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FIRST RECORD OF *ALEUROCLAVA AUCUBAE* (HEMIPTERA ALEYRODIDAE) IN HUNGARY, WITH A CHECKLIST OF WHITEFLIES OCCURRING IN THE COUNTRY

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Hári K., Fail J., Streito J.-C., Fetykó K.G., Szita É., Haltrich A., Vikár D., Radácsi P., Véték G. [†] - First record of *Aleuroclava aucubae* (Hemiptera Aleyrodidae) in Hungary, with a checklist of whiteflies occurring in the country.

Aleuroclava aucubae (Kuwana) (Hemiptera: Sternorrhyncha: Aleyrodidae), native to Japan, has been recorded for the first time in Hungary. Several individuals of the species were found on various ornamental plants (*Celtis*, *Fraxinus*, *Morus*, *Sorbus*, *Ulmus*) at five locations in the country in 2014 and 2018. The currently known distribution and host associations of the species are briefly discussed, along with an annotated checklist of the whitefly fauna of Hungary.

KEY WORDS: *Aleuroclava aucubae*, whitefly, Aleyrodidae, first record, Hungary, ornamental plants, checklist

INTRODUCTION

Whiteflies (Hemiptera: Sternorrhyncha: Aleyrodidae) comprise a relatively small group of insects, currently containing 1610 extant species in 161 genera (MARTIN & MOUND, 2007 updated). The whitefly fauna of Hungary is relatively poorly known. The first notes were published by HORVÁTH (1897), reporting five species. The latest checklist, containing fifteen species, was compiled by VISNYA (1941). Subsequently recorded further species include *Asterobemisia obenbergeri* (Zahradnik), *Asterobemisia paveli* (Zahradnik), *Bemisia tabaci* (Gennadius), *Bulgarialeurodes cotesii* (Maskell), and *Trialeurodes packardi* (Morrill) (KOZÁR & NAGY-DÁVID, 1986; KOZÁR *et al.*, 1987; KOZÁR & BINK-MOENEN, 1988; SZABÓ & HATALÁNÉ ZSELLÉR, 1991; KOZÁR *et al.*, 2002). This present paper reports the occurrence in Hungary of an additional, alien whitefly species, *Aleuroclava aucubae*.

In 2014, during a survey aiming to map the distribution of the citricola scale, *Coccus pseudomagnoliarum* (Kuwana) (Hemiptera: Coccidae) in Hungary, black puparia of a whitefly species were observed on common hackberry trees (*Celtis occidentalis* L.) in the towns of Tata, Dabas, Kecskemét and Örkény. Infested leaves were collected, and the puparia were removed and preserved in 70% ethanol. In another survey, ornamental trees in containers representing ca. 100 taxa, grown in the Eötvös Loránd University Botanic Garden, Budapest, were regularly inspected for the occurrence of pests and diseases between May and September 2018. The plants originated from three different nurseries in Hun-

gary (Alsótekeresi Faiskola, Alsótekeres; Kiss Kertész Duo Kft., Fülöpháza; Tahi Faiskola Kft., Tahi). They had been transported to the botanic garden in May 2018. During visual inspections carried out in August and September, experts detected the presence of black puparia of a whitefly species; these were collected, and preserved in 70% ethanol, whilst the infested plant species were recorded.

An annotated checklist of the whitefly species of Hungary is also provided in this paper. Based on the temporal trends of arrival in Europe of alien arthropods (ROQUES, 2010) the occurrence of further species may be expected.

MATERIALS AND METHODS

Puparia from each date of collection were identified by Jean-Claude Streito at the CBGP (Centre for Biology and Management of Populations, Montpellier). The slides are on deposit in the CBGP-INRAE collection platform.

