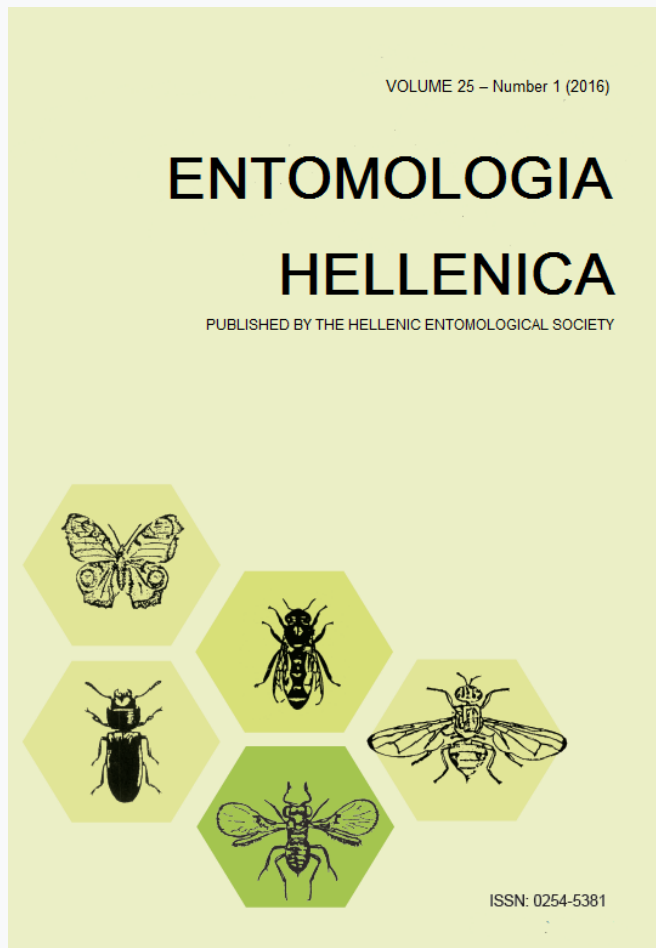


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SHORT COMMUNICATION

First record of the nesting whitefly, *Paraleyrodes minei*, in Greece**A.P. KALAITZAKI^{1,*}, A.E. TSAGKARAKIS² AND A. ILIAS³**¹*ELGO 'DEMETER', Institute for Olive Tree, Subtropical Crops and Viticulture, 73100 Chania, Greece*²*Laboratory of Agricultural Zoology & Entomology, Agricultural University of Athens, 11855 Athens, Greece*³*Department of Viticulture, Vegetable Crops and Plant Protection, ELGO 'DEMETER', Institute for Olive Tree, Subtropical Crops and Viticulture, 71307 Heraklion, Greece***ABSTRACT**

On late June 2015, the nesting whitefly *Paraleyrodes minei* Iaccarino (Hemiptera: Aleyrodidae) was recorded for first time in Greece. Its occurrence was observed on leaves of sweet orange [*Citrus sinensis* (L.) Osbeck] trees at Platánias, Chania, on the underside of which tiny white “nests” were observed, due to the woolly waxy material secreted by females, around themselves, as well as by the filamentous translucent wax rods extending from the dorsum of late nymphal instars. In our surveys *P. minei* was observed at low or moderate population densities. Information on its morphology, biology and present geographical distribution is provided.

KEY WORDS: Aleyrodidae, citrus, invasive species, polyphagous pest.

Paraleyrodes minei Iaccarino (Hemiptera: Aleyrodidae) is commonly known as “nesting whitefly”, since the adult females lay eggs usually surrounded by annular fluffy wax secreted by the females and so the eggs appear to be laid in a white “nest” of woolly wax (Iaccarino et al. 2011).

Paraleyrodes minei was first described in 1989 on sour orange (*Citrus aurantium* L.) leaves, collected from the coastal region of Syria (EPPO 2011). However, it is considered as a neotropical species originating probably from Central America (EPPO 2011). In Central America and the Caribbean it has been found in Belize, Dominican Republic, Guatemala, Haiti, Honduras and Puerto Rico, in North

America in Mexico, Bermuda and USA (California, Florida, Texas, Hawaii) and in South America in Colombia (Martin 2004, Evans 2007, EPPO 2011). In the Mediterranean basin, except Syria, it has been recorded in Cyprus, Israel, Italy, Lebanon, Morocco, Spain and Turkey (Iaccarino 1990, Garcia Garcia et al. 1992, Llorens and Garrido 1992, Argov 1994, Martin et al. 2000, EPPO 2014), as well as in Portugal (Madeira), China (Hong Kong), Iran and Benin (Aguiar and Pita 1996, Evans 2007, Ghahani et al. 2009, EPPO 2011).

It is a polyphagous species, since it has been recorded on several host plants belonging to 14 families (Anonaceae, Apocynaceae, Araceae, Arecaceae,

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Asteraceae, Compositae, Ericaceae, Euphorbiaceae, Lauraceae, Myrtaceae, Piperaceae, Polygonaceae, Rhizophoraceae, Rubiaceae and Rutaceae) (Martin et al. 2000, Evans 2007). In particular, except citrus, it is known to attack avocado (*Persea americana* Mill) and ornamental plant species (e.g. *Anthurium*, *Chamaedorea*, *Synгонium*) (EPPO 2011).

