

First record of tetranychids (Acari: Tetranychidae) on *Euterpe precatoria* (Arecaceae) in the Brazilian Amazon¹

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ABSTRACT

The Tetranychidae family comprises mite species that are strictly phytophagous and typically associated with medicinal, ornamental, fruit and forest plants. Between August and October 2023, webs and mites were observed on the leaflets of solitary açai palms [*Euterpe precatoria* Mart. (Arecaceae)] seedlings, in nurseries in Rio Branco, Acre state, Brazil. The mites were collected, mounted, identified and quantified. The subsequent identification confirmed the presence of three tetranychid species: *Tetranychus palmarum* Flechtmann & Noronha, 2011, *Tetranychus ludeni* Zacher and *Oligonychus gossypii* (Zacher). These species had not been previously recorded on *E. precatoria*, with only *O. gossypii* being already reported in the state. Thus, this is the first record of tetranychids infesting solitary açai palm, and the first report of *T. palmarum* and *T. ludeni* in Acre.

KEYWORDS: Tetranychidea, phytophagous mite, spider mite.

RESUMO

Primeiro registro de tetraniquídeos (Acari: Tetranychidae) em *Euterpe precatoria* (Arecaceae) na Amazônia brasileira

A família Tetranychidae abrange espécies de ácaros estritamente fitófagos associados a plantas medicinais, ornamentais, frutíferas e florestais. De agosto a outubro de 2023, foi observada a presença de teias e ácaros sobre folíolos de mudas de açaizeiro-solteiro [*Euterpe precatoria* Mart. (Arecaceae)], em viveiros localizados em Rio Branco, estado do Acre. Os ácaros foram coletados, montados, identificados e quantificados. Após as identificações, foi constatada a ocorrência de três espécies de tetraniquídeos: *Tetranychus palmarum* Flechtmann & Noronha, 2011, *Tetranychus ludeni* Zacher e *Oligonychus gossypii* (Zacher). A ocorrência dessas espécies não era conhecida para *E. precatoria*, e apenas *O. gossypii* já havia sido relatado no estado. Assim, configura-se o primeiro registro de tetraniquídeos infestando açaizeiro-solteiro, e o primeiro relato de *T. palmarum* e *T. ludeni* para o Acre.

PALAVRAS-CHAVE: Tetranychidea, ácaro fitófago, ácaro-de-teia.

The Arecaceae family comprises a diverse group of species ranging from small shrubs to large trees, commonly known as palms (Balslev et al. 2011). Among these are the seven species of the *Euterpe* genus, which are exclusively Neotropical and naturally occur from Central America to the tropical regions of South America (Henderson & Galeano 1996, Baker & Couvreur 2013a, Baker & Couvreur 2013b).

In Brazil, *Euterpe edulis* Mart., *Euterpe oleracea* Mart. and *Euterpe precatoria* Mart. hold significant agricultural and extractive value, carrying notable socioeconomic importance (Bussmann & Zambrana 2012). In 2018, the pulp extracted from

fruits of these palms was recognized as the highest value-added non-timber forest product derived from extractivism in Brazil (IBGE 2019).

Euterpe precatoria (solitary açai palm) is considered one of the most significant species in agronomic and economic terms. This palm naturally occurs in the phytogeographic domains of *terra firme*, *várzea* and ombrophilous forests in the central and western Amazon of Brazil (Bussmann & Zambrana 2012, Martinot et al. 2017).

Due to the growing national and international demand for açai, its market value has increased, leading to a significant rise in production driven by

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the intensification of açaí management supported by public policies (Tagore et al. 2019). As the cultivated area expands, phytosanitary concerns are becoming increasingly relevant, as several pest species have been reported in association with açaí palms from the seedling stage to adulthood (Souza & Lemos 2004).

Knowledge on the insects and mites associated with this palm is essential for providing sound management recommendations for the primary pest organisms present (Souza & Lemos 2004). Among the primary pest mites in cultivated plants are those belonging to the Tetranychidae family, which includes the most important pest mite species in agriculture, whose population outbreaks can lead to severe losses and even plant death (Hoy 2011).

Until now, among the agriculturally important *Euterpe* species, tetranychids have been recorded only on *E. edulis* and *E. oleracea* (Flechtmann & Moraes 2024). This is the first report of the association of three species of tetranychid mites with solitary açaí palm plants in the Brazilian Amazon.

Weekly, from August to October 2023, a large number of webs and mites were observed on three-month-old *E. precatoria* seedlings in three adjacent shaded nurseries at the experimental field of Embrapa Acre (10°01'24.5"S, 67°42'4.7"W and altitude of 179 m), in Rio Branco, Acre state, Brazil.