The whiteflies checklist was prepared by reviewing related Hungarian and foreign literature (HORVÁTH, 1897; VISNYA, 1941; MOUND & HALSEY, 1978; KOZÁR & NAGY-DÁVID, 1986; KOZÁR *et al.*, 1987; KOZÁR & BINK-MOENEN, 1988; SZABÓ & HATALÁNÉ ZSELLÉR, 1991; KOZÁR *et al.*, 2002; MARTIN & MOUND, 2007). The nomenclature of whitefly species has changed over the past decades. Our list includes the valid scientific names according to OUVARD & MARTIN (2020) as well as the synonyms used in previous publications.

Table 1- List of whiteflies (Hemiptera: Aleyrodidae) recorded in Hungary until 2019. Distribution of the species is indicated according to the zoographical regions presented in the work of Evans (2007). Feeding behaviour, habitat associations, and pest status in Hungary are shown according to the indicated references for occurrence in Hungary and the works of Kozár & Bink-Moenen (1988), Ripka *et al.* (1996), and Haltrich *et al.* (2013).

Species	Distribution	Feeding behaviour	Habitat associations	Pest status in Hungary	Reference for occurrence in Hungary
<i>Aleurochiton acerinus</i> Haupt, 1934	Western Palearctic	monophagous on <i>Acer campestre</i>	outdoors	not known	First reported as <i>Aleurochiton acerina</i> (Haupt) by VISNYA (1941)
<i>Aleurochiton aceris</i> (Modeer, 1778)	Western Palearctic	monophagous on <i>Acer platanoides</i>	outdoors	minor	First reported as <i>Aleurodes aceris</i> Geoffroy by HORVÁTH (1897)
<i>Aleurochiton pseudoplatani</i> Visnya, 1936	Western Palearctic	monophagous on <i>Acer pseudoplatanus</i>	outdoors	minor	VISNYA (1941)
<i>Aleuroclava aucubae</i> (Kuwana, 1911)	Nearctic, Eastern Palearctic	polyphagous on woody plants	outdoors	minor	New to the Hungarian fauna; found in 2014 and 2018 in Hungary – reported in this present study
<i>Aleurolobus wunni</i> (Ryberg, 1938)	Western Palearctic	polyphagous on herbaceous plants	outdoors	minor	First reported as <i>Aleurolobus asari</i> (Wünn) by VISNYA (1941)
<i>Aleurotulus nephrolepidis</i> (Quaintance, 1900)	Nearctic, Neotropical, Western Palearctic, Afrotropical	polyphagous on ornamental plants	indoors in Hungary	not known	First reported as <i>Aleuroplatus kewensis</i> Trehan by VISNYA (1941) (in glasshouse)
<i>Aleyrodes asari</i> (Schrank, 1801)	Western Palearctic	monophagous on <i>Asarum europaeum</i>	outdoors	not known	VISNYA (1941)
<i>Aleyrodes lonicerae</i> Walker, 1852	Western Palearctic, Eastern Palearctic	polyphagous on herbaceous and woody plants	outdoors	not known	First reported under the following synonymic names in VISNYA (1941): <i>Aleurodes rubi</i> Signoret; <i>Aleurodes fragariae</i> Walker
<i>Aleyrodes proletella</i> (Linnaeus, 1758)	Western Palearctic, Eastern Palearctic, Nearctic, Neotropical, Afrotropical, Pacific Islands	polyphagous on herbaceous plants	outdoors	moderate, with preference for Brassicaceae	First reported under the following synonymic names in HORVÁTH (1897): <i>Aleurodes brassicae</i> Walker; <i>Aleurodes proletella</i> Linnaeus
<i>Asterobemisia carpinii</i> (Koch, 1857)	Neotropical, Western Palearctic, Eastern Palearctic	polyphagous on woody plants	outdoors	minor	First reported under the following synonymic names in VISNYA (1941): <i>Bemisia</i> (<i>Neobemisia</i>) <i>avellanae</i> (Signoret); <i>Bemisia</i> (<i>Neobemisia</i>) <i>ribium</i> (Douglas)

