Mass occurrence of the citrus flatid planthopper (*Metcalfa pruinosa* (Say, 1830)) (Hemiptera: Flatidae) in an agricultural hedgerow at Gödöllő (Hungary)

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SUMMARY

Citrus flatid planthopper,, a native insect to North America have had for a long time a scarce economic importance there. However, being polyphagous made small damage on citrus trees and some ornamentals.In 1979 it was introduced to Italy where it established and spread quickly. It is now an invasive alien species continually spreading in South and Central Europe causing considerable damage in grape wine and various ornamentals. Present study shows the results of a humble investigation in Gödöllő (Hungary). On the majority (70%) of the trees and shrubs have been found adults, vaxy filaments and nymph cuticles of M. pruinosa. Infested plants – among them some with American origin – were: *Acer negundo, Celtis occidentalis, Clenatis vitalba, Crataegus monogyna, Lycium barbarus, Morus alba, Prunus padus, Prunus serotina, Prunus spinosa, Robinia pseudo-acacia, Rosa canina* and *Ulmus campestris*. *The hedgerow was situated between an alfalfa field and the railway line. The length of similar hedges can be merely in Pest county several hundred km, which means M. PRUINOSA has plenty of opportunity for spreading along the railway and infest agricultural and ornamental cultures.*

Key words: *Metcalfa pruinosa*, citrus flatid planthopper, invasive alien species, Hungary, hedgerow, mass occurrence

INTRODUCTION

Metcalfa pruinosa (Say, 1870) is native to North America from where it was accidentally introduced to Italy in 1979 (Zangheri and Donadini 1980). After a rapid spreading in Italy it managed to get to more than 15 European countries (Strauss 2010). *M. pruinosa* has been settled in Italy, France (Della Giustina 1986), Slovenia (Sivic 1991 in Strauss 2010), Switzerland (Jermini *et al.,* 1995), Croatia (Maceljski *et al.,* 1995 in Strauss 2010), Austria (Kahrer and Moosbeckhofer 2003), Greece (Drosopoulos *et al.,* 2004 in Strauss 2010), Spain (Pons *et al.,* 2002 in Strauss 2010), Serbia and Montenegro (Hrncic 2003), ungary (Orosz and Dér 2004),Bulgaria (Tomov *et al*., 2006 in Strauss 2010), Turkey (Karsavuran and Güçlu 2004 in Strauss 2010), Bosnia Herzegovina (Gotlin Culjak *et al.,* 2007 in Strauss 2010), Romania (Grozea *et al.*, 2011) and was found also in Albania and Slovakia (DAISIE website 2013). *M. pruinosa* populations found in the UK and Bohemia were successfully eradicated by insecticide treatments (C. Malumphy and P. Lauterer, personnel communication in Strauss 2009).

Its harm is little in the USA: some fruit trees and ornamentals suffered small damage and aesthetic injury (Mead 1969). Being polyphagous, *M. pruinosa* attacked various cultivated and wild trees, shrubs and weedy plants in Italy (Bagnali and Luccchi 2000). Sucking of nymphs can cause deformation and injury of shoots and twigs leading to wilt and destruction. Grape quality damaged considerably as a consequence of nymphs' feeding (acidity and sugar content altered) and also soyabean suffered a 30-40% yield loss in Italy (Ciampolini *et al.,* 1987). Grape quality decreased heavily by the honeydew production of *M. pruinosa* and the following sooty mould formation in France (Della Giustina and Navarra 1993). Ornamentals in nurseries and parks are in danger because of the vaxy filaments produced on leaves and shoots by *M. pruinosa* (Lauterer 2002, Strauss 2010). It was revealed that some *M. pruinosa* were infected with various phytoplasmas but they could not transmit them in experiments (Bressan *et al.,* 2006 in Strauss 2010).

In Bohemia, Austria and Romania started thorough observations and investigations to get to know its spread, host plants and control opportunities. In Austria using the CLIMEX® programme various parameters (temperature index, diapausa index, moisture index, cold, wet, dry and heat stresses) were investigated in order to find the susceptible Austrian areas and cultures and also worked on the control opportunities (Strauss 2010).

M. pruinosa occurred in Hungary (Budapest) in 2004 but its expansion and injury has not been reported considerably. On its first occurrence no damage was found. The pest was observed on feeding *Ambrosia artemisiifolia* L. in Szabolcs-Szathmár county (Szőke L. personnel communication, 2011), which was considered as a possible A. *artemisiifolia* control. It was found also on grape in Budapest in 2010 (Bozsik not published, 2010).