From each sampling, leaflets containing mites were collected, placed in labeled airtight bags and transported to the laboratory, where the leaflets were examined under a stereomicroscope. Using a fine-tipped brush, the mites were captured and placed in containers with 70 % ethyl alcohol, for identification.

The samples collected in August 2023 were sent to the acarology laboratory of the Universidade do Vale do Taquari (Univates), in Lajeado, Rio Grande do Sul state, Brazil, while the samples from September and October 2023 were sent to the acarology and agricultural entomology laboratory at the Universidade Federal do Amazonas (UFAM), in Itacoatiara, Amazonas state, Brazil.

The mites were prepared on glass slides and coverslips for microscopy in Hoyer's medium, with nymphs and females mounted in groups of up to four individuals in a dorsal-ventral position, and males mounted individually in a lateral-lateral position. The slides were then placed in an oven at 45 °C, for 7 days, to dry and clarify the specimens (Moraes & Flechtmann 2008). The mites were identified at the species level under a phase contrast microscope,

according to Flechtmann & Khihinicki (2002), Flechtmann & Noronha (2011), Seeman & Beard (2011) and Mushtaq et al. (2023). The slides were deposited in the reference collection of the Natural Science Museum of the Univates and in the collection of the UFAM.

Under microscopic examination, the specimens exhibited a palp with a thumb-claw process; chelicerae fused together, with a long, stylet-like movable digit recurved at the base and inserted into the stylophore; stigmata at the base of the gnathosoma; long setae on the dorsum of the idiosoma; two pairs of duplex setae on tarsus I; presence of an empodium; a pair of para-anal setae; and females with striae on the genital opening. These characteristics confirmed that they belong to the Tetranychidae family (Moraes & Flechtmann 2008). However, differences were observed in the type of empodium, arrangement of duplex setae on tarsus I, positioning of proximal tactile setae on tarsus I in females, and, in males, the aedeagus shape, identifying three tetranychid species in the samples: *Tetranychus palmarum* Flechtmann & Noronha, 2011, *Tetranychus ludeni* Zacher, 1913 and *Oligonychus gossypii* (Zacher, 1921).

In *T. palmarum* (6 ♀; 3 ♂; 12 nymphs), the empodium is distally split and features a prominent dorsomedian spur (Figure 1A). Tarsus I has one proximal and one distal pair of duplex setae. In females, tarsus I bears four proximal tactile setae near the proximal duplex setae pair and a solenidium aligned with the duplex setae pair. Males have an aedeagus with the body and head axes nearly parallel and the body curved upward (Figure 1B). The head is approximately twice the width of the neck, with a median elevation and sharp angulation at the anterior and posterior projections, the anterior being slightly beak-shaped and the posterior short (Flechtmann & Noronha 2011).

Tetranychus ludeni (6 ♀; 3 ♂; 4 nymphs) has a distally split empodium, but lacks a distinct dorsomedian spur. In females, the four proximal tactile setae on tarsus I are aligned with the proximal duplex setae pair (Figure 1C). In males, the aedeagus differs from that of *T. palmarum*, as the head is slightly wider than the neck and lacks a posterior projection (Figure 1D) (Seeman & Beard 2011).

For *O. gossypii* (16 ♀; 4 ♂; 17 nymphs), notable differences were observed, when compared to the two previously mentioned species, particularly the unciform empodium with ventrally adjacent hairs

