcgregori, L. ometus, L. americanus* and *Macrocheles indicus* were earlier not known in India from bird nests. The occurrence of Macrochelidae in nest can be explained by the fact that these mites entered into the nests through flies, on whose body the macrochelids attached themselves for dispersal. The other mites like Tydeidae, Cunaxidae, which are common predators of Psoccid insects were available abundantly in nests. The sole species of Laelapidae occurred in nest is an ectoparasitic species and got detached from bird's body while fluttering the wings. Since only four nests could be examined in the present study, many of the other groups of mites earlier recorded in India (Gupta and Paul 1989; Bhattacharya 1995) could not be collected. The number of species of different orders as was seen in this study was Astigmata (4 spp.), Prostigmata (6 spp.) and Mesostigmata (8 spp.) indicating dominance of Mesostigmata in the habitat.

Cattle shed mites : Out of 52 species recorded from cattle sheds, the occurrence of the *Dermatophagoides pteronyssinus, D. farinae, Austroglycyphagus geniculatus* appear to be unknown from cattle sheds in the world. The occurrence of most of the other species belonging to family Tydeidae, Cunaxidae, Pyroglyphidae, Glycyphagidae, Ascidae, Parasitidae, Ameroseiidae and Phytoseiidae recorded here were earlier not known in this habitat from India. The dominant groups were Ascidae, Laelapidae, Uropodidae and Macrocheledae. Some of these mites *viz.* Uropodidae and Macrocheledae are common inhabitants of dung; Laelapidae are parasitic group while Ascidae occur in cosmopolitan habitats. The occurrence of other mites like Tydeidae, Cunaxidae *etc.* are accidental and entered in cattle sheds through fodder and hay. The number of species represented by 3 different orders *viz.* Prostigmata, Astigmata and Mesostigmata were 17, 6 and 29 respectively, indicating the abundance of Mesostigmatid mites in this habitat.

Roof garden mites : Altogether 14 species were collected of which 9 species represented the order Prostigmata and 3 to Astigmata and 2 to Mesostigmata. The Prostigmata comprising of

phytophagus (Tetranychidae, Tenuipalpidae and Eriophidae), predatory (Tydeidae, Stigmaeidae and Phytoseiidae) and fungivorus mites (Acaridae and Glycyphagidae).

SUMMARY

This paper reports the occurrence of 88 species of mites belonging to 56 genera and 25 families under 3 orders from five different habitats inside human settlements, *viz.* house dust, stored products, bird's nest, cattle sheds and roof gardens, discusses their relative abundance, nature of association and provides information as to their novelty, if any, regarding their occurrence in five selected habitats in relation to West Bengal and India. Ten species and six genera are reported first time from India. The present study further indicates that among five different habitats examined, taxal diversity and relative abundance of different mites species were higher in cattle sheds followed by house dust and stored products.

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