

First record of *Raphignathus collegiatus* Atyeo, Baker, & Crossley, 1961 (Acari: Raphignathidae) associated to bark of *Vitis vinifera* L. from Baja California, México

Primer reporte de *Raphignathus collegiatus* Atyeo, Baker, & Crossley, 1961 (Acari: Raphignathidae) asociado a la corteza de *Vitis vinifera* L. en Baja California, México

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ABSTRACT

The knowledge of the diversity of organisms found in specific habitats is of utmost importance due to the critical roles they play in food chains. Similarly, the diversity of mites associated with the genus *Vitis* in Mexico remains largely unknown. Although these mites often go unnoticed, they are generally of great importance in assessing the potential of predatory species as candidates for biological pest control. In this context, the predatory mite *Raphignathus collegiatus* Atyeo, Baker & Crossley, 1961, is reported for the first time under vine bark, associated with infestations of *Planococcus ficus* Signoret in commercial vineyards of the Guadalupe Valley in Ensenada, Baja California, Mexico.

KEY WORDS: Prostigmata, predator, Acari, grapevine, vineyards.

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RESUMEN

El conocimiento de la diversidad de organismos que se encuentran en un hábitat específico es de suma importancia debido a los roles importantes que cumplen en las cadenas tróficas. Así mismo, la diversidad de ácaros asociada al género *Vitis* en México es desconocida y aunque la mayoría de las veces pasa desapercibida, suelen ser de gran importancia para determinar el potencial de especies depredadoras como prospectos para el control biológico de plagas. En este sentido, se reporta por primera vez al ácaro depredador *Raphignathus collegiatus* Atyeo, Baker & Crossley, 1961 bajo la corteza de vid, asociado a infestaciones de *Planococcus ficus* Signoret en viñedos comerciales del Valle de Guadalupe en Ensenada, Baja California, México.

PALABRAS CLAVE: Ensenada, Prostigmata, depredador, Acari, uva

Introduction

Bark of trees provides an important habitat for insect and other arthropod richness due to its structural complexity (Schowalter, 2017). In the grapevines (*Vitis vinifera* L.), bark tends to develop profusely within the first few years of growth (Hellman, 2003). This structure allows various organisms to benefit from it, including fungi, weed seeds, and small arthropods.

One of the main challenges directly affecting grapevine productivity is pests and diseases. This is particularly important given that viticulture currently faces significant emerging phytosanitary problems. For instance, in 2009, the first appearance of the vine mealybug (*Planococcus ficus* Signoret) was recorded in Sonora, which later spread to one of the country's main winemaking regions located in the Ensenada municipality, Baja California (DGSV-CNRF, 2022).

Among pest control methods, biological control employs several ecological groups of natural enemies, that can vary depending on the pest type (Hoddle & Van Driesch, 2009). For soft-bodied insects (Pseudococcidae), *P. ficus*, parasitoids and predators are the primary groups; however, no mites are currently known as potential control agents within the latter group (Cocco et al., 2021). To reduce the use of chemical insecticides for managing and controlling the vine mealybug, this study describes the first step in the search for native natural enemies associated with this pest in commercial vineyards in the Guadalupe Valley, Ensenada, Baja California, Mexico, and reports for the first time its associated predatory mite.

Material and Methods

Three collections of grapevine bark were carried out in commercial vineyards in the Guadalupe Valley, located in the municipality of Ensenada, Baja California, in June 2023. These vines exhibited typical symptoms of vine mealybug infestation, such as dark discolorations and the presence of ants on the trunks (Figure 1). After identification, the samples were placed in airtight bags and transported to the laboratory at the Faculty of Enology and Gastronomy on the El Porvenir campus. In the laboratory, the samples were processed using a VELAB® SC5 stereomicroscope. The mites found were directly mounted in Hoyer's medium and placed in an oven for 5 days at 50 °C (Monjarás-Barrera *et al.*, 2019). Species-level identification was carried out under a Meiji Techno® ML5000 phase-contrast microscope, using the original description by Atyeo *et al.* (1961) and the keys provided by Khan *et al.* (2023) for comparison.



Figure 1. Typical dark colorations indicative of the presence of *P. ficus* on grapevines

Results and Discussion

For species determination, the criteria established by Doğan *et al.* (2024) were followed, disregarding the subgenus category proposed by Khan *et al.* (2023) and opting instead to delimit identification at the genus level:

Superfamily Raphignathoidea Kramer, 1877

Family Raphignathidae Kramer, 1877

Genus *Raphignathus* Dugès, 1834

Type species *Raphignathus gracilis* (Rack, 1962)

Species *Raphignathus collegiatus* Atyeo, Baker, & Crossley, 1961 (figure 2)

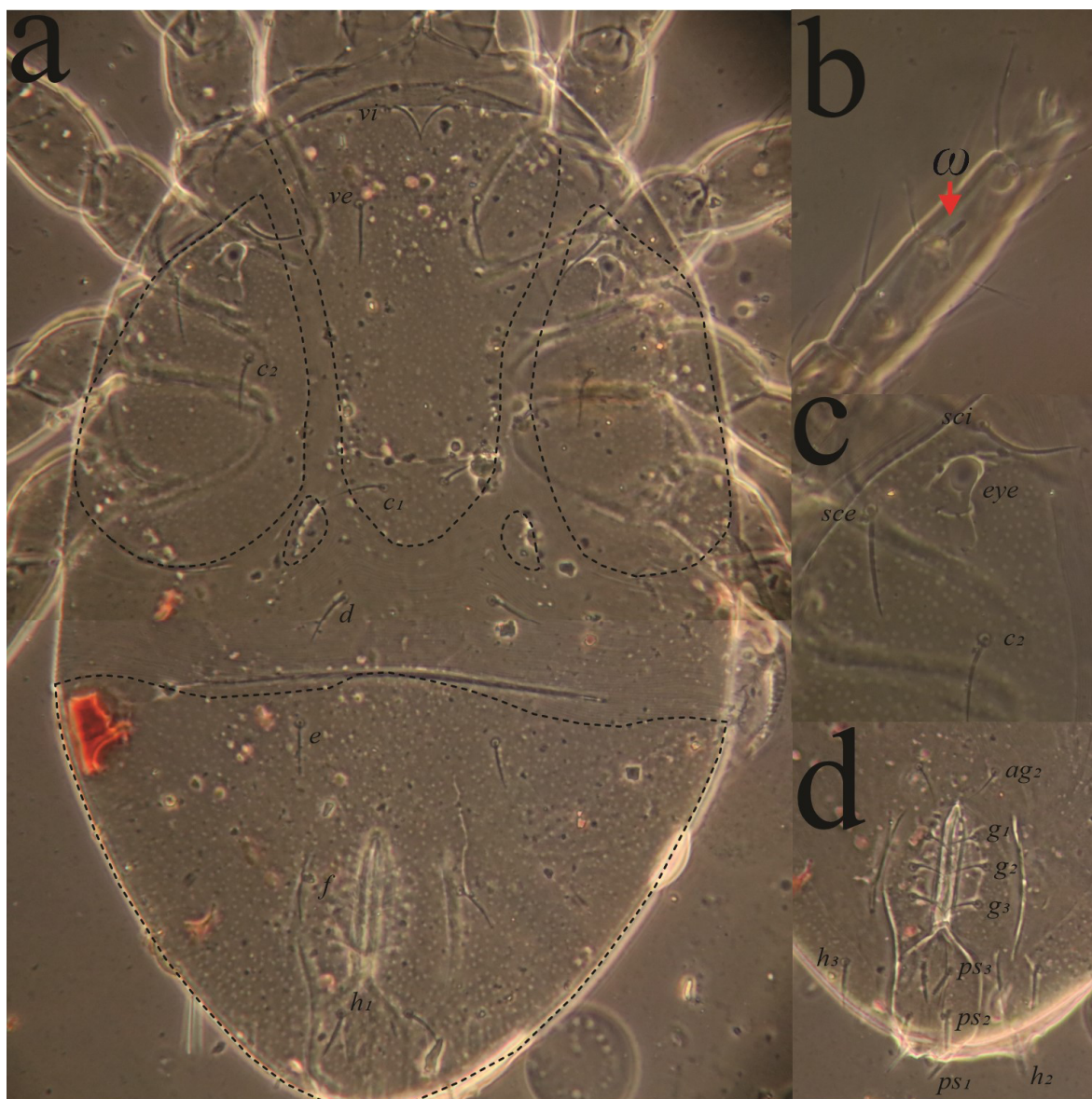


Figure 2. Adult female of *Raphignathus collegiatus*. a) dorsal view, dotted lines outline the boundaries of the dorsal shields; b) solenidion ω on tarsus I; c) punctate laterodorsal shield; d) genitoanal region.

A total of 12 adult females were obtained from the Tempranillo (6), Cabernet (4), and Merlot (2) cultivars. All individuals were found on plants infested with *P. ficus*; however, their abundance was low. This low abundance has also been observed in species of *Dittrichia* (Asteraceae), where only three individuals of *R. collegiatus* were collected (Ebrahim & Barbar, 2023).

Regarding predatory capacity, some species of the *Raphignathus* genus are considered biological control agents in soil and play an important role in reducing phytophagous arthropods (Khanjani *et al.*, 2013), such as *R. hecmatanaensis* Khanjani & Ueckermann, which has been reported in scale insect (Diaspididae) infestations on citrus (Navaran & Hajizadeh, 2021). For *R. collegiatus*, this species has been reported in the soil of various fruit trees (Koç & Akyol, 2004), palms (Zaher & Gomaa, 1981), and on moss (Doğan, 2003). It has also been reported under the bark of various plant species, such as horse chestnut (Atyeo *et al.*, 1961). This last point is significant, as all individuals collected in this study were found under the bark of grapevine plants. However, one of the main limitations in Mexico is the lack of knowledge about the natural enemies of pests present in viticulture production systems (Monjarás-Barrera & Domínguez-Castro, 2024).

Conclusion

This new record of a predatory mite species associated with *P. ficus* is highly relevant because they share the same habitat behavior. However, it is essential to conduct further studies on its biology to determine its role within viticultural production systems. This research lays the foundation for exploring a novel alternative aimed at assessing its predatory efficiency and potential as a biological control agent for *P. ficus* in the region.

Author Contributions

Conceptualization of the work: M.-B. J. I.; methodology development: M.-B. J. I., D.-C. C.; experimental validation: M.-B. J. I.; data analysis: M.-B. J. I.; manuscript writing and preparation: M.-B. J. I., D.-C. C., L.-G. G., C.-M. A., C.-S. G. R.; drafting, review, and editing: M.-B. J. I., D.-C. C., L.-G. G., C.-M. A., C.-S. G. R.

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Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

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Conflict of Interest

The authors declare no conflict of interest.

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