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ORIGINAL ARTICLE

Four new records of mites (Acari: Astigmata) phoretic on insects in Riyadh, Saudi Arabia

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Abstract A survey was carried out to investigate astigmatid mites associated with four unrelated insect species, belonging to four families. The four insect species, *Musca domestica* (Linnaeus, 1785) (Diptera: Muscidae), *Labidura riparia* (Pallas, 1773) (Dermaptera: Labiduridae), *Gryllus bimaculatus* (DeGeer, 1773) (Orthoptera: Gryllidae), and *Periplaneta americana* (Linnaeus, 1758) (Blattaria: Blattidae), collected from different localities in Riyadh, were observed. Four astigmatid mites (*Caloglyphus csibbii* Eraky, *Histiostoma camphori* Eraky, *Histiostoma pickaxei* Eraky and Shoker, and *Myianoetus lili* Eraky) belonging to two families, Acaridae and Histiostomatidae, were recorded on *G. bimaculatus*, *L. riparia*, *P. americana,* and *M. domestica*, respectively. All recorded mites are considered new to Saudi Arabian mite fauna. One individual of *Copronomoia sphaerocerae* (Vitzthum) (Histiostomatidae) mite, previously recorded in Saudi Arabia, was found on *M. domestica*. For each mite species found, notes on density and attachment sites are given. An identification key, based on deutonymphal stages, for the five mite species reported in this study and other phoretic astigmatid mites previously recorded on insects in Saudi Arabia is provided.

1. Introduction

The Astigmata is one of the most successful groups of mites in establishing diversified interspecific relationships with both vertebrates and invertebrates (Houck and OConnor, 1991). Among the arthropod hosts, astigmatid deutonymphs occur on different insect orders, mostly on Coleoptera, Hymenoptera, and Diptera. In order to be transported to other habitats, deutonymphs (hypopi) seek and attach to the surface of other organisms with sucker-like setal sockets on the venter of their bodies and after insect migration they detach themselves from the host to colonize a new habitat (OConnor, 1982).

Mite fauna of Saudi Arabia has received a very little consideration and the ground work for taxonomical, biological and

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Table 1 Density and attachment sites of astigmatid deutonymphs found associated with four insect species in different locations of Riyadh.

Mite species	Insect host	Mite density	Location	Attachment
Acaridae				
Caloglyphus csibbii[*]	*Gryllus bimaculatus*	+	Der'eiyah	Dorsally on abdomen
Histiostomatidae (=Anoetidae)				
Copronomoia sphaerocerae	*Musca domestica*	+	Ouyainah	Ventrally on thorax
Histiostoma camphori[*]	*Labidura riparia*	+ + +	Waseel	On cerci
Histiostoma pickaxei[*]	*Periplaneta americana*	+	Der'eiyah	Coxae of legs II
Myianoetus lili[*]	*M. domestica*	+ +	Hayer	Ventrally on thorax

+, Low <10 mite individuals; + +, moderate 10–50 mite individuals; + + +, high >50 mite individuals.
[*] New records.

ecological studies of mites is extremely rare. Despite the importance of studying relationships between mites and their insect hosts, a few studies of mites associated with insects have been reported in Saudi Arabia (Samšiňák, 1979; Dabbour and Abdel-Aziz, 1982; Mashaly et al., 2011).

However, the first work revealed the presence of mites associated with insects in Saudi Arabia was made by Samšiňák (1979), who reported six species belonging to different mite groups associated with house fly *Musca domestica* (Linnaeus, 1785) (Diptera: Muscidae). Among these six species, only two species belong to Astigmata. Later, Dabbour and Abdel-Aziz (1982) reported another unidentified species belonging to Astigmata on *M. domestica*.

The aims of the present work were to: (i) investigate astigmatid mites on four insect species belonging to four different families, with given notes about density and attachment sites for each phoretic mite, (ii) examine previously recorded phoretic astigmatid mites on insects in Saudi Arabia, and (iii) provide an identification key for both the newly recorded mite species found in this study and the previously recorded ones. The identification key presented will pave the way for further taxonomic investigations in the Kingdom.

2. Materials and methods

The study was conducted during the period from November 2008 to April 2009. Four different insect species were irregularly sampled, namely *M. domestica*, *Labidura riparia* (Pallas, 1773), *Gryllus bimaculatus* (DeGeer, 1773) and *Periplaneta americana* (Linnaeus, 1758) from different localities (Waseel, Hayer, Ouyainah, Der'eiyah) in Riyadh.

Insects were trapped using pitfall, sweeping and hand picking. Samples were transported to the Acarology Laboratory, King Saud University for examination. Insects were examined for the presence of mites under a stereoscopic microscope at 40–120×. Each mite-infested insect was examined and photographed separately. Different parts of the insect body (e.g. head, thorax, and abdomen) were examined for mites. The numbers and locations of the attached mites were documented.

Afterwards, each mite-infested insect was put in a glass vial with Ethyl alcohol (70%) and the vial was shaken well to detach mites from the insect body. A few mite individuals were still attached to the insects bodies, they were separated by using a very fine camel hair brush under the stereoscopic microscope. Phoretic mites were cleared for a week in lactophenol (lactic acid:phenol crystals:distilled water 50:25:25), mounted onto micro-slides with Hoyer's medium and left to be fully dried in a hot oven (40–50 °C) for 1–2 weeks (Zhang, 2003). Identification and photography were performed with a light compound microscope (BX-51, Olympus, Japan) equipped with a digital camera (DP-71, Olympus, Japan). All measurements were in micrometres (μm). The terminology used in the key presented in this study follows Dindal (1990), Negm (2007) and Eraky and Osman (2008). Previously recorded phoretic mite species (Mashaly et al., 2011) were borrowed from the Museum of Zoology Department, King Saud University and examined. An identification key for the newly and previously recorded mites in Saudi Arabia was established.

For further taxonomic studies, voucher species were deposited as slide-mounted specimens in King Saud University Museum of Arthropods (KSMA), College of Food and Agriculture Sciences, King Saud University.

3. Results and discussion

Five mite species belonging to two families of Astigmata (Acaridae and Histiostomatidae) were found phoretic on four insect species (Table 1). Out of these five species, four are

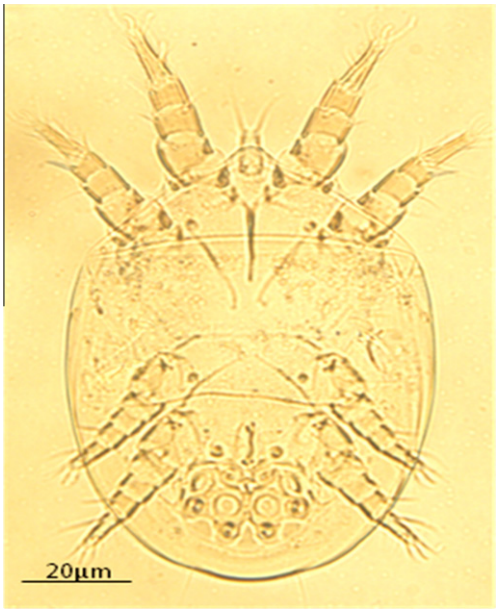

Figure 1 Acaridae, venter of hypopus.