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Swirski Mite *Amblyseius swirskii* Athias-Henriot (Arachnida: Mesostigmata: Phytoseiidae)[1]

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The Featured Creatures collection provides in-depth profiles of insects, nematodes, arachnids, and other organisms relevant to Florida. These profiles are intended for the use of interested laypersons with some knowledge of biology as well as academic audiences.

Introduction

Aloysius swirskii is a beneficial predatory mite endemic to the Eastern Mediterranean region. This species is considered a generalist predator and readily consumes small soft-bodied arthropod pest species as well as pollen or plant exudates. *Amblyseius swirskii* has attracted substantial interest as a biological control agent of mites, thrips, and whiteflies in greenhouse and nursery crops and is currently reared and sold commercially in Europe and North America for this purpose.

Figure 1. Adult *Amblyseius swirskii* feeding on thrips larvae. Credit: Steven Arthurs, University of Florida

Synonymy

Amblyseius rykei

Neoseiulus swirskii

Typhlodromips swirskii

The multiple species synonyms in the Phytoseiidae are a result of identifications derived from single specimens, poorly defined morphological characters, and lack of technical skills in phytoseiid taxonomy.

Distribution

Amblyseius swirskii is native to Israel, Italy, Cyprus, Turkey, Greece, and Egypt and can be found on various crops including apples, apricot, citrus, vegetables, and cotton (EPPO 2021). In North America it was first released in 1983 for control of citrus pests in California. Since 2005, *Amblyseius swirskii* has been released or tested as a biological control agent in many European countries, as well as North America, North Africa, China, Japan, and Argentina (Arthurs et al. 2009, Cedola and Polack 2011, Chen et al. 2011, EPPO 2021, Kade et al. 2011, Sato and Mochizuki 2011). Hence, in recent years, the range of *Amblyseius swirskii* may have expanded considerably in areas with suitable climatic conditions for its survival.

Description

Amblyseius swirskii belongs to the *Phytoseiidae* family, members of which are characterized by long legs, with the front pair pointing forward, and relatively few hairs (< 20 pairs) on their backs. The color of the mites may vary from deep red to pale yellow depending on the prey items eaten. Mites feeding on thrips and whiteflies are generally pale yellow to pale tan.

Amblyseius swirskii cannot be readily distinguished from some other phytoseiid mites and positive identification requires examination of slide-mounted specimens under a microscope. Length and position of setae (small bristles) on the dorsal surface of adults are important morphological characters for identification of phytoseiid mites. See https://www1.montpellier.inra.fr/CBGP/phytoseiidae/sitewebvineyards2/Subfamilies_1.htm.

Like other mites, *Amblyseius swirskii* has five life stages: egg, larva, protonymph, deutonymph, and adult.

Adults

Adults are pear-shaped, 0.5 mm (1/50th inch) in length with an unsegmented body and four pairs of legs. Males may be slightly smaller than females.

Eggs

Eggs are oval-shaped, pale-whitish, and approximately 0.15 mm (1/150th inch) in length. *Amblyseius swirskii* lays eggs on the underside of plant leaves, mainly at the intersection of main and lateral ribs. Females prefer to lay eggs on leaf hairs (trichomes) near plant domatia (small hairy tufts or pockets found on the lower surface of some leaves), which may be an adaptation to avoid egg predators.

Immature Stages

Larvae are pale white to nearly transparent in color and only have three pairs of legs. The protonymph (2nd stage) and deutonymph (3rd stage) have four pairs of legs and are darker than the larvae.

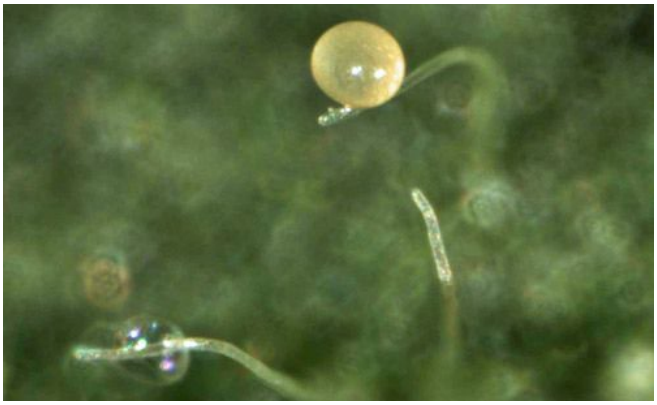

Figure 2. Egg of *Amblyseius swirskii* laid on leaf trichome; emerged (empty) egg is visible in the lower left corner.
Credit: Mahmut Dogramaci, University of Florida

Figure 3. Larva of *Amblyseius swirskii.* Note: only three pairs of legs.
Credit: Mahmut Dogramaci, University of Florida

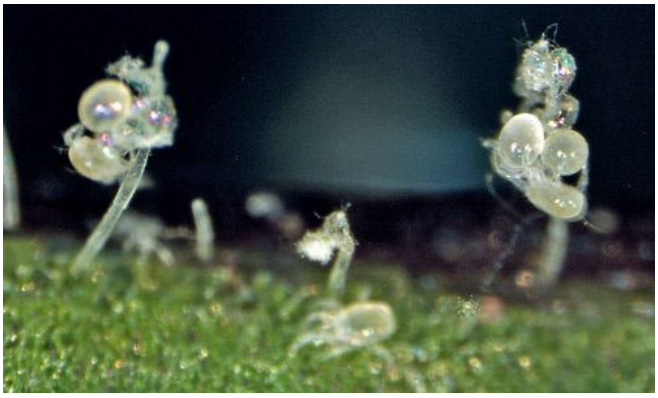

Figure 4. *Amblyseius swirskii* larvae emerging from eggs.
Credit: Mahmut Dogramaci, University of Florida

Biology

Amongst phytoseiids, *Amblyseius swirskii* is considered a Type III generalist, with a broader host range and reduced tendency to aggregate in response to prey compared to Type I and II species (Croft et al. 2004). In addition to arthropod prey, *Amblyseius swirskii* can survive and reproduce on various pollens and gain sustenance from plant nectars, which may allow them to persist during periods of low pest density and improve their effectiveness as biological control agents (Ragusa and Swirski 1975). *Amblyseius swirskii* is adapted to warmer and humid sub-tropical climates and may be less effective in cooler conditions and at reduced relative humidity.

Development of *Amblyseius swirskii* is influenced by type of food (prey, pollen, plant exudates), availability of food, and environmental conditions. Mites develop between 18°C and 36°C (64.4°F and 96.8°F) at 60% relative humidity (Lee and Gillespie 2011). Feeding on prey, the egg to adult development period at 25°C (77°F) is around five days (Park et al. 2010). *Amblyseius swirskii* feeding on live prey develop faster and lay more eggs when compared with *Amblyseius swirskii* feeding on pollen; for example, females laid 26 and 38 eggs on pollen and mite diets, respectively (Park et al. 2011). When not actively hunting, *Amblyseius swirskii* are typically found on the underside of leaves along the midrib or in other protected locations such as domatia.

Figure 5. Leaf domatia of pepper plant containing different life stages of *Amblyseius swirskii*. Eggs are on outer trichomes and mites are inside the pocket of the domatia.
Credit: Mahmut Dogramaci, University of Florida

Host Range

Amblyseius swirskii is documented to feed and reproduce on a wide range of prey from several orders, including thrips (western flower, onion, melon, and chilli), whiteflies (greenhouse and silverleaf) and plant feeding mites (spider, broad and eriophyoid) (Calvo et al. 2011, Dogramaci et al. 2011, Nomikou et al. 2001, Onzo et al. 2012, Stansly and Castillo 2010, Wimmer et al. 2008, Xiao et al. 2012). *Amblyseius swirskii* mainly feeds on the immature stages of thrips and whiteflies, although it also attacks the adult stages of smaller pest species (Arthurs et al. 2009). A recent study documented *Amblyseius swirskii* feeding and probably reproducing on immature Asian citrus psyllids (Juan-Blasco et al. 2012).

Figure 6. *Amblyseius swirskii* feeding on adult chilli thrips.
Credit: Steven Arthurs, University of Florida

Economic Importance

Amblyseius swirskii is commonly used to control whiteflies and thrips in greenhouse vegetables (especially cucumber, pepper, and eggplant) and some ornamental crops in Europe and North America (Buitenhuis et al. 2010, Messelink et al. 2006). Since *Amblyseius swirskii* is not susceptible to diapause it can be used throughout much of the season provided daytime temperatures regularly exceed 22°C (71.6°F). The mites are released directly in the crops in bran or vermiculite carriers sprinkled on the leaves or substrates or may be broadcast via air blast (Buitenhuis et al. 2010, Opit et al. 2005). The recommended release rates are typically between 25 and 100 mites per m^2 depending on pest species, pest density, and crop. Recent research suggests that the effectiveness of *Amblyseius swirskii* as a biological control agent may be reduced when multiple pest species are present. Kakkar et al. (2016) reported that in a cucumber field, *Amblyseius swirskii* fed preferentially and significantly suppressed melon thrips on leaves but did not provide effective control of common blossom thrips inhabiting cucumber flowers.

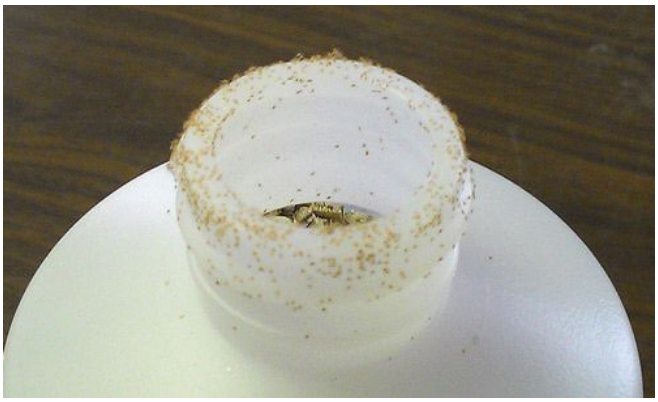

Figure 7. Commercial preparation of predatory mites in vermiculite carrier.
Credit: Bill Lewis, Delray Plants

Figure 8. Commercial preparation of predatory mites in carrier being hand-applied to ornamental palms.
Credit: Bill Lewis, Delray Plants

Figure 9. Commercial preparation of predatory mites being air-applied (blown) onto ornamental palms.
Credit: Bill Lewis, Delray Plants

Slow-release sachets (breeding systems) that contain a substitute prey (bran mite) have been developed and allow gradual release of predators through a small hole in the sachet over several weeks. These sachets are water resistant and provide resources for the reproducing mites during the release period. The use of *Amblyseius swirskii* may be compatible with certain, but not all, insecticides, or other biocontrol agents (Colomer et al. 2011, Dogramaci et al. 2011). In its natural range, *Amblyseius swirskii* is an important predator of mites and other pests on citrus and other subtropical crops.

Figure 10. Slow-release sachet of predatory mites hung on a rose plant.
Credit: Steven Arthurs, University of Florida

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