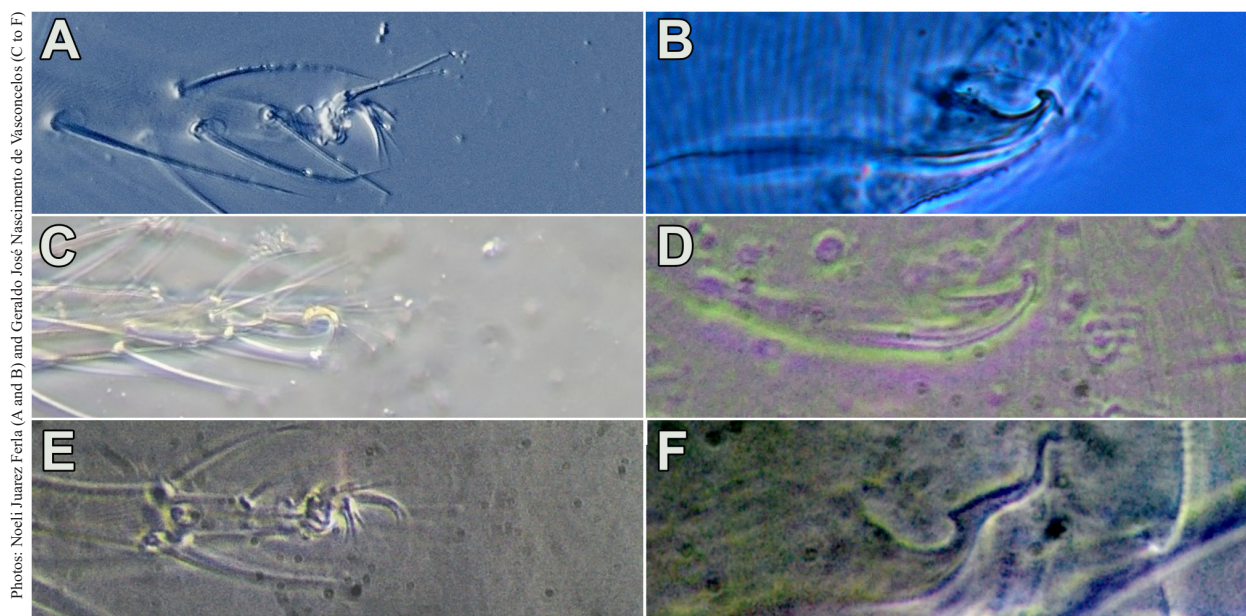


Figure 1. Empodium I of the female (left) and aedeagus (right) of tetranychid mites collected from *Euterpe precatoria*: *Tetranychus palmarum* (A and B), *Tetranychus ludeni* (C and D) and *Oligonychus gossypii* (E and F).

(Figure 1E) and the two pairs of duplex setae on tarsus I, which are distally positioned and adjacent. The aedeagus features a strongly sigmoid dorsal margin of the head (Figure 1F), with a sharply pointed posterior projection significantly longer than the neck width (Mushtaq et al. 2023).

When alive, the three species share some similarities, as they occur on the underside of *E. precatoria* leaflets (Figure 2A), where they establish populations protected by varying amounts of webbing. Examination of the leaflets under a stereomicroscope revealed the presence of eggs, nymphs and adults (Figures 2B and 2C), indicating that *E. precatoria* serves as a suitable host plant for the feeding and reproduction of these mites. Adult females of *T. palmarum*, *T. ludeni* and *O. gossypii* exhibit reddish hues, and their eggs are spherical. *T. palmarum* and *O. gossypii* males are also reddish, whereas those of *T. ludeni* are greenish.

The damage observed on the leaflets is due to the feeding habits of tetranychid mites, which consume the mesophyll cell contents, leading to cell death (Bensoussan et al. 2016). Affected leaflets later exhibited chlorosis (Figure 2D). However, no mortality of *E. precatoria* seedlings was observed during the period of mite occurrence in the nurseries. *Tetranychus palmarum* has been reported only in Brazil, specifically on the African oil palm (*Elaeis*

guineensis Jacq.; Arecaceae) (Migeon & Dorkeld 2024). *Tetranychus ludeni* is a cosmopolitan and polyphagous species, with 363 known host plants, including Arecaceae, such as the coconut palm (*Cocos nucifera* L.) and the Chinese fan palm (*Livistona* sp.) (Flechtmann & Moraes 2024). *Oligonychus gossypii* has an Afrotropical and Neotropical distribution, occurring on 57 plant species, but with no previous records on Arecaceae (Flechtmann & Moraes 2024, Migeon & Dorkeld 2024).

In Brazil, *T. palmarum* has been recorded only in the Pará and Amazonas states, while *T. ludeni* is found in all regions, with records in 12 states and the Federal District (Flechtmann & Moraes 2024). *Oligonychus gossypii* has been reported in six states across different regions, except for the South ones (Flechtmann & Moraes 2024). Neither of the two *Tetranychus* species had been previously recorded in Acre.

There were no previous records of tetranychid mites associated with *E. precatoria*; however, *E. edulis* and *E. oleracea* have been reported to host several species of tetranychids. For *E. edulis*, the following species have been recorded: *Eutetranychus* sp., *Oligonychus* sp., *Schizotetranychus* sp., *Tetranychus mexicanus* (McGregor, 1950) and *Tetranychus* sp. (Flechtmann & Moraes 2024). For *E. oleracea*, the recorded species include *Oligonychus pratensis* (Banks, 1912), *Oligonychus* sp., *T. mexicanus*,

