

Scientific Note

Mites associated with *Citrus latifolia* (Rutaceae) from an orchard at Artur Nogueira municipality, São Paulo state, Brazil

Jeferson L. C. Mineiro , Adalton Raga 

APTA, Instituto Biológico, Centro Avançado de Pesquisa em Proteção de Plantas e Saúde Animal, 13101-680, Campinas, São Paulo, Brazil.

 Corresponding author: jefmin@hotmail.com

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Abstract. *Citrus latifolia* Tanaka (Rutaceae) is a perennial and spinescent citrus tree. Knowledge of the mite fauna on this plant in São Paulo state is limited. The aim of this work was to survey the mite species from a *C. latifolia* orchard in Artur Nogueira municipality, central-eastern region of São Paulo state. Leaf samples were collected every two weeks from November 2011 to April 2012 for examination under a stereomicroscope. Mites found were mounted on microscopic slides in Hoyer's medium. In total, 147 mites representing 21 species of 11 families were found. *Panonychus citri* (McGregor, 1916) (Tetranychidae) was the dominant phytophagous species, accounting for about 20% of all mites. The predatory mite family Phytoseiidae was the most diverse, comprising nine species. *Brevipalpus yothersi* Baker, 1949 and *P. citri* are reported for the first time in *C. latifolia* in Brazil.

Keywords: Acari, *Euseius concordis*, *Iphiseiodes zuluagai*, *Panonychus citri*, Taiti lime.

Citrus plants are attacked by several species of pest mites, among them *Phyllocoptruta oleivora* (Ashmead, 1879) (Eriophyidae), *Eutetranychus banksi* (McGregor, 1914), *Panonychus citri* (McGregor, 1916), *Tetranychus mexicanus* (McGregor, 1950) (Tetranychidae), *Brevipalpus yothersi* Baker, 1949 and *Brevipalpus papayensis* Baker, 1949 (Tenuipalpidae) (Smith & Peña 2002; Mineiro et al. 2018). Predatory mites of the family Phytoseiidae are important natural enemies of pest mites in citrus agroecosystems, especially *Iphiseiodes zuluagai* Denmark & Muma, 1972, *Euseius citrifolius* Denmark & Muma, 1970 and *Euseius concordis* (Chant, 1959) (Gravena et al. 1994; Sato et al. 1994; Raga et al. 1996; Reis 2000; Sato 2005).

Citrus latifolia Tanaka (Rutaceae), popularly known as Tahiti lime in Brazil, is a perennial, spinescent fruit tree that reaches up to 6 m in height. The fruits are consumed in the form of juice or otherwise industrialized (Lorenzi et al. 2006). Knowledge of mite fauna on plants of this species in São Paulo state is limited. The objective of this study was to evaluate the mite diversity in commercial orchards of Tahiti lime.

Samplings were carried out in an orchard located in Fazendinha Farm (22°34'23"S, 47°10'21"W; 610m), Artur Nogueira municipality, in the central-eastern region of São Paulo state, Brazil. Ten leaves of this plant were collected biweekly from the middle third of 10 plants from November 2011 to April 2012. They were placed in paper bags, which in turn were placed in a cooled isopropylene box to decrease mite activity and for transport to the laboratory.

The extraction of the mites was carried out in the laboratory by submerging the sampled leaves for 5 minutes in a solution of water + detergent. The solution was vigorously agitated to dislodge the mites from the samples. The mites were sieved (0.038 mm mesh) and mounted on microscope slides in Hoyer's medium. Voucher specimens were deposited in "Geraldo Calcagnolo" Mite Reference Collection, Instituto Biológico (ICMBio authorization 35919-1).

A total of 147 mites representing 21 species of 11 families were found (Tab. 1). Phytophagous mites (Eriophyidae, Tenuipalpidae and Tetranychidae) represented approximately 37% of the mites found. *Panonychus citri* was the dominant species, representing about 20% of all mites collected (Tab. 1).

