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A rapidly spreading potential pest, *Orientus ishidae* identified in Hungary

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Abstract

The present study reports the first data on the occurrence of the mosaic leafhopper, *Orientus ishidae* (Matsumura) (Hemiptera Cicadellidae), in Hungary. The species is of eastern Palaearctic origin and a few years after its first detection in the western Palaearctic it has been reported from several European countries. Recently the phytoplasma of Flavescence dorée has been identified from *O. ishidae* individuals collected in Italy and Slovenia. Due to the fast spread and possible economic importance of the species, attention needs to be called to monitoring of this possible pest of grapevines.

Key words: Hungary, *Orientus ishidae*, mosaic leafhopper, Cicadellidae, vector, Flavescence dorée.

Introduction

In the last decades several Auchenorrhyncha species have been introduced into Europe and also spread due to human activities (Arzone *et al*., 1987; Mifsud *et al*., 2010), and some of these have been found in the Carpathian Basin as well. For instance in the past decade, two invasive Auchenorrhyncha pest species have been found in Hungary: *Metcalfa pruinosa* (Say), a flatid planthopper (Pénzes, 2004), and *Scaphoideus titanus* Ball, a leafhopper species, a vector of the grapevine disease Flavescence dorée (Dér *et al*., 2007).

The mosaic leafhopper, *Orientus ishidae* (Matsumura) (Hemiptera Cicadellidae), originates from eastern Asia; in the Palaearctic checklist the species was mentioned from the Far East, including Japan, the Korean Peninsula and the Maritime Territory of the former USSR (Nast, 1972). It was probably unintentionally introduced to the Nearctic as well, where it was recorded from several locations in North America (Metcalf, 1967). The first record from Europe dates back to 1998 from Italy (Guglielmino, 2005). Later on the species was recorded from Switzerland in 2000 (Günthart and Mühlethaler, 2002; Günthart *et al*., 2004), Germany and Slovenia in 2002 (Nickel and Remane, 2003; Seljak, 2004), Czech Republic in 2004 (Malenovsky and Lauterer, 2010) and Austria in 2007 (Nickel, 2010). Furthermore, the species is also known from France (Mifsud *et al*., 2010). As previous studies have suggested, *O. ishidae* probably had been introduced into Europe by trading of plants (Günthart *et al*., 2004; Malenovsky and Lauterer, 2010; Mifsud *et al*., 2010).

Examination of the morphology of the male and female genitalia revealed that the taxon previously referred to as *O. ishidae*, comprises two distinct species (Guglielmino, 2005). The study found that specimens examined from Japan, USA and European countries belonged to *O. ishidae*, but those from China and Eastern Maritime region of Russia were described as a different species, *Orientus amurensis* (Guglielmino, 2005).

Recently the phytoplasma of Flavescence dorée, a dangerous grapevine disease has been identified from mosaic leafhopper adults from Italy and Slovenia (Mehle *et al*., 2010; Gaffuri *et al*., 2011). Further studies confirmed these results and revealed the presence of three strains of Flavescence dorée in *O. ishidae* individuals (Mehle *et al*., 2011), indicating that the species is a potential vector of FD phytoplasma.

The current study reports the first data on the occurrence of the mosaic leafhopper, *O. ishidae* from Hungary. Previous data on the distribution, host range, potential economic importance and possibilities for monitoring are also discussed.

Materials and methods

Collecting was carried out by using CSALOMON® yellow sticky traps (10 × 16 cm, codenamed 'SZs') and branch-beating. In 2011 yellow sticky traps were set in Julianna-major, Northwest of Budapest (47°32'47"N 18°55'57"E altitude 315 m) in the vicinity of a suburban area, to forest trees (including *Quercus* and *Betula*); in Halásztelek (Pest county, 47°21'08"N 19°00'25"E altitude 98 m), in a sour cherry orchard; in Pusztazámor (Pest county, 47°22'35"N 18°48'50"E altitude 127 m), in a row of mixed forest trees (including *Acer* spp., *Juglans regia* and *Robinia pseudoacacia*) next to an alfalfa field; and in vineyards in Balatonlelle (Somogy county, 46°47'05"N 17°46'35"E altitude 163 m) and Soltvadkert (Bács-Kiskun county, 46°36'00"N 19°26'01"E altitude 107 m). At each site 5 pairs of yellow sticky traps were set at a height of 1.8-2 m and exposed from August to September 2011. At sites where yellow sticky traps caught *O. ishidae*, branch beating was also performed to provide additional individuals.