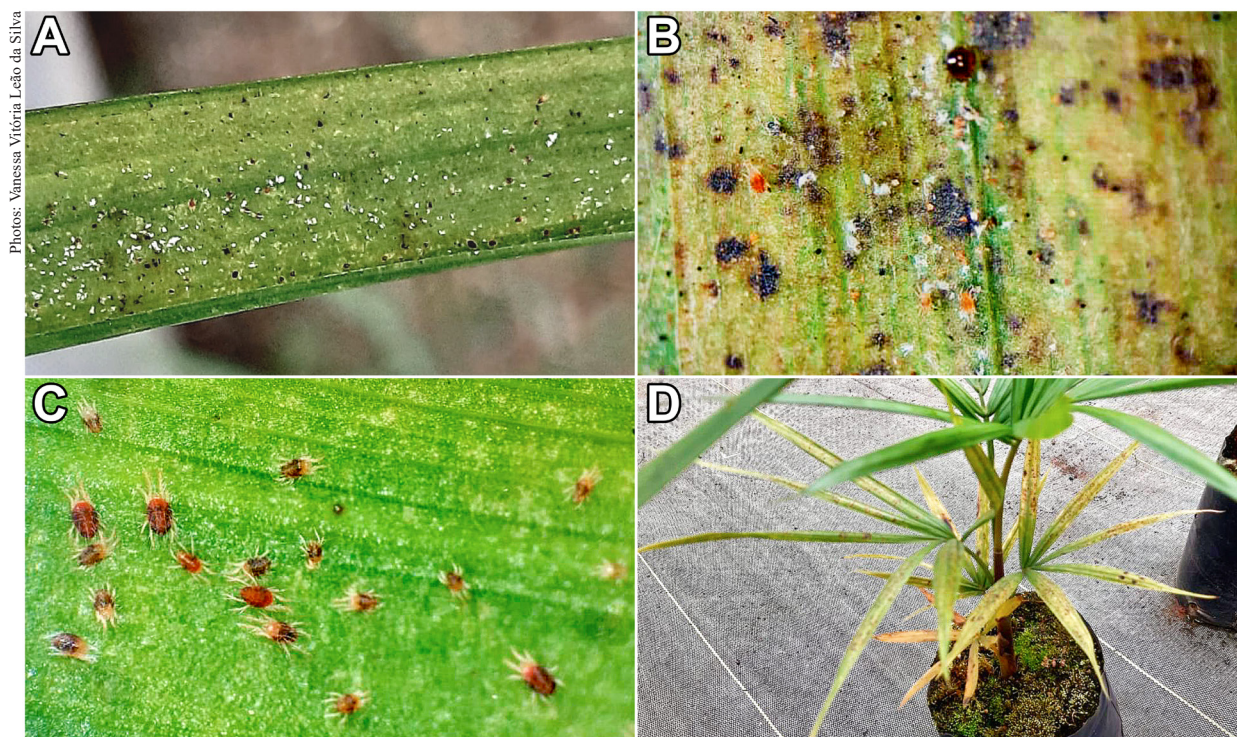


Figure 2. Tetranychid mites on *Euterpe precatoria* seedlings grown in a nursery. A) Damage and chlorosis on basal leaves; B-D) colony on the underside of the leaflet.

Tetranychus urticae Koch, 1836 and *T. palmarum* (Brito et al. 2024, Flechtmann & Moraes 2024).

In addition to tetranychid mites, other phytophagous mites have been reported on *Euterpe* species. Regarding Tenuipalpidae, *Raoiella indica* Hirst, 1924 has been recorded on *E. precatoria*, *E. edulis* and *E. oleracea* (Castro et al. 2024). The following species have been reported on *E. edulis* and *E. oleracea*: *Brevipalpus yothersi* Baker, 1949, *B. phoenicis* sensu lato (Geijskes, 1939), *Brevipalpus* sp., *Tenuipalpus coyacus* De Leon, 1957 and *Tenuipalpus* sp. (Castro et al. 2024). *Brevipalpus* sp., *Brevipalpus feresi* Ochoa & Beard, 2015 and *Tenuipalpus* sp. have been recorded on *E. oleracea* (Arruda Filho & Moraes 2002, Brito et al. 2024, Castro et al. 2024).

Brito et al. (2024) reported the presence of *Tuckerella ornata* (Tucker, 1926) (Tuckerellidae) on *E. oleracea*. Additionally, Teodoro et al. (2015) noted the occurrence of *Retractus johnstoni* Keifer, 1965 (Phytoseiidae) across all three *Euterpe* species. For *E. oleracea*, Brito et al. (2024) also identified *Davisella* sp. (Diptilomiopidae) and *Acaphyllisa* sp. (Eriophyidae).

Given the biotic potential, ease of dispersion and the damage caused to host plants by tetranychid

mites, further research is recommended to clarify their geographic distribution, damage levels and host plants, especially tropical fruit crops, in the Acre state. Additionally, studies are needed to develop control strategies for these tetranychids, aiming to mitigate potential economic losses in commercial *E. precatoria* plantations in the state, particularly in light of the expansion of cultivated areas to meet the growing national and international demand.

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