

AMBLYSEIUS FILCAE DENMARK AND VILLANUEVA, N. SP. (ACARI: PHYTOSEIIDAE) FOUND ON VIBURNUM IN FLORIDA: DESCRIPTION, LIFE CYCLE AND FEEDING STUDIES

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ABSTRACT - *Amblyseius filcae* Denmark and Villanueva, n. sp. was found on *Viburnum odoratissimum* Ker Gawl. var. *awabuki* (K. Koch) Zabel (Caprifoliaceae) in Florida. The adult female can be identified by its rosy coloration, and, on permanent slides, by its tubular-fundibular spermathecal calyx 15 μm long and nodular atrium. Developmental times on pollen of crocea iceplant (*Malephora crocea* Jacquin) (Alzooceae) were 60.6 ± 1.3 , 32.2 ± 1.3 , 41.3 ± 1.0 , 29.6 ± 1.6 , 54.7 ± 1.4 , 218.7 ± 3.3 h for eggs, larvae, protonymphs, deutonymphs, preoviposition time and total female developmental time (up to first oviposition), respectively. *Amblyseius filcae* showed a weak or no predatory performance on *Phyllocoptruta oleivora* (Ashmead) and adult female *Brevipalpus phoenicis* (Geijskes) during predator-prey laboratory bioassays, but *B. phoenicis* egg predation was observed.

Keywords - Acari, Phytoseiidae, life cycle, predation, pollen, U.S.A.

INTRODUCTION

We report an undescribed phytoseiid mite species collected from sweet viburnum, *Viburnum odoratissimum* Ker Gawl. var. *awabuki* (K. Koch) Zabel (Caprifoliaceae), an ornamental plant used for landscape in Florida. The plant was used as hedge at the Citrus Research and Education Center in Lake Alfred. The phytoseiid mite was found in association with *Brevipalpus phoenicis* (Geijskes) (Acari: Tenuipalpidae), a vector of citrus leprosis virus, and often the most abundant phytophagous mite on *Viburnum* plants (Rodrigues *et al.*, 2007). The objectives of this paper are to describe this new species and report its life cycle and potential as a natural enemy of the citrus rust mite, *Phyllocoptruta oleivora* (Ashmead) (Acari: Eriophyidae) and *B. phoenicis*.

MATERIALS AND METHODS

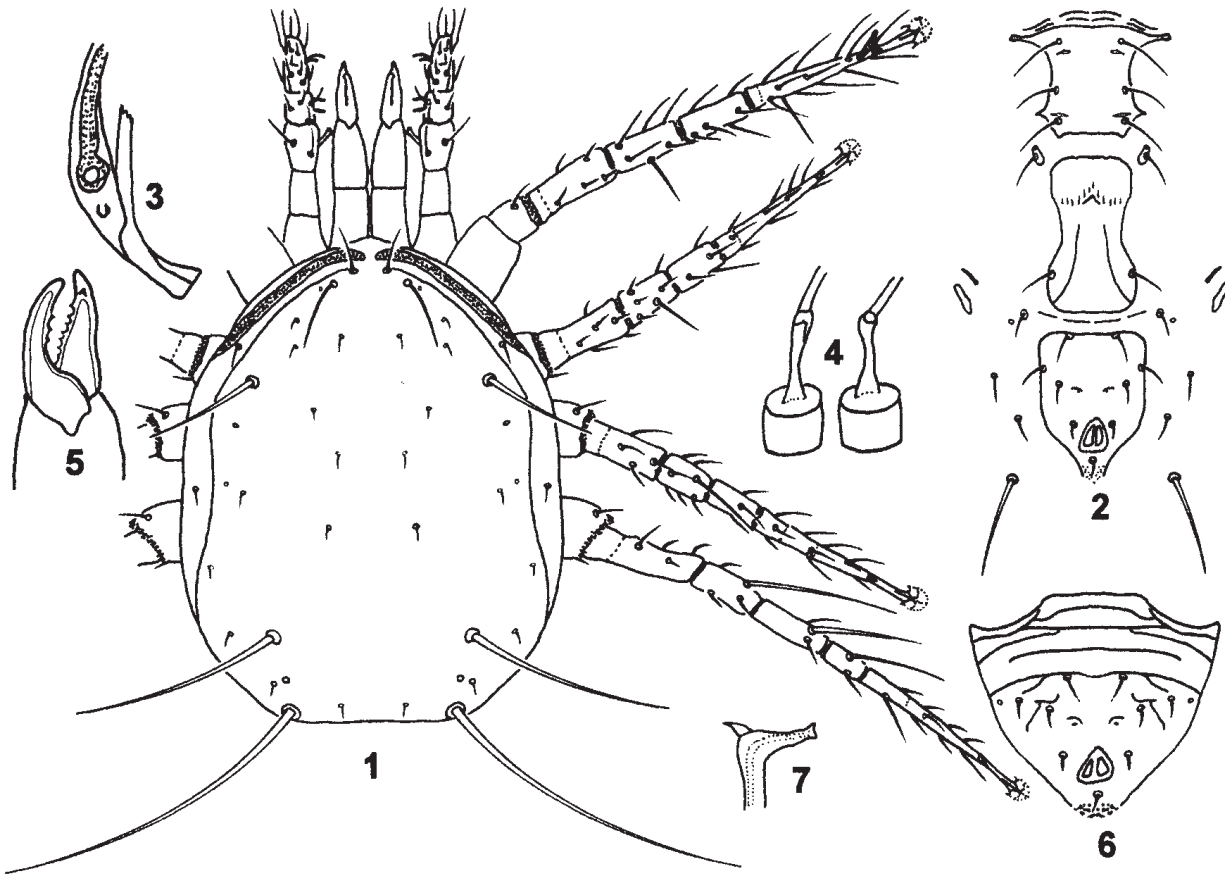
A colony of the new species was established in the laboratory from specimens collected on sweet viburnum plants. The phytoseiid colony was reared on pollen of