Branch-beating was also performed in a study focusing on ornamental plants in the botanical garden of the Corvinus University of Budapest (47°28'50"N 19°02'24"E altitude 123 m). There, collectings were carried out from July 1 to October 10 in 2011, and from May 24 to September 28 in 2012.

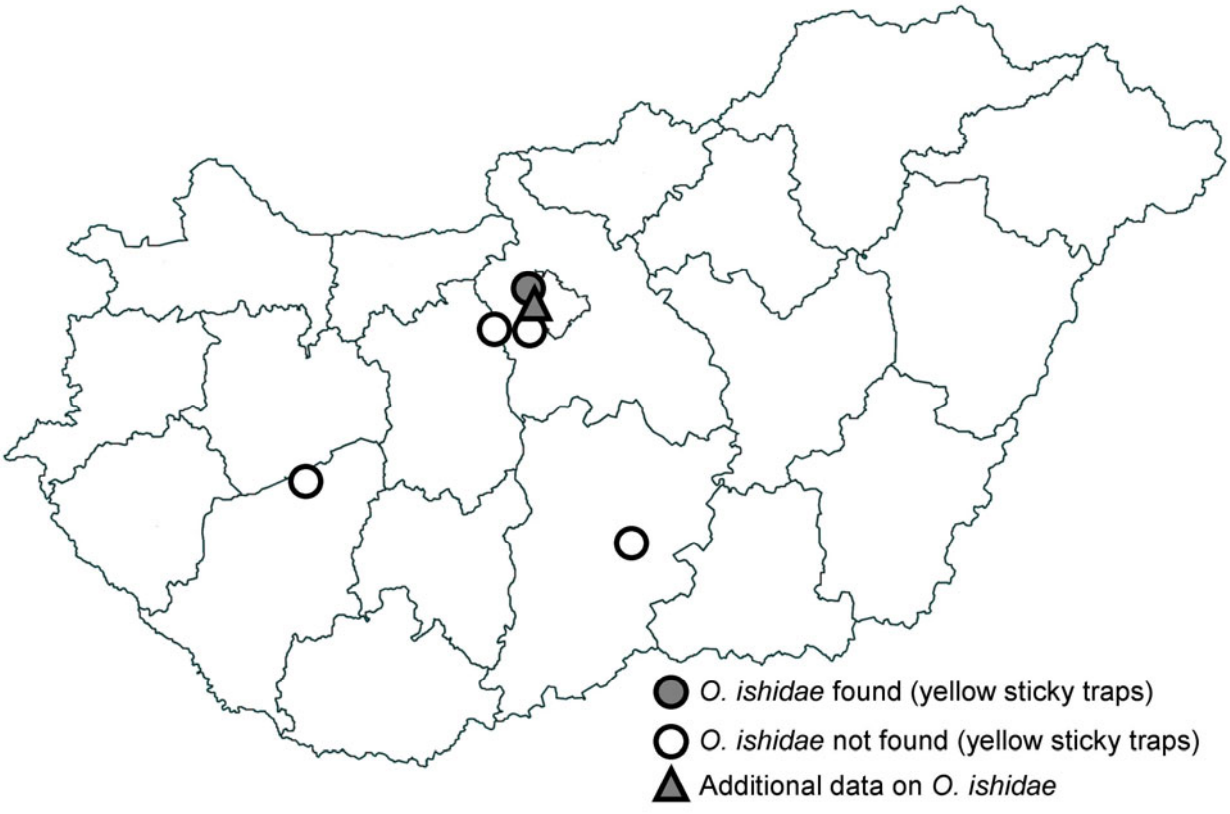

Figure 1. Sampling sites of the present study in Hungary. Yellow sticky traps were set out in 2011.

