UF IFAS Extension UNIVERSITY of FLORIDA

EENY-810

https://doi.org/10.32473/edis-IN1425-2024

Coccophagus lycimnia (Walker) (Hymenoptera: Aphelinidae): Parasitoid of Soft Scale Pests (Coccidae: Hemiptera)[1]

Salman A. Al-Shami and Jawwad A. Qureshi[2]

This publication describes the biology, distribution, behavior, and impact of the parasitoid *Coccophagus lycimnia* (Walker). This parasitoid is known for significantly reducing soft scale populations. This document provides important knowledge about this beneficial insect and is intended for a wide group of interested audiences including growers, extension agents, researchers, students, laypersons, and other stakeholders.

Introduction

Coccophagus lycimnia (Walker) is a member of Aphelinidae which is an important family of beneficial insects with significant economic importance as biological control agents against whitefly and scale insect pests (Viggiani 1984; Noyes 2012). It was the most abundant species among 21 parasitoid species reared from lecanium scales (*Parthenolecanium* spp.) in the urban landscapes of Georgia, North Carolina, South Carolina, and Virginia, United States (Camacho et al. 2018). These authors also reported that *Coccophagus lycimnia* was identified under the synonym *Coccophagus lecanii* (Fitch) in Compere (1931). We found it attacking the green scale *Coccus viridis* (Coccidae: Hemiptera) in Fort Pierce, Florida. The genus *Coccophagus* is a member of the subfamily of Coccophaginae and is a typical aphelinid, where males and females may develop on different hosts (Walter 1983; Williams and Polaszek 1996). Females are usually primary endoparasitoids of a variety of scale species, whereas males may develop as ectoparasitoids of the same or closely related host species (Williams and Polaszek 1996; Hayat 1997; Bernal et al. 2001; Hunter and Woolley 2001; Myartseva 2006).

Distribution

Coccophagus lycimnia is a cosmopolitan species and can be found on almost every continent (Muegge and Lambdin 1989; Myartseva 2006; Bernal et al. 2001). In North and South America, the most common species of the genus *Coccophagus* include *Coccophagus lycimnia* (Walker), *Coccophagusscutellar is* (Dalman) and *Coccophagus quaestor* Girault (Myartseva 2006).

Description

Eggs

Females of *Coccophagus lycimnia* will search for a potential scale host before inserting their ovipositor into the target individual. They repeatedly touch the scale with their antennae during probing. In response, the scale host excretes a droplet of honeydew which the parasitoid consumes to increase their longevity. Eggs are pale, oval to teardrop in

1. This document is EENY-810, one of a series of the Entomology and Nematology Department, UF/IFAS Extension. Original publication date May 2024. Visit the EDIS website at https://edis.ifas.ufl.edu for the currently supported version of this publication. This document is also available on the Featured Creatures website at http://entnemdept.ifas.ufl.edu/creatures/.

2. Salman A. Al-Shami, postdoctoral researcher, and Jawwad A. Qureshi associate professor, UF/IFAS Entomology and Nematology Department, Southwest Florida Research and Education Center, Immokalee, Florida; Indian River Research and Education Center, Fort Pierce, Florida; UF/IFAS Extension, Gainesville, Florida 32611 and UF/IFAS

shape with obvious round ends (Muegge and Lambdin 1989). Eggs are deposited on the dorsal side of the scales at different locations depending on the size of the host (Muegge and Lambdin 1989; Bernal et al. 2001). A mated female of *Coccophagus lycimnia* produces an average of 5.6 eggs per day (Muegge and Lambdin 1989). In *Coccophagus* species, fertilized eggs develop into females and unfertilized into males (Viggiani 1984; Muegge and Lambdin 1989). In most *Coccophagus* species, the fertility rate is high during the first two weeks of female life (Viggiani 1984).

Larvae

Coccophagus lycimnia larvae feed and develop in the host scales (Figure 1). The larvae are elongate without spiracles. They excrete small meconial pellets as they mature and proceed to pupation, which can be observed under the scale cover circled around the body of the scale (Figure 1 top right).

Figure 1. *Coccophagus lycimnia* developing in the green scale *Coccus viridis* (Coccidae: Hemiptera). Larvae developing (top left and right), prepupa (bottom left) and pupa (bottom right) in the green scale *Coccus viridis*. The pupa taken out from the green scale showing the dorsal view.
Credits: Salman Al-Shami UF/IFAS

Pupae

Pupation takes place inside the scale (Figure 1). The pupae position themselves with their head directed at the scale posterior (Muegge and Lambdin 1989). The adult parasitoid (Figure 2) emerges by making an exit hole in the scale body (Figure 2). The duration of prepupal and pupal stages depend on scale species and environmental factors, but it can range from 11 to 15 days. The pupal color turns into black in the last week of pupation (Viggiani 1984).

