



Mites associated with ambrosia and bark beetles (Curculionidae: Scolytinae) in avocado orchards in Michoacan, Mexico

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Received: 17 April 2019 Accepted: 27 July 2019 Available online: 31 July 2019

ABSTRACT: Avocado is one of the most important crops in Mexico. To investigate mite species associated with ambrosia and bark beetles in avocado plantations, three study sites with different management and crop conditions were selected in the state of Michoacan. Orchards were checked for trunks infested with ambrosia and bark beetles during 2017. In the laboratory, avocado trunks were placed in emergence chambers, and insects and mites collected, mounted and identified. Four species of Scolytinae were found associated with avocado trunks; three ambrosia beetle species, namely *Monarthrum exornatum*, *M. fimbriaticorne* and *Dryocoetoides capucinus*, and one bark beetle, *Phloeocleptus plagiatus*. *Monarthrum fimbriaticorne* was the most common beetle found at the three sites. The seven mite species collected belonged to 6 genera, *Proctolaelaps*, *Trichouropoda*, *Mexeches*, *Eutogenes*, *Elattoma* and *Tyrophagus*. *Elattoma abeskoun* was the most abundant species in this study. These results represent the first report in the country on mites associated with ambrosia and bark beetles in avocado orchards.

Keywords: *Persea americana*, Acari, Scolytinae, association.

Approximately 250 mite species have been reported as phoretic on insects; many of them transport microorganisms like bacteria, fungi and nematodes (Hofstetter et al., 2015). Mites are associated with a great number of Scolytinae, with studies on these interactions having been done mainly in forest ecosystems (Wirth et al., 2016); however, knowledge of these associations in agricultural systems and fruit trees is limited (Ahadiyat and Ostovan, 2006; Chaires-Grijalva, 2013).

Due to the scarce information available on the association between ambrosia and bark beetles and mites in fruit trees, and the economic importance of avocado (*Persea americana* Mill.) in Mexico, the objective of the present research was to study the mite species associated with ambrosia and bark beetles in three avocado orchards in Nuevo Parangaricutiro, Ziracuaretiro and Uruapan, Michoacan, Mexico.

The samples were collected from June to November, 2017 from three orchards located in the state of Michoacan, Mexico: "El Durazno" (19°22'30" N, 102°14'16" W, 2245 masl) in the municipality of Nuevo Parangaricutiro, "La Ziranda" (19°24'00" N, 101°54'56" W, 1304 masl) in the municipality of Ziracuaretiro and "La Piedra China" (19°21'19" N, 102°03'34" W, 1564 masl) in the municipality of Uruapan. Infested trunks were transported to the Entomology and Acarology Laboratory in Texcoco, where they were placed in emergence chambers. Emerging adult insects were collected and their phoretic mites separated from June to December, 2017. Specifically, the insects were carefully checked under a stereoscopic microscope

to separate the mites fixed to the exoskeleton. Permanent mounting was done in Hoyer's medium and then taxonomic determination was done by using specialized keys. The mite slides were placed in the personal collection of Dr. Estrada-Venegas.

A total of 659 mites were collected, of which 76.17% were found on *Phloeocleptus plagiatus* Wood, 13.96% on *Monarthrum exornatum* (Schedl), 9.40% on *Monarthrum fimbriaticorne* (Blandford) and 0.47% on *Dryocoetoides capucinus* (Eichhoff). The following mite species were identified: *Proctolaelaps bickleyi* (Bram) and *Proctolaelaps subcorticalis* Lindquist (Melicharidae); *Mexeches virginensis* (Baker) and *Eutogenes foxi* Baker (Cheyletidae); *Elattoma abeskoun* Rahiminejad and Hajiqanbar (Pygmephoridae); *Tyrophagus putrescentiae* (Schrank) (Acaridae) and *Trichouropoda* sp.1 (Trematuridae). Of these seven species, six of them (*P. bickleyi*, *P. subcorticalis*, *E. foxi*, *M. virginensis*, *E. abeskoun* and *Trichouropoda* sp. 1) were associated with *P. plagiatus*, the same six species were associated with *M. exornatum*, three species (*P. bickleyi*, *T. putrescentiae* and *Trichouropoda* sp. 1) with *M. fimbriaticorne* and one (*P. bickleyi*) with *D. capucinus*.

The most abundant family was Pygmephoridae (*E. abeskoun*) with 61.45% of all the collected specimens, followed by Trematuridae with 26.25%, Melicharidae with 10.92% and Cheyletidae and Acaridae with 1.38%.

The species of phoretic mites collected in this study are new records of associations as phoretic forms with the ambrosia beetle species, *M. exornatum*, *M. fimbriaticorne*

and *D. capucinus*, and with the bark beetle, *P. plagiatus*, in *P. americana* wood in the state of Michoacan, Mexico; and in the case of the species *M. virginiensis* and *E. abeskoun*, new records for Mexico.

Acknowledgements

To CONACYT for the scholarship granted to the first author, and to Israel Solis Velazquez, Alejandro Anguiano, Cuauhtémoc Aceves Pacheco and Tziri Aceves Martínez for their assistance in collecting the samples from their orchards. This research is part of the project "Ambrosia beetles in avocado orchards in Mexico", (Grant PM 18-4017), and it was presented at the XV International Congress of Acarology in Antalya, Turkey in September, 2018.

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Edited by: Salih Doğan

Reviewed by: Two anonymous referees

Citation: Sandoval-Cornejo, E.N., Estrada-Venegas, E.G., Equihua-Martínez, A., Romero-Nápoles, J., Alvarado-Rosales, D. 2019. Mites associated with ambrosia and bark beetles (Curculionidae: Scolytinae) in avocado orchards in Michoacan, Mexico. *Acarological Studies*, 1 (2): 174-175.