The collected individuals were preserved as dry specimens. Male individuals were dissected and genitalia macerated with NaOH solution. Specimens were identified according to the works of Biedermann and Niedringhaus (2004) and Guglielmino (2005), and deposited in the Natural History Museum of Budapest and in the first authors' collection.

Results and discussion

The first individual of *O. ishidae* found in Hungary was caught in 2010 in a household garden in the northwestern part of Budapest. In 2011 among the sampling sites *Orientus* adults have only been found on yellow sticky traps at the northwestern border of Budapest near a suburban area (figure 1). At this site further individuals were caught by branch beating from *Betula* and *Quercus*. Furthermore, additional individuals were found on *Viburnum* spp. in the botanical garden of the Corvinus University of Budapest, and in an apartment in its close vicinity, south of the latter sampling site (figure 1). At both sites, both male and female individuals were collected. Examination of male (n = 5) and female (n = 8) genitalia revealed that all individuals belonged to *O. ishidae* (Matsumura 1902). This is in accordance with previous data, which suggests that European data of *Orientus* refer to *O. ishidae* (in Guglielmino, 2005). According to the recent checklist (Györffy *et al*., 2009) this species is new to the fauna of Hungary.

Adults were caught (either by yellow sticky traps or brach beating) between 11 July and 16 August. This is in accordance with previous data (Nickel, 2010). Data from Germany indicate, that the species has one generation per year, and possibly it overwinters as egg (Biederman and Niedringhaus, 2004; Nickel, 2010).

Although the first records of *O. ishidae* from different countries reported only a few individuals, a continuous spread of the species is likely: few years after its first detection it became common in some regions of Germany (Nickel, 2010) and in Slovenia it has spread throughout the country as well (Mehle *et al*. 2010).

In our study all individuals were caught in urban or suburban area. This was the case in most records from other countries as well, for example in Germany 8 years after that the first individuals were found, most records were still from urban sites, although the species has also been found along rivers and woodland margins as well (Nickel, 2010). The dominance of urban records on the presence of the species and its ability to overwinter in the egg stage, which provides a long period while an individual might remain unnoticed, suggest that besides the natural spreading the species was probably introduced to some regions by trading with plants, as it was suggested for other species as well (Arzone *et al*., 1987).

The importance of the species is highlighted by previous studies which identified strains of Flavescence dorée phytoplasma from *O. ishidae* specimens (Mehle *et al*., 2010; 2011; Gaffuri *et al*., 2011). Although the presence of a phytoplasma in a given insect species does not necessarily mean the host is a vector, the abundance of possible phytoplasma hosts in relation to occurrence of

the disease may also provide clues on the identity of the vector species (Weintraub and Beanland, 2006). Nevertheless this can also suggest that *O. ishidae* may be a potential vector of Flavescence dorée phytoplasma: in FD infected vineyards in Italy the mosaic leafhopper was found abundant, however only very few specimens of *S. titanus* were found (Gaffuri *et al*., 2011). Consequently the potential vector role of *O. ishidae* should not be neglected, and appropriate methods for detection and tracking its spread seem necessary. It might be worth to mention that an other, rather common leafhopper species, *Oncopsis alni* (Schrank) was found FD positive as well in a previous study (Mehle *et al*., 2011), and a planthopper species, *Dictyophara pannonica* (Germar) was found to transmit the FD phytoplasma in laboratory experiments (Filippin *et al*., 2009).

For monitoring the mosaic leafhopper light-trapping seems to be a possible method, since several previous studies reported individuals attracted by light (Günthart *et al*., 2004; Guglielmino, 2005; Malenovsky and Lauterer, 2010; Nickel, 2010). However since operating light-traps might be expensive or complicated in some circumstances, yellow sticky traps may offer another alternative for detecting the presence of the species, suggested by previous data (Seljak, 2004; Gaffuri *et al*. 2011), and confirmed by the present study as well. The species can also be collected by branch-beating, as in the present study, however this method is rather labour-intensive for monitoring purposes, and therefore it may be suggested only if the presence of the species is detected (either by coloured sticky traps or light-trapping), and in case of studies for which live individuals are preferred.

Monitoring of *O. ishidae* might be both important for countries where Flavescence dorée is present and also for those, where the phytoplasma has not been found in vineyards yet, as in the case of Hungary (Zsolnai and Orosz, 2013).

Orientus ishidae (Matsumura 1902)

Body length (including wings) of collected adult specimens: 4.7-5.5 mm (males), 5.5-6.5 mm (females).

Head stout, rounded, with relatively large compound eyes, but overall narrower than pronotum. Frons with irregular dark markings. Basic colour light brownish grey, with dark markings on the head, pronotum, scutellum and fore wings. Markings of the head and scutellum light brown, occasionally with a reddish tinge. Fore wings long, exceeding abdomen, with characteristic, dark, mosaic-like pattern (figure 2). Ventral side and legs mostly dark. Male genital plates apically tapering, each with a distinct subapical tooth. Detailed description of *O. ishidae*, including characteristic features of male and female genitalia, and detailed comparison to *O. amurensis* can be found in the work of Guglielmino (2005).

The mosaic leafhopper is highly polyphagous, so far in Europe it has been reported from various dicotyledonous plants including *Acer*, *Betula*, *Carpinus*, *Corylus*, *Fagus*, *Hedera*, *Malus*, *Populus*, *Prunus*, *Salix* and *Urtica* (Günthart, 2004; Seljak, 2004; Guglielmino, 2005; Nickel, 2010).

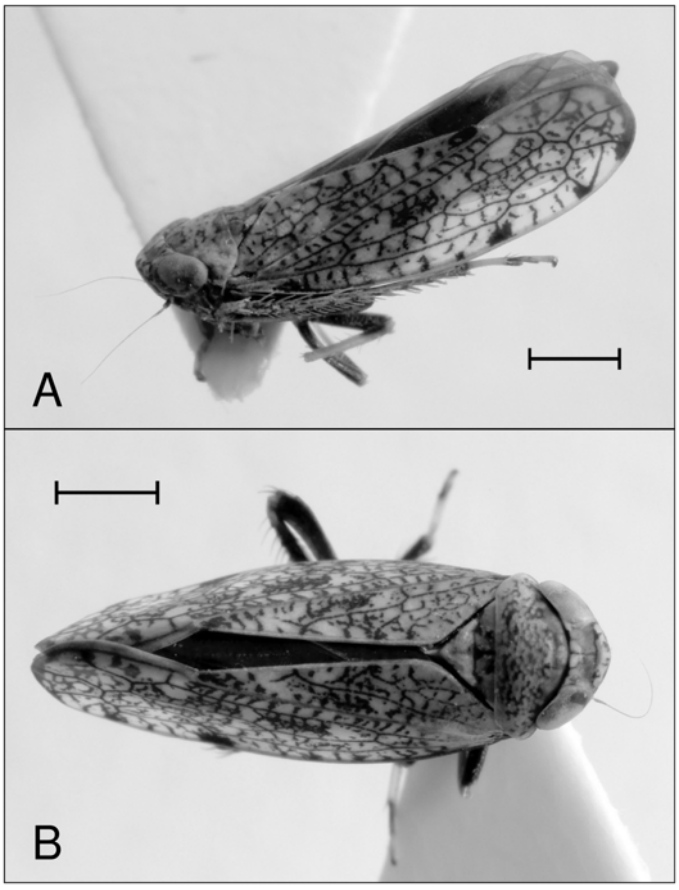

Figure 2. Adult of *O. ishidae* in lateral (A) and in dorsal (B) view. Scale bar 1 mm.

Conclusions

As indicated by its occurrence in several European countries within a relatively short period of time, the mosaic leafhopper, *O. ishidae* is a rapidly spreading potential pest. Its spreading is probably greatly helped by its highly polyphagous nature, but most probably the species was also introduced to some regions unintentionally by trading with plant materials. The rapid spread and the wide range of possible food plants, together with its potential role in spreading grapevine disease Flavescence dorée (Mehle *et al*., 2010; 2011; Gaffuri *et al*., 2011) highlight the importance of monitoring this species, especially in grapevine-growing areas.

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