Predatory mites (Cunaxidae, Ascidae, Blattisociidae and Phytoseiidae) represented approximately 46% of the mites found, with a predominance of Phytoseiidae, the most diverse (nine species) and abundant (64 specimens) family. *Iphiseiodes zuluagai* and *E. concordis* were the dominant phytoseiids, representing 24 and 7% of the mites of this family, respectively (Tab. 1).

Several phytoseiid species recorded in this study have already been reported on citrus in São Paulo state, such as *Amblyseius chiapensis* De Leon, 1961, *Amblyseius acalyphus* Denmark & Muma, 1973, *E. citrifolius*, *I. zuluagai* and *Metaseiulus (Metaseiulus) camelliae* (Chant & Yoshida-Shaul, 1983) (Sato et al. 1994). The predominance of phytoseiids on citrus have also been reported in this state in previous studies (Sato et al. 1994; Raga et al. 1996; Reis 2000).

Tahiti lime has been reported to be severely attacked by phytophagous mites e.g. Eriophyidae, Tenuipalpidae and Tetranychidae in Brazil (Silva et al. 2017). In the present work, we found two specimens of *B. yothersi* (Tenuipalpidae), which has been mentioned as an important vector of citrus leprosis virus (Nunes et al. 2018). However, leprosis symptom was not observed here. *Phyllocoptruta oleivora*, *T. mexicanus* and *Brevipalpus phoenicis* (Geijskes, 1939) *sensu lato* are also common plant-feeding mites on leaves, fruits and branches of Tahiti lime in Venezuela (Quiros-Gonzalez 2000), but these species above were rare or absent in the present work.

None of the leaf samples collected in this study showed significant damage caused by the phytophagous mites. Some phytophagous species found here, such as *P. citri* and *Tetranychus* sp., have been reported to reach relatively high abundance on Tahiti lime in Florida (Childers & Abou-Setta 1999), but the population number of these mites in our study was always low. The absence of significant damage indicated that the phytophagous mites were in ecological equilibrium, probably at least partly due to the action of natural enemies.

Although the Tahiti lemon crop is of great economic importance for Brazilian exportations, the mite diversity is poorly known. In the present study, *B. yothersi* and *P. citri* are reported for the first time on *C. latifolia* in Brazil.

Table 1. Mite species from leaves of *Citrus latifolia* in Artur Nogueira municipality, São Paulo state, from November 2011 to April 2012.

Taxa (predominant feeding habit) ¹	Abundance
Trombidiformes, Prostigmata	
Cunaxidae (Pr)	<i>Armscirus</i> sp. 1
Eupodidae (Un)	<i>Eupodes</i> sp. 1
Eriophyidae (Ph)	<i>Phyllocoptruta oleivora</i> 1
Tenuipalpidae (Ph)	<i>Brevipalpus yothersi</i> 2
Tetranychidae (Ph)	<i>Eutetranychus</i> sp. 1
	<i>Panonychus citri</i> 30
	<i>Tetranychus</i> sp. 21
Tydeidae (Ph)	<i>Lorryia formosa</i> 19
Sarcoptiformes, Oribatida	
Oppiidae (Ot)	<i>Aeroppia</i> sp. 2
Acaridae (Ot)	<i>Tyrophagus putrescentiae</i> 2
Mesostigmata	
Ascidae (Pr)	<i>Asca</i> sp. 2
Blattisociidae (Pr)	<i>Lasioseius</i> sp. 1
Phytoseiidae (Pr)	<i>Amblyseius chiapensis</i> 4
	<i>Amblyseius herbicolus</i> 1
	<i>Amblyseius</i> sp. 3
	<i>Euseius citrifolius</i> 3
	<i>Euseius concordis</i> 11
	<i>Euseius mesembrinus</i> 4
	<i>Iphiseiodes saopaulus</i> 2
	<i>Iphiseiodes zuluagai</i> 35
	<i>Proprioseiopsis neotropicus</i> 1

(¹) Pr: predator; Ph: phytophagous; Ot: other; Un: unknown

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Authors' Contributions

JLdeCM and AR designed the study, discussed the results, and wrote the manuscript. AR conducted the field activities. JLdeCM classified and identified the specimens.

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