Adults

The adults of *Coccophagus lycimnia* are approximately 1.3-1.5 mm long (Figure 2). The head is black to blackish brown. The legs are whitish-yellow color and the antennae yellow to light brown with seven segments (Abd-Rabou 2002). A bright yellow spot can be seen easily on the thorax (scutellum) (Figure 2). The life span of *Coccophagus lycimnia* depends on temperature and availability of the food. Females are more common than males and live longer which could be up to 5 weeks. However, the mated females live shorter lives and 13 days was reported at 27°C (Muegge and Lambdin 1989). Like many other wasps, mated *Coccophagus lycimnia* can oviposit both unfertilized and fertilized eggs that develop into males and females, respectively.

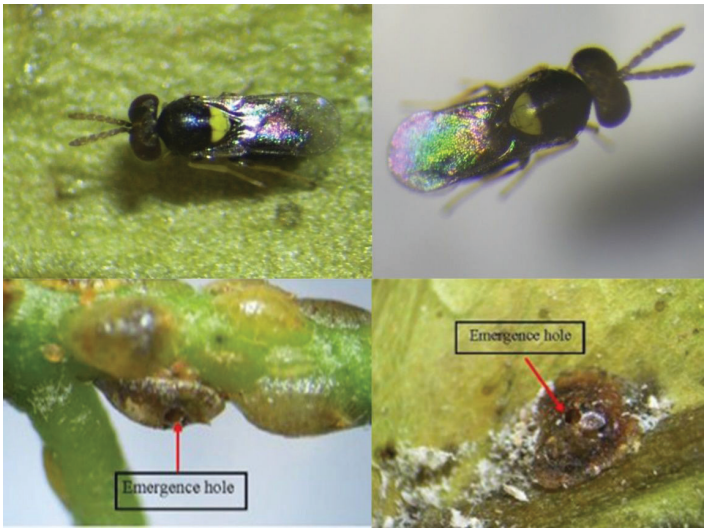

Figure 2. *Coccophagus lycimnia* adult female with the obvious bright yellow spot on scutellum (top row) emerged from the green scale *Coccus viridis* (Coccidae: Hemiptera) and the parasitoids emergence holes (bottom row) in the scale dorsum.
Credits: Salman Al-Shami UF/IFAS

Hosts

Soft scale insects of the family Coccidae (Hempitera) are important pests in Florida infesting several plants including citrus (Hamon and Williams 1984). *Coccophaguslycimnia* is a parasitoid of most soft scale species from family Coccidae particularly; citricola scale *Coccuspseudomagnoliarum*, plum scale *Sphaerolecanium prunastri*, calico scale *Eulecaniumkuwanai*, European fruit lecanium *Parthenolecaniumcorni*, green scale *Coccusviridis*, brown scale *Coccushesperidum*, black scale *Sissetia oleae* and Caribbean black scale *Sissetianeglecta* (Hamon and Williams 1984; Viggiani 1984; Hayat 1997).

Economic Importance

Many species of *Coccophagus* (including *Coccophagus lycimnia*) are economically important as typical biological control agents against soft scales pests attacking different crops such as olive, cherry, coffee, and citrus (Bartlett et al. 1978; Myartseva et al. 2014; Paloukis and Navrozidis 1996; Kapranas et al. 2007). The naturally occurring *Coccophagus lycimnia* in the region was found parasitizing green scale *Coccus viridis* in citrus under protective screen (CUPS) in the Southeast of Florida (Al-Shami and Qureshi, unpublished). *Coccophagus lycimnia* has been released in California to control the black scale (Bartlett 1978). Bernal et al. (2001) reported that parasitism rate of *Coccophagus lycimnia* on citricola scale *Coccus pseudomagnoliarum* was as high as 84%. However, one of the most important challenges in using natural enemies to control the soft scale pests is applications of broad-spectrum insecticides against multiple pests. Population of natural enemies can be maintained through moderate and judicious application of selective insecticides. *Coccophagus lycimnia* is not available commercially so the natural populations should be conserved.

Selected References

Abd-Rabou S. 2002. "Revision of Aphelinidae (Hymenoptera) from Egypt." Second International Conference of Plant Protection Research Institute, Dokki, Giza, Egypt 1:280. https://doi.org/10.1111/j.1744-7917.2004.tb00189.x

Bartlett BR, Clausen CP, DeBach P, Goeden RD, Legner EF, McMurtry JA, Oatman ER. 1978. "Introduced parasites and predators of arthropod pests and weeds: A world review." U.S. Department of Agriculture, Agriculture Handbook No. 480. Washington, D.C., USA. 554 pp.