<i>Asterobemisia obenbergeri</i> (Zahradnik, 1961)	Western Palearctic	polyphagous on herbaceous plants	outdoors	not known	KOZÁR & BINK-MOENEN (1988)
<i>Asterobemisia paveli</i> (Zahradnik, 1961)	Western Palearctic	polyphagous on herbaceous plants	outdoors	not known	KOZÁR <i>et al.</i> (2002)
<i>Bemisia tabaci</i> (Gennadius, 1889)	cosmopolitan	polyphagous on woody and herbaceous plants	indoors and outdoors	major	SZABÓ & HATALÁNÉ ZSELLÉR (1991)
<i>Bulgariaeurodes cotesii</i> (Maskell, 1895)	Western Palearctic, Oriental	monophagous on <i>Rosa</i> spp.	outdoors	minor	KOZÁR & NAGY-DÁVID (1986)
<i>Ceraleurodicus varus</i> (Bondar, 1928)	Neotropical, Western Palearctic	polyphagous on herbaceous plants	indoors in Hungary	not known	First reported as <i>Parudamoselis kesselyaki</i> Visnya by VISNYA (1941) (in glasshouse)
<i>Filicaleyrodes williamsi</i> (Trehan, 1938)	Nearctic, Western Palearctic	oligophagous on herbaceous plants	indoors in Hungary	not known	First reported as <i>Trialeurodes Williamsi</i> (Trehan) by VISNYA (1941) (in glasshouse)
<i>Pealius quercus</i> (Signoret, 1868)	Western Palearctic	polyphagous on woody plants	outdoors	not known	First reported as <i>Aleurochiton quercus</i> (Signoret) by VISNYA (1941)
<i>Siphoninus immaculatus</i> (Heeger, 1856)	Western Palearctic	monophagous on <i>Hedera</i> spp.	outdoors	not known	First reported as <i>Aleurodes immaculata</i> HEEGER by HORVÁTH (1897)
<i>Siphoninus phillyreae</i> (Haliday, 1835)	Nearctic, Neotropical, Western Palearctic, Afrotropical, Eastern Palearctic, Australasian	polyphagous on woody plants	outdoors	minor	First reported as <i>Aleurodes phillyreae</i> Haliday by HORVÁTH (1897)
<i>Trialeurodes packardi</i> (Morrill, 1903)	Nearctic, Western Palearctic, Eastern Palearctic	polyphagous on woody and herbaceous plants	outdoors	major in strawberry	KOZÁR <i>et al.</i> (1987)
<i>Trialeurodes vaporariorum</i> (Westwood, 1856)	cosmopolitan	polyphagous on woody and herbaceous plants	indoors in Hun- gary	major	VISNYA (1941)

RESULTS

Aleuroclava aucubae (Kuwana, 1911)
(Hemiptera: Sternorrhyncha: Aleyrodidae)

MATERIAL EXAMINED: Hungary, Tata: Cseke-tó [47°39'04.7"N 18°19'49.7"E], 02.x.2014, on *Celtis occidentalis* L. (puparia), K. Vadász leg.; Tata: Jázmin Restaurant [47°39'45.09"N, 18°19'27.39"E], 30.x.2014, on *Celtis occidentalis* L. (puparia), É. Szita leg.; Dabas: road no. 5, 'Diego' coach station [47°10'18.6"N 19°21'58.6"E], 05.x.2014, on *Celtis occidentalis* L., K. Fetykó leg.; Kecskemét: Ménteleki crossroads [46°57'29.5"N 19°36'36.4"E], 05.x.2014, on *Celtis occidentalis* L., K. Fetykó leg.; Örkény: road no. 5 rest area [47°06'45.3"N 19°27'10.2"E], 09.x.2014, on *Celtis occidentalis* L., A. Haltrich leg.; Budapest: Eötvös Loránd University Botanic Garden [47°29'01.7"N 19°05'08.2"E], 15.viii.2018, on *Fraxinus angustifolia* subsp. *oxycarpa* (Willd.) Franco & Rocha Afonso (4 puparia), *Fraxinus excelsior* L. 'Tekeres' (3 puparia), *Fraxinus ornus* L. 'Pilis' (5 puparia), *Morus alba* L. 'Fegyvernekiana' (3 puparia), *Sorbus* 'Titan' (5 puparia), *Ulmus* 'Lakatos Esernyő' (2 puparia), *Ulmus pumila* L. 'Pusztá' (7 puparia), *Ulmus* 'Lobel' (3 puparia), K. Hári leg.; same locality, 05.ix.2018, on *Celtis occidentalis* L. 'Magnifica' (3 puparia), *Fraxinus ornus* L. 'Mecsek' (6 puparia), G. Véték leg.

NEW HOST ASSOCIATIONS: *Celtis occidentalis* L., *Fraxinus angustifolia* subsp. *oxycarpa* (Willd.) Franco & Rocha Afonso, *Fraxinus excelsior* L. 'Tekeres', *Fraxinus ornus* L. 'Mecsek', *Fraxinus ornus* L. 'Pilis', *Sorbus* 'Titan', *Ulmus* 'Lakatos Esernyő', *Ulmus* 'Lobel', *Ulmus pumila* L. 'Pusztá', *Celtis occidentalis* L. 'Magnifica'.

With the recent record of *Aleuroclava aucubae*, the Hungarian whitefly fauna currently comprises 21 species belonging to 13 genera (Table 1).

DISCUSSION

Aleuroclava aucubae is an East Palearctic species described in Japan (KUWANA, 1911; MOUND & HALSEY, 1978) and later recorded in China and Taiwan (EVANS, 2007, 2008) and South Korea (SUH, 2010). It has been introduced into the USA (California) (GAIMARI, 2005). In Europe, it was first recorded in northern Italy in 2006 (PELLIZZARI & ŠIMALA, 2007), misidentified as *Aleuroclava guyavae* (TAKAHASHI, 1932). It was subsequently detected in Slovenia (SELJAK, 2012), Croatia (ŠIMALA *et al.*, 2014), France (Corsica) (STREITO *et al.*, 2014), Montenegro (MALUMPHY *et al.*, 2015), Russia (GAVRILOV-ZIMIN & BORISOV, 2020).

Aleuroclava aucubae is a polyphagous species. It has been recorded feeding on a wide range of plants belonging to more than 15 families (e.g., Juglandaceae, Moraceae, Oleaceae, Rosaceae, Rutaceae, Ulmaceae, Vitaceae), including several economically important genera such as *Citrus*, *Ficus*, *Juglans*, *Prunus*, and ornamentals: *Pittosporum* and *Photinia* (EVANS, 2007; WATSON, 2007; SUH, 2010; SELJAK, 2012; MALUMPHY *et al.*,

2015). *Encarsia lutea* (Masi), *Encarsia sophia* (Girault & Dodd) and *Encarsia aseta* (Hayat & Polaszek) are known parasitoids of *A. aucubae* from China and Italy (HUANG & POLASZEK, 1998; VIGGIANI & IACCARINO, 2016).

The fact that infested host plants were reported from several parts of Hungary might indicate that *A. aucubae* has been present in this country for a long time; or that the species has accidentally been introduced several times together with its host plants. The level of infestation was low, generally with only 1–3 puparia per leaf, but leaves with more than ten puparia were frequently found during August 2018. Nevertheless, no visible symptoms of damage to the affected plants have been observed, which suggests that *A. aucubae* will probably remain a minor pest of cultivated plants in Hungary. Some puparia showed evidence of having been parasitised (i.e. a round exit hole). The parasitoids of *A. aucubae* might contribute to the control of this alien whitefly species in Hungary. Further research on the distribution, biology and natural enemies of *A. aucubae* is recommended.

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