The aim of this paper is to show a local mass outbreak of *M. pruinosa* in a hedgerow at Gödöllő which a long-lasting shelter and spreading opportunity could be and also to give some information on its host plant diversity.

Morphology

Mead (1969) and Lauterer (2002) gave a detailed morphological characterisation on adults and nymphs, thus here only a very brief description will be provided. Adults are 7-8 mm in length. Dorsal surface of the body and forewings are blackish brown. Body and forewings are covered with a whitish powdery secretion making the blackish colour grey-bluish. The nymphs' body is flattened and white, covered with a dense waxy substance

forming long filaments at the apex. The same waxy secretion is produced on leaves and shoots where the nymphs feed. The 5th – last – instar is 5-6 mm long. Development stage of nymphs can be distinguished by the size of head capsule and wing pads (Lauterer, 2002).

Life cycle

*M. pruinosa*has one generation a year and overwinters as eggs laid in the bark of damaged twigs (Mead, 1969, Lauterer 2002). In France and Austria, nymphs can hatch from May to mid July and suck phloem sup of host plants and produce a lot of honeydew. They have 5 growth stages. Finishing development adults emerge in August and begin laying eggs. Egg production can be maximum 90 eggs (Della Giustina**,** 1987, Kahrer *et al.,* 2009).

Host plants

M. pruinosa is a polyphagous planthopper feeding on a great diversity of plants. Unfortunately, because of this high diversity it is difficult to prove its preference and future injury.

In the USA, *M. pruinosa* was found on citrus, grape fruit, orange, grape, many forest and fruit trees, shrubs and some herbs (Mead, 1969).

Bagnoli and Lucchi (2000) reported more than 200 host plants from different families for *M pruinosa* in Italy. In the Czech Republik, *M. pruinosa* slightly damaged ornamental plants like *Thuja occidentalis* L., *Juniperus communis* L., *Sorbus aucuparia* L., *Lilium* sp. and were found also on some woody species (Lauterer, 2002). In Austria (Vienna), the following host plant species were observed: *Acer* ssp., *Ailanthus altissima L.*, *Buxus microphylla L.*, *Catalpa bignonioides L.*, *Clematis* ssp., *Deutzia* ssp., *Euonymus* ssp., *Fraxinus excelsior L., Hibiscus* ssp., *Lonicera* ssp., *Mahonia quifolium L.*, *Parthenocissus quinquefolia L.*, *Paulownia tomentosa* L., *Prunus* ssp., *Robinia pseudoacacia L.*, *Rubus fruticosus L.*, *Sambucus nigra L.*, *Spirea* ssp., *Symphoricarpus albus L.*, *Viburnum burkwoodii* (Kahrer *et al.,* 2009) and *Urtica dioica* L. (Strauss 2010). In Serbia (Belgrad), *M. pruinosa* were reported on woody species in the genera: *Acer*, *Aesculus*, *Gleditchia*, *Robinia*, *Ailanthus*, *Populus*, *Platanus*, *Prunus*, *Pyrus*, *Ulmus*, *Tilia*, *Cornus*, *Fraxinus*, *Quercus* and *Thuja* (Mihajlović 2007). In Romania, it was collected and seen on *Acer saccharinum* L., *Juglans nigra* L., *Juniperus* sp., *Thuja occidentalis* L., *Buxus sempervirens* L., *Albizia julibrissin Durazz., Potentila (Dasiphora) fruticosa* L., *Cycas revoluta* Thunb., *Vitis vinifera* L., *Atriplex hortensis* L., *Sambucus nigra* L., *Melissa officinalis* L., *Philadelphus coronarium, Ligustrum vulgare* L., *Hibiscus rosa-sinensis l. an Rosa* sp. (Grozea *et al.,* 2011). In Hungary, *M. pruinosa* was observed in Budapest on the following plants: Acer sp., *Aesculus hippocatanum* L., *Berberis* sp., *Crataegus* sp., *Hibiscus* sp., *Syringa* sp., Ulmus sp. (Orosz and Dér, 2004).

The pest was monitored on feeding *Ambrosia artemisiifolia* L. in Szabolcs-Szathmár county (Szőke L. personnel communication, 2011), which was considered as a possible *A. artemisiifolia control.* It was found also on grape in Budapest in 2010 (Bozsik not published, 2010).