crocea iceplant, *Malephora crocea* (Jacquin) in an environmental chamber (25 ± 1 °C, 55 ± 1 % RH and 14h:10h, L:D daylength). All tests were conducted under these environmental conditions and all phytoseiid mites used in the studies were taken from the laboratory colony.

Identification and description - Specimens mounted in Hoyer's medium and identified using a phase-contrast microscope. All measurements, unless otherwise noted, are given in micrometers (μm).

Life cycle - To evaluate the duration of *A. filcae* developmental stages, individual eggs (< 12 h old) ($n = 40$) were placed on 1.8 cm diameter leaf disks of sweet viburnum or grapefruit (*Citrus paradisi* Macfayden) with a No. 5/0 brush. Disks were placed lower surface up on top of a water-saturated cotton pad in 15 cm diameter Petri dishes to maintain disk turgidity and to contain the mites. Pollen from iceplant and citrus were placed on the *Viburnum* and citrus disks, respectively. Plenty of all food sources were provided during the duration of the study.

Predation studies - Valencia oranges [(*Citrus sinensis* (L.) Osbeck)] (4 to 5 cm diameter) heavily infested



Figs. 1-7. *Amblyseius filcae* Denmark and Villanueva - 1. Dorsal shield legs and setation (female); 2. Ventral shields and setation (female); 3. Posterior peritremal and stigmatal shields (female); 4. Spermathecae (female); 5. Chelicera (female); 6. Ventrianal shield (male); 7. Spermatodactyl (male).

with *P. oleivora* were used as arenas, as described by Villanueva and Childers (2007) to test *A. filcae* immature and female predation on *P. oleivora*. One <12 h old egg of *A. filcae* ($n = 20$) was placed in each arena. A wet cotton strip was used to hold the mites within a circular area (~ 2.5 to 3.0 cm diameter) in the upper part of each orange. Oranges ($n = 20$) were placed on plastic PVC rings (1 cm height x 4 cm diameter) to maintain stability. The arenas were held in an environmental chamber ($25 \pm 1^\circ\text{C}$, $55 \pm 1\%$ RH and 14h:10h, L:D daylength). Mite development was recorded every 12 h. Predation of was evaluated by placing a 24 h-starved phytoseiid mite in an arena and observing its search for prey for a 5 minute interval. Ten *A. filcae* females and ten oranges were used in this test.

Predation tests were also conducted using laboratory-reared *B. phoenicis* females as prey. The bioassay unit consisted of a 90 mm diameter Petri dish ($n = 10$) with a 1.5 cm diameter leaf arena of *V. odoratissimum* placed on top of a layer of water-saturated cotton. Ten adult *B. phoenicis* were placed on each leaf arena and 24 h

later one adult *A. filcae* was added. Arenas were checked twice daily for 7 days.

RESULTS AND DISCUSSION

Amblyseius filcae Denmark and Villanueva, n. sp. (Figs. 1-7)

Diagnosis - *Amblyseius filcae* is similar to *Amblyseius genualis* De Leon, but differs in having a spermatheca with a tubular-fundibular calyx 15 μm long and a nodular atrium; j3 34, s4 81, Z4 102, Z5 235 in *A. filcae* as opposed to having a spermatheca with a tubular-fundibular calyx 22 μm long, and a c-shaped atrium, j3 44, s4 91, Z4 112 and Z5 260 in *A. genualis*.

