

Phoretic *Sancassania* sp. (Acaridae: Astigmata) on *Oryctes agamemnon* (Coleoptera: Scarabaeidae) in UAE

Mohammad A. Al-Deeb, Sabir B. Muzzaffar, and Mohamed R. Enan



Department of Biology
Faculty of Science
United Arab Emirates University
P.O. Box 17551, Al Ain, UAE
m_aldeeb@uaeu.ac.ae



Abstract

A study on phoretic mites associated with *Oryctes agamemnon* (Coleoptera: Scarabaeidae) was conducted in Al-Ain in UAE. The purpose of the study was (1) to document the presence of phoretic mites, (2) to make a genetic profile, and (3) to study host mite load and body distribution. *Oryctes agamemnon* beetles were collected from date palm farms and examined under stereoscope. Mites were counted on different beetle body parts. The molecular technique, randomly amplified polymorphic DNA-polymerase chain reaction (RAPD-PCR), was employed to make a genetic profile. The results showed that a phoretic mite species, *Sancassania* sp. (Acaridae: Astigmata), was associated with *O. agamemnon* adults and larvae. Most of the mites were found under the elytra and in the sub-elytral space. By developing the reaction products with agarose gel electrophoresis, it became evident that DNA fragments were amplified with all the primers used. The banding pattern can be used in the identification of the UAE *Sancassania* spp. The presence of this mite in desert ecosystem indicated that more phoretic mites may exist in the desert. This finding was the first record of *Sancassania* in UAE. It also added a new genus to the UAE biodiversity list. This phoretic mite and other mites in general need to be studied and conserved.

Introduction

Phoresy is a symbiotic interaction that results in dispersal, benefiting the relocated organisms without negatively impacting the phoretic host (Holte *et al.*, 2001). Scarab beetles are commonly associated with phoretic astigmatid mites (Acaridae: Astigmata) (Houck & OConnor, 1991).

The desert ecosystem is characterized by low biodiversity. UAE is located in the desert biome and, therefore, has a limited number of animal species. In addition, microarthropod species compositions in general, and phoretic mites in particular, are relatively unexplored and there is significant potential for discovering new species. The addition of a genus or species to the roster of the known organisms in UAE would be important for biodiversity and species conservation. The phoretic stage of *Sancassania* sp., the deutonymph, disperses in soil until they encounter and attach to *O. agamemnon* beetle larvae or adults. The mites remain with the beetles as phoretic stages. To our knowledge, this study is the first record of a phoretic astigmatid mite of the genus *Sancassania* on *O. agamemnon* in UAE. Also, this is the first research on phoretic mites in UAE. More work is undergoing toward studying the rest of phoretic astigmatid mites in the UAE desert ecosystem, which has not been previously explored. There is a possibility that the species collected in UAE represents a new species in the genus *Sancassania*.

Materials and Methods

Collecting area. The collection of specimens was carried out in infested date palm plantations at Al-Ain (24° 11' N, 55° 45' E), Abu Dhabi, UAE, during the period from June to September in 2007 and 2008.

Insects and mites. *Oryctes agamemnon* beetles were captured at night using light traps, brought to the laboratory, and examined under a dissecting microscope. Mites were removed using a fine camel hair brush and were stored in 70% ethanol. Mite specimens were cleared in Nesbitt's solution, mounted in Hoyer's medium on microscope slides, and examined under a compound microscope for identification.

DNA Extraction and RAPD-PCR amplification.

DNA was extracted from mite samples. A set of nine decamer primers (Operon Technologies, Inc., USA) were examined for RAPD-PCR analysis.

Results

Mite identification. Based on traditional taxonomy using morphological identification characters the phoretic mite belonged to the order Acari, suborder Astigmata, family Acaridae, genus *Sancassania* (= *Caloglyphus*). Two immature stages were found, deutonymphs (Fig. 1) and tritonymphs (Fig. 3). The majority of collected mites were deutonymphs, with only few tritonymphs. Ventral suckers, which are present on the body of deutonymphs, were used to attach to the *O. agamemnon* body surface. The anterior tarsus of tritonymphs have expanded foliate setae (Fig. 4). Most of the deutonymphs and tritonymphs were found in the sub-elytral space, and fewer mites were found on the thoracic and abdominal sternal plates or legs of *O. agamemnon* beetles. In some cases, mites were found on the beetle head.

DNA RAPD-PCR. By developing the reaction products with agarose gel electrophoresis, it became evident that DNA fragments were amplified with all the primers used (Fig. 2). Every primer produced at least one intense band together with fainter bands. The number of intense bands produced by each primer was: 3, 2, 2, 1, 3, 4, 2, 4 and 4, respectively. For example, the molecular size of the three bands produced by primer one was 400, 450, and 750 bp, and the intense band produced by primer four was 350 bp.



Fig. 1. *Sancassania* sp. deutonymph ventral view (under compound microscope (x100)).

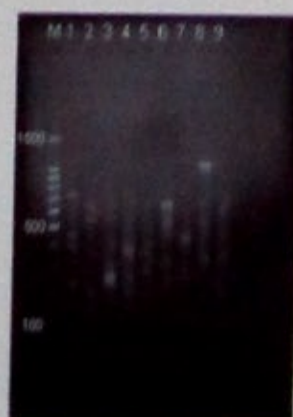


Fig. 2. Agarose gel electrophoresis of PCR-amplified DNA of astigmatid mite, *Sancassania* sp. (RAPD-PCR profiles using 9 primers).

An important aspect of using the RAPD-PCR method and other DNA-related identification methods is that adult specimens, which are usually required in traditional taxonomy (and which were not available for this study), are not essential for identification. In addition, the genus *Sancassania* is morphologically conserved, but has high intraspecific variability and a large number of species.

RAPD reactions often produce a pattern of bright intense bands together with fainter bands or faintly smeared regions in the gel. Therefore, the molecular size of the bright intense bands and their total number provide a banding pattern profile specific to the UAE *Sancassania* mite, which could be compared with other mite profiles using the RAPD-PCR technique. Mites with the same profiles generated by the same set of primers should belong to the same species of phoretic mite. More work is warranted on *Sancassania* species composition in UAE ecosystem, in part, because *Sancassania* DNA samples from other countries were not available to us to conduct comparisons.

Conclusion

Sancassania sp. was found as a phoretic mite on the fruit-stalk borer, *O. agamemnon*, in UAE. The RAPD-PCR method, which is a reliable and sensitive assay, was employed to provide a DNA banding pattern of the *Sancassania* sp. which could be used to compare it with other mite profiles when they are available.



Fig. 3. *Sancassania* sp. tritonymph (under compound microscope (x100)).



Fig. 4. The expanded foliate setae of the anterior tarsus of *Sancassania* sp. tritonymph (under compound microscope (x400)).

References

Holte, A.E., M.A. Houck and N.L. Collie, 2001. Potential role of parasitism in the evolution of mutualism in astigmatid mites: *Hemisarcoptes coaremani* as a model. *Experimental and Applied Acarology*, 25: 97-107.

Houck, M.A. and B.M. O'Connor, 1991. Ecological and Evolutionary Significance of Phoresy in the Astigmata. *Annu. Rev. Entomol.*, 36: 611-636.