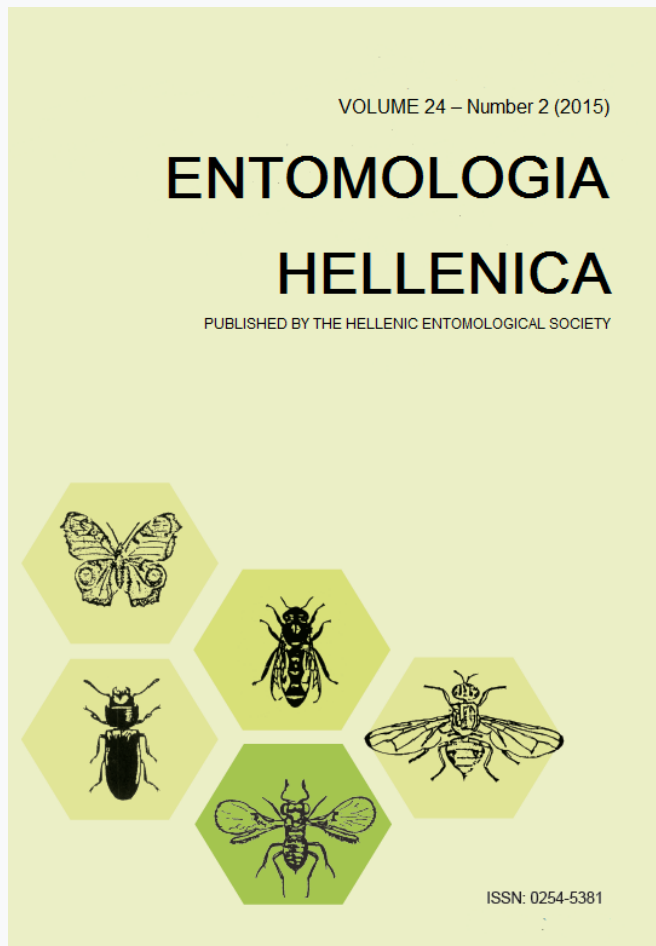


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SHORT COMMUNICATION

First record of the mycophagous ladybird *Psyllobora vigintiduopunctata* on greenhouse cucumber plants in Crete (Greece)

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ABSTRACT

In July 2014, in an organic greenhouse cucumber crop at the Farm of the Technological Educational Institute of Crete, at Heraklion, larvae and adults of *Psyllobora vigintiduopunctata* (L.) (Coleoptera: Coccinellidae) were observed feeding on hyphae of *Podosphaera xanthii* (Braun & Shishkoff) (Erysiphales: Erysiphaceae), that had covered the cucumber leaves. The most common genus worldwide of mycophagous tribe Halyziini (Mulsant) is *Psyllobora*, which is known for its potential in the biological control of powdery mildew.

KEYWORDS: Biological control, Halyziini, powdery mildew, 22-spot ladybird.

The Erysiphaceae (Ascomycota: Erysiphales) species are causal agents of powdery mildew (PM). They are obligate biotrophic parasite fungi with a very wide range of host plants, including most of the cultivated species. PM grows with hyphae or mycelium in both upper and lower leaf surfaces. However it can also appear on stems, flowers or fruits. It is one of the most destructive plant pathogens and its control usually requires repetitive applications of fungicides (Pérez-García et al. 2009). The management of PM becomes more difficult because of its resistance development to fungicides (McGrath 2001).

The Halyziini tribe (Mulsant) (Coleoptera: Coccinellidae) includes mycophagous species. These can also consume plant tissue and mites (Sutherland and Parella 2009a). Their ability to feed on plant tissue and mites may be an evolutionary trait as their mandibles seem to have adapted specifically to scrape the leaf surfaces in order to consume the conidiophores of the fungus (Giorgi et al. 2009).

In the last twenty years various studies from Brazil, China, India, Cuba, Italy, Argentina, Japan, Turkey, Syria and the United States of America have been

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published on the biology of Halyziini and their potential to be used as biological control agents of PM (Sutherland and Parella 2009a). Similar studies have been conducted for the *Psyllobora bisoetonotata* (Mulsant) (Coleoptera: Coccinellidae) in India (Kumar et al. 2010, Maurice 2014) and Sudan (Satti 2015).

In U.S.A. encouraging results for the management of PM using *Psyllobora vigintimaculata* (Say) (Coleoptera: Coccinellidae) have been obtained in grape crops by Sutherland and Parella (2009b). Furthermore, studies have shown that wettable sulfur, myclobutanil and trifloxystrobin which are used against PM, are toxic to these beetles but not the mildew microbial antagonists, *Streptomyces lydicus* or *Bacillus subtilis* (Sutherland et al. 2010).

The species *P. vigintiduopunctata* (L.) was first observed in Germany in 1874 on leaves of *Astragalus* (Fabales: Fabaceae), consuming hyphae of *Erysiphe holosericea* (Wallroth) (Erysiphales: Erysiphaceae). It has also been reported from Kazakhstan (Sutherland and Parella 2009a) and from Italy in 1913 (Canepari 2011). An updated distribution map is presented by the Global Biodiversity Information Facility (2015). The species *P. vigintiduopunctata* has also been observed to have other feeding habits. In Iran *P. vigintiduopunctata* was found feeding on aphids on pomegranate trees (Mohammad et al. 2013). In Turkey *P. vigintiduopunctata* was observed feeding on various plant species in different habitats (Yurtsever 2001).