On late June 2015, *P. minei* was recorded for first time in Greece in a citrus grove at Platanias municipality of the prefecture of Chania, NW coast of Crete island (35°30'50.47''N, 23°53'24.00''E). The collected specimens (few 2nd, 3rd, 4th instar nymphs and 24 adults) were detected on the underside of mature leaves of sweet orange. Specimens were transferred in the Laboratory of Entomology of the Institute for Olive Tree, Subtropical Crops and Viticulture of Chania, where specimens were identified to species based on keys (Martin 1996, Evans 2007) and available literature data (Iaccarino et al. 2011). In addition, half of the collected adults were sent to the Institute for Olive Tree, Subtropical Crops and Viticulture in Heraklion (Greece) for molecular identification. A partial fragment of mitochondrial cytochrome oxidase subunit I (COI) was selected for molecular analysis. *Paraleyrodes minei* nucleotide sequences are not yet available in NCBI database, therefore a primer pair was designed in a conserved region of aligned COI sequences from 11 Aleyrodidae species (*Paraleyrodes pseudonaranjiae* Martin, *Paraleyrodes bondari* Peracchi, *Aleurodicus dispersus* Russell, *Aleurodicus dugesii* Cockerell, *Aleurodicus floccissimus* Martin, Hernández-Suarez & Carnero, *Aleurodicus rugioperculatus* Martin, *Lecanoideus floccissimus* Martin, Hernández-Suarez & Carnero, *Aleuronudus melzeri* Bondar, *Palaealeurodicus machili* Takahashi, *Metaleurodicus cardini* Back and *Dialeurodes citri* Ashmead) annotated in NCBI database (<http://www.ncbi.nlm.nih.gov/>).

Genomic DNA from four individual *P. minei* adults was extracted as previously described by Tsagkarakou et al. (2007) and a 566bp fragment of the COI gene was amplified by PCR and sequenced. No polymorphisms were detected among the individuals tested. The nucleotide sequences were identified as mitochondrial cytochrome oxidase I gene of the Aleyrodidae family, showing 82, 78 and 79% identity with the respective sequences of *P. bondari*, *Aleuroclava gordonia* Takahashi, and *Bemisia tabaci* Gennadius. The only but useful conclusion that can be drawn from this molecular analysis, in the absence of genomic data for the *P. minei* species, is that the analyzed species does not identify with any of the fore mentioned species.

Inspections in several other citrus-growing areas of Chania showed that the pest occurred in a wide area in the northern parts of the Prefecture of Chania. Except sweet orange it was also detected on lemon [*C. limon* (L.) Burm. f.] and sour orange (*C. aurantium* L.). In our surveys *P. minei* was observed at low or moderate population densities. Frequently, coexistence of the nesting and the woolly whitefly, *Aleurothrixus floccosus* (Maskell) (Hemiptera: Aleyrodidae), was recorded. In these cases, the different type and form of wax secreted by the two whitefly species has facilitated the taxonomic separation. In the field, *A. floccosus* was easily distinguished by the finely tangled flocculent white wax obscuring the immature stages, and copious excretion of honeydew while *P. minei* by the tiny white "nests" due to the woolly waxy material secreted by females, around themselves. To a lesser extent on the same infested leaves, *D. citri* was also recorded. Among the three aforementioned whitefly species the nesting whitefly displayed the lowest population compared to the other two species.

Paraleyrodes minei adults are almost 1.2 mm long, pale yellow in color with white powdery wax covering the body, especially

the wings (Fig. 1A). Females lay approximately 60 eggs (Mohammad and Abboud 2001, Argov et al. 2012) within a “nest” of secreted woolly wax. First (crawler), second and third instar nymphs have a hyaline wax fringe along the marginal area (Fig. 1B). Crawlers remain either in the “nests”, so the nymphs of the following stages will add the flocculent wax

rods, or emerge from the “nests” leaving them empty (Iaccarino 1990) (Fig. 1C). Pupa is sub-elliptic with seven pairs of compound wax pores, one cephalic and six abdominal. It is surrounded and sometimes covered by filamentous translucent wax rods, extending from the dorsum (Iaccarino 1990, Argov et al. 2012) (Fig. 1D).

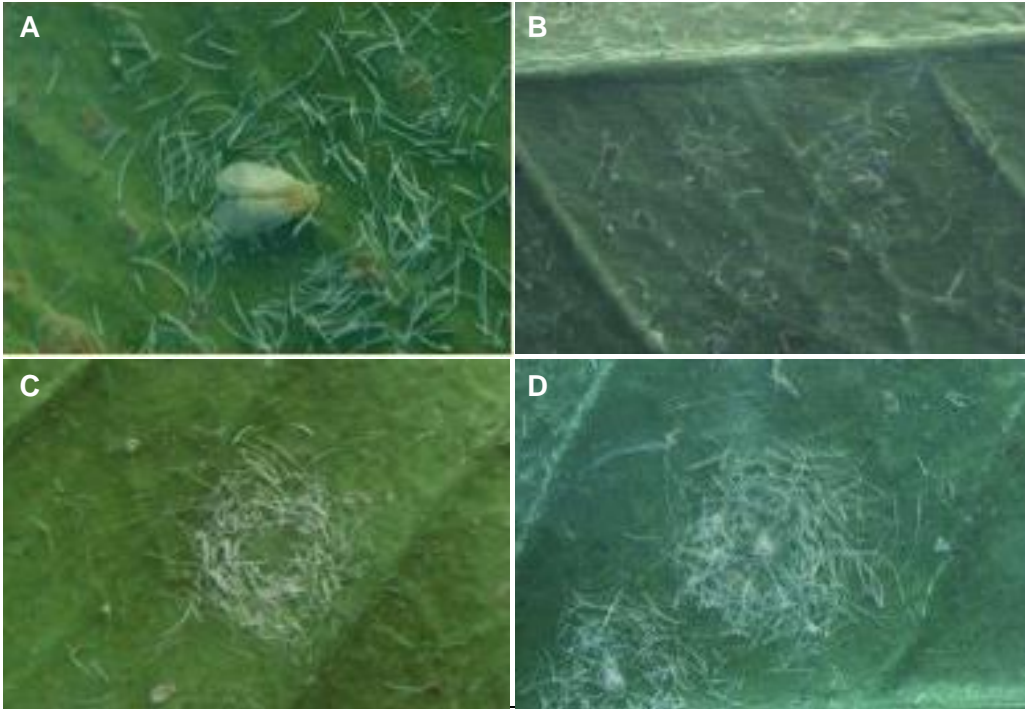


FIG. 1. (A) Adult of *P. minei* resting on a leaf of sweet orange; (B) Immature stages (1st, 2nd and 3rd instar nymphs) of *P. minei* on a leaf of sweet orange; (C) “Empty” nest of *P. minei* with the characteristic rods in a circular pattern detected on a leaf of sweet orange; (D) Pupa of *P. minei* on a leaf of sweet orange.

Damage on the host plants is similar to other species of whiteflies by sucking plant sap, injecting toxic saliva and by secreting honeydew which serves as substrate for the development of sooty mold (Katsoyannos 1996). However, the importance of *P. minei* is controversial. In California and South Italy it is regarded as a serious pest of commercial citrus (Bellows et al. 1998,

Longo and Rapisarda 2014), whereas in Syria it has been recorded abundant only in abandoned citrus orchards (Iaccarino 1990) and in Canary islands as a non-economic pest of citrus (Hernández-Suárez et al. 2012). Thus, further studies are required for a better understanding of the biology and habits of this species in the area of Chania which will contribute greatly to its efficient

management. Currently, field population studies as well as studies on the potential damage of this species on citrus trees in the Prefecture of Chania are being conducted.

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Πρώτη καταγραφή του αλευρώδη *Paraleyrodes minei* στην Ελλάδα

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ΠΕΡΙΛΗΨΗ

Στα τέλη Ιουνίου του 2015 εντοπίστηκε προσβολή από τον αλευρώδη *Paraleyrodes minei* Iaccarino (Hemiptera: Aleyrodidae) σε εσπεριδοειδώνα με πορτοκαλίες, ποικιλίας Washington Navel, στην περιοχή του Πλατανιά, Χανίων (35°30'50.47''N, 23°53'24.00''E). Η παρουσία του διαπιστώθηκε στην κάτω επιφάνεια ανεπτυγμένων φύλλων της τρέχουσας βλάστησης. Στα δείγματα που εξετάστηκαν βρέθηκαν διάφορα στάδια ανάπτυξης του εντόμου (νύμφες 2^{ης}, 3^{ης} και 4^{ης} ηλικίας, καθώς και ενήλικα). Συχνά στα ίδια φύλλα βρέθηκε επίσης προσβολή από τον εριώδη αλευρώδη, *Aleurothrixus floccosus* Meskell (Hemiptera: Aleyrodidae), γεγονός που βοήθησε να αποδειχθεί ότι μακροσκοπικά είναι δυνατή η αναγνώριση της παρουσίας του νέου είδους αλευρώδη στην καλλιέργεια, διότι τα κηρώδη νημάτια που εκκρίνονται από τα δύο αυτά είδη διαφέρουν μορφολογικά. Ένα μήνα αργότερα (τέλη Ιουλίου) στον ίδιο εσπεριδοειδώνα βρέθηκε επίσης και το *Dialeurodes citri* (Ashmead) (Hemiptera: Aleyrodidae). Το *P. minei* θεωρείται ιθαγενές είδος της κεντρικής Αμερικής. Είναι πολυφάγο είδος αφού έχει καταγραφεί να προσβάλλει είδη φυτών που ανήκουν σε 14 οικογένειες. Δίδονται πληροφορίες σχετικά με τα μορφολογικά και βιολογικά χαρακτηριστικά, καθώς και για την εξάπλωση του εντόμου.