FEMALE ($n = 4$) - *Dorsal idiosoma* (Fig. 1) - Dorsal shield length 329, width at s4 188, smooth, with 4 solenostomes at the following sites: posterolaterad of j3, posterior to s4, anterolaterad to Z1 and anteromedial to S5; 17 pairs of setae. Measurement of idiosomal setae: j1 31, j3 34, j4 4, j5 4, j6 4, J2 4, J5 5; z2 5, z4 5, z5 4, Z1 4,

Z4 102, Z5 235; s4 81, S2 5, S4 5, S5 5; r3 10, R1 5. *Ventral idiosoma* (Fig. 2) - Sternal shield smooth, with 2 pairs of elliptical solenostomes and 3 pairs of setae (ST1, ST2, and ST3); ST4 on metasternal plates. Ventrianal shield smooth, with a pair of elliptical lyrifissures and 3 pairs of preanal setae (JV1, JV2, and ZV2). Setae ZV1, ZV3, JV4 and JV5 (79) on integument surrounding ventrianal shield. Peritreme (Fig. 3) extending anteriorly to j1. *Spermatheca* (Fig. 4) - With a tubular-fundibular calyx 15 μ m long, with a nodular atrium. *Chelicera* (Fig. 5) - Normal relative to body size, fixed digit with 9 denticles, movable digit with 3 denticles. *Legs* - Formula (in descending order of length) 4123. Macrosetae on SgeI, SgeII, SgeIII, SgeIV 110, StiIV 78, StIV 62. Genu II 2-2/0-2/0-1; genu III 1-2/1-2/0-1.

MALE (n = 1) - Smaller than female, with shorter setae. Ventrianal shield (Fig. 6) reticulate, with a pair of elliptical solenostomes and 3 pairs of short, smooth setae. Spermatodactyl (Fig. 7) foot-like terminally, L-shaped, toe not enlarged and lateral process present.

Collection data - Female holotype, 3 female and 1 male paratypes, USA, Florida, Polk Co., Lake Alfred, laboratory reared from specimens collected on *Viburnum odoratissimum* Ker Gawl. var. *awabuki* (K. Koch) Zabel (Caprifoliaceae). Holotype deposited in the United States National Museum of Natural History (USNMNH) and 3 female and 1 male paratypes deposited in the Florida State Collection of Arthropods (FSCA).

Etymology - This species is named as a tribute to Filca Villanueva Angeles, a sister of the senior author, who died at an early age.

Life cycle, feeding and predatory studies - The mean \pm SEM developmental times (in hours) of *A. filcae* on ice-plant pollen were 60.6 ± 1.3 for eggs, 32.2 ± 1.3 for larvae, 41.3 ± 1.0 for protonymphs, 29.6 ± 1.6 for deutonymphs, 54.7 ± 1.4 for preoviposition time, 218.7 ± 3.3 for total female developmental time (up to first oviposition), and 162.0 ± 1.5 for the total developmental time of males. All immature instars of *A. filcae* were clear to whitish in color. The female idiosoma was mostly a distinctive rosy color, except few individuals had the rosy color concentrated only in the digestive tract regardless of feeding.

Amblyseius filcae reared on citrus pollen and with *P. oleivora* did not develop further than the protonymphal

stage and died. Predation of *P. oleivora* by female *A. filcae* was not observed during trials. Both tests indicated that *P. oleivora* was not a suitable prey for the development of *A. filcae* or as an alternative prey of adults. In addition, this may be the reason why *A. filcae* was not found on citrus plants growing adjacent to *Viburnum* where this mite was initially collected and where *P. oleivora* was abundant. *Amblyseius filcae* did not prey on *B. phoenicis* however, in many cases *A. filcae* was found on the moist cotton beyond the leaf arena trying to escape, indicating a poor predatory behavior toward *B. phoenicis* adults. However, *A. filcae* was observed feeding on eggs of *B. phoenicis*. This mite might prefer immature *Brevipalpus* mites, although no tests were conducted to evaluate this behavior. Further tests are necessary to assess this potential.

The origin of *A. filcae* in Florida is unknown. It may be a native species that found a new niche on this non-native plant, or it may be an introduced species. If *A. filcae* is an introduced species then there are two possible sources of this introduction: *Viburnum* plants brought originally from Asia or from the Caribbean.

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