Bernal JS, Luck RF, Morse JG, Drury MS. 2001. "Seasonal and scale size relationships between citricola scale (Homoptera: Coccidae) and its parasitoid complex (Hymenoptera: Chalcidoidea) on San Joaquin Valley Citrus." *Biological Control* 20:210–221. https://doi.org/10.1006/bcon.2000.0905

Camacho RE, Chong JH, Braman SK, Frank SD, Schultz PB. 2018. "Natural enemy communities and biological control of *Parthenolecanium* spp. (Hemiptera: Coccidae) in the Southeastern United States." *Journal of Economic Entomology* 111 (4): 1558–1568. https://doi.org/10.1093/jee/toy102

Compere H. 1931. "A revision of the species of Coccophagus, a genus of hymenopterous, coccid inhabiting parasites." *Proceedings of the United States National Museum* 78 (7): 1–132. https://doi.org/10.5479/si.00963801.78-2850.1

Hamon AB, Williams ML. 1984. "The soft scales of Florida (Homoptera: Coccoidea). Arthropods of Florida and neighboring land areas." Florida Department of Agriculture & Consumer Services, Contribution No. 600. Gainesville, Florida, USA. 194 pp.

Hayat M. 1997. "Aphelinidae" (pp. 111–145). In: Ben-Dov Y, Hodgson CJ (Eds.). "Soft scale insects, their biology, natural enemies and control." Elsevier, Amsterdam, The Netherlands. https://doi.org/10.1016/S1572-4379(97)80079-6

Hunter MS, Woolley JB. 2001. "Evolution and behavioral ecology of heteronomous aphelinid parasitoids." *Annual Review of Entomology* 46:251–290. https://doi.org/10.1146/annurev.ento.46.1.251

Kapranas A, Morse JG, Pacheco P, Forster LD, Luck RF. 2007. "Survey of brown soft scale *Coccus hesperidum* L. parasitoids in southern California citrus." *Biological Control* 42:288–299. https://doi.org/10.1016/j.biocontrol.2007.05.012

Muegge MA, Lambdin PL. 1989. "Longevity and fecundity of *Coccophagus lycimnia* (Walker) (Hymenoptera: Aphelinidae), a primary parasitoid of *Coccus hesperidum* (Homoptera: Coccidae)." *Journal of Agricultural Entomology* 6 (3): 169–174. https://doi.org/10.18474/0749-8004-24.1.96

Myartseva SN. 2006. "Review of Mexican species of Coccophagus Westwood, with a key and description of new species (Hymenoptera: Chalcidoidea: Aphelinidae)." *Zoosystematica Rossica* 15 (1): 113–130. https://doi.org/10.31610/zsr/2009.18.1.109

Myartseva SN, Ruíz-Cancino E, Coronado-Blanco JM, 2014. "*Parasaissetia nigra* (Hemiptera: Coccidae) and its parasitoids from the genus *Coccophagus* (Hymenoptera: Aphelinidae), with description of a new species from Tamaulipas, México." *Florida Entomologist* 97 (3): 1015–1020. https://doi.org/10.1653/024.097.0302

Noyes JS. 2012. Universal Chalcidoid Database. The Natural History Museum. Available online at https://www.nhm.ac.uk/our-science/data/chalcidoids/. Accessed on September 20, 2023.

Paloukis SS, Navrozidis EI. 1996. "Contribution to the control of *Sphaeolecanium prunastri* (Fonsc.) on cherry trees in N. Greece." Proceedings XX International Congress of Entomology, Firenze, Italy, August 25-31, pp.719

Viggiani G. 1984. "Bionomics of the Aphelinidae (Hymenoptera: Chalcidoidea)." *Annual Review of Entomology* 29:257–276. https://doi.org/10.1146/annurev.en.29.010184.001353

Walter GH. 1983. ''Divergent male ontogenies in Aphelinidae (Hymenoptera: Chalcidoidea): A simplified classification and a suggested evolutionary sequence." *Biological Journal of the Linnean Society* 19:63–82. https://doi.org/10.1111/j.1095-8312.1983.tb00777.x

Williams T, Polaszek A. 1996. "A re-examination of host relations in the Aphelinidae (Hymenoptera: Chalcidoidea)." *Biological Journal of the Linnean Society* 57:35–45. https://doi.org/10.1006/bijl.1995.0003