In July of 2014, larvae and adults of a coccinellid species were found to feed on hyphae of PM caused by *Podosphaera xanthii* (Braun & Shishkoff) (Erysiphales: Erysiphaceae) on *Cucumis sativus* (L.) (Cucurbitales: Cucurbitaceae) plants. These plants were organically grown in a greenhouse, on the Farm of the Technological Educational Institute of Crete, in Heraklion. The adults and larvae were identified as *P. vigintiduopunctata*

(Fig. 1) according to the National Biodiversity Data Centre, Ireland (2014) and the Natural History Museum UK Checklists (2014). During the observation period all four larval instars and both females and males were recorded.

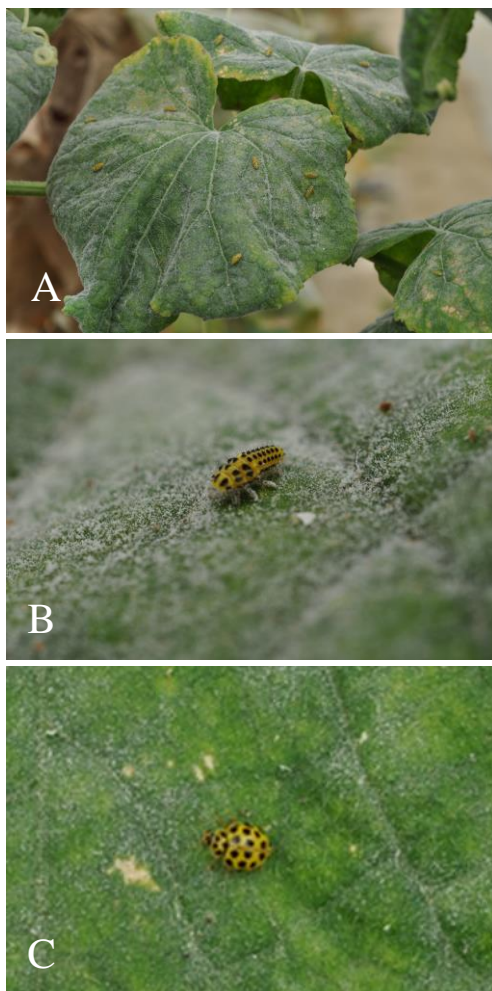


FIG. 1. *Psyllobora vigintiduopunctata* larvae (A and B) and adult (C) on cucumber leaf consuming spores and hyphae of powdery mildew caused by *Podosphaera xanthii*.

According to our preliminary observations, *P. vigintiduopunctata* populations were high. In some cases more than ten

larvae per cucumber leaf were recorded. Such a group of larvae continuously feeding on the leaf surface completely removed mildew hyphae and spores within one week. Insect population was high to the end of October. Gradual reduction of the population was observed later and it was attributed to a reduced PM infection and the declining cucumber plant vegetation.

From these preliminary observations, it appears that *P. vigintiduopunctata* can develop high populations under the conditions it was found and thus, may have a strong potential to reduce PM infections. Further studies have to be carried out, for the evaluation of its potential in the biological control of PM. Future experiments in the laboratory and in the greenhouse should focus on the adaptation and the effectiveness of *P. vigintiduopunctata* under variable conditions of temperature, food substrates and cultivation practices.

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Πρώτη καταγραφή του μυκητοφάγου εντόμου *Psyllobora vigintiduopunctata* σε θερμοκηπιακή καλλιέργεια αγγουριάς στην Κρήτη

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ΠΕΡΙΛΗΨΗ

Στην Ελλάδα τα είδη των γενών των ωιδίων *Podosphaera*, *Erysiphe* και *Leveillula* (Ascomycota: Erysiphales) προσβάλλουν πολλές καλλιέργειες και προκαλούν σοβαρές ζημιές. Είναι γνωστό ότι είδη της φυλής *Halyziini* (Mulsant) (Coleoptera: Coccinellidae) τρέφονται από υφές ωιδίων. Το πλέον διαδεδομένο γένος είναι το *Psyllobora* που έχει βρεθεί στην Ευρώπη, την Αμερική, την Ασία και την Αφρική. Τα τελευταία 20 έτη έχουν δημοσιευθεί δεδομένα για τη βιολογία των *Halyziini* και τη δυναμική τους για το βιολογικό έλεγχο των ωιδίων. Το είδος *Psyllobora vigintiduopunctata* (L.) καταγράφηκε στη Γερμανία για πρώτη φορά το 1874. Έκτοτε έχει καταγραφεί σε πολλές άλλες περιοχές, κυρίως της Βόρειας Ευρώπης. Τον Ιούλιο 2014 σε βιολογική καλλιέργεια αγγουριάς στο θερμοκήπιο, στο Αγρόκτημα του ΤΕΙ Κρήτης στο Ηράκλειο, παρατηρήθηκαν προνύμφες και ακμαία του εντόμου *P. vigintiduopunctata* να τρέφονται με υφές και σπόρια του μύκητα *Podosphaera xanthii*. Υπήρχαν ιδιαίτερα υψηλοί πληθυσμοί, σε κάποιες περιπτώσεις περισσότερες από δέκα προνύμφες και ενήλικα ανά φύλλο αγγουριάς. Οι προνύμφες με συνεχή βόσκηση στην επιφάνεια του φύλλου αφαιρούσαν τελείως το ωίδιο. Ο πληθυσμός διατηρήθηκε σε υψηλό επίπεδο μέχρι το τέλος Οκτωβρίου. Οι παρατηρήσεις μας έδειξαν ότι το *P. vigintiduopunctata* δυνητικά έχει προοπτικές για την καταπολέμηση του ωιδίου. Οι επόμενες μελέτες θα επικεντρωθούν στην αποτελεσματικότητα του εντόμου σε διαφορετικές συνθήκες, υποστρώματα και καλλιεργητικές τεχνικές.