Control

In its native area it usually no needs for control except in case of obvious damage which is a rarity (Mead, 1969). Cutting twigs infested with eggs or treatments with horticultural oil and insecticidal soap is enough against *M. pruinosa* (Rebek, 2009). Chlorpyriphos and imidacloprid was efficient in Austria. Fenitrothion was used successfully in the Czech Republic (Lauterer, 2002). Strauss (2009) studied control opportunities with special regard for the use of the natural enemy, *Neodryinus typhlocybae* (Ashmead 1893) (Hymenoptera: Dryinidae) which has been released and used in Italy, France, Slovenia, Switzerland, Croatia, Greece, the Netherlands and Spain (Tommasini *et al.,* 1998 in Strauss 2009; Ciglar *et al.,* 1998 in Strauss 2009; Jermini *et al.,* 2000; Žežlina *et al.,* 2001 in Strauss 2009; Malausa 1999 in Strauss 2009; A. Sala, personnel communication 2007 in Strauss 2009). She showed that *N. typhlocybae* attacked and parasitised only *M. pruinosa* and the native European planthoppers were saved (Strauss 2009). *Coccinella septempunctata* feeds also on *M. pruinosa* (Kahrer *et al.,* 2009).

Route of spreading

Spreading of *M. pruinosa* in Hungary could be with transported tree and ornamental seedlings from areas where the pest is established or the planthopper itself could migrate from the same localities. According to Lauterer (2002) the natural annual spreading of *M. pruinosa* is aboit 50 m on each direction. Grozea *et al.,* 2011 thought *M. pruinosa* individuals flew in Romania (Temes County) from the neighbouring Serbia and Hungary. It means that the density of this planthopper in our country was estimated high.

MATERIALS AND METHODS

As a consequence of an accidental finding of a *M. pruinosa* adult when passing by a semi-natural hedgerow at Gödöllő (small town in the north of Hungary, 25 km away from Budapest) detailed visual investigation of the shrubbery was carried out. Leaves and shoots of trees and shrubs for *M. pruinosa* and its rests were carefully examined at every 10 m along a 650 m part of the hedge on 28-30. August 2012, and the findings were noted. Altogether 65 plants were chosen and observed. The hedge came along at the one side of a cultivated alfalfa field and at the other side of the railway track. Characteristic woody plants were: *Acer negundo* L., *Acer saccharinum* L., *Celtis occidentalis* L., *Clematis vitalba* L., *Cornus sanguinea* L., *Crataegus monogyna Jacquin, 1775, Eounymus europeus, Lycium barbarum* L. , *Morus alba* L., *Prunus padus, Prunus serotina, Prunus spinosa, Robinia pseudoacacia, Rhamnus cathartica* L., *Rosa canina, Ulmus campestris. R. pseudoacacia* and *P. spinosa* predominated. All the plants – except *R. pseudoacacia, A. negundo, A. saccharinum, C. occidentalis, L. barbarum, M. alba, P. serotina* - belong to the native Hungarian flora. *R. pseudoacacia, A. negundo, A. saccharinum, C. occidentalis, P. serotina* are native to North America.

RESULTS AND DISCUSSION

Adults, nymph cuticles and waxy filaments of *M. pruinosa* were found on the leaves and shoots. No living nymphs have been observed. 46 (70.8%) of the 65 examined plants showed the presence of *M. pruinosa*. 7 plant species were exotic of the 16 hedge trees and 5 of the 7 exotics were native to North America which is also the original country of *M. pruinosa* (Table 1). However, interestingly no individual or any rest of the *M. pruinosa* have been found on *A. saccharinum*, also native to America. The length of this kind of hedge - running parallel with the railway line – can be more than several hundred km long only in Pest county. This means that the hedge can be a huge reservoir of *M. pruinosa*, an invasive species. These hedges have enormous beneficial importance as resources for firewood, medicinal plants, fruits, berries, mushrooms, bee pastures; structures like ecological networks, corridors and barriers, shelter for protected plant and animal species, and natural enemies. The management of these hedges is generally cutting the trees in every 5 or 10 years to gain some heating material and making a better view. It is a chance that there is neither money, nor intension for spraying with chemical insecticides these structures. This means that in case of introduced invasive pests without natural enemies, there is quite a high risk for establishing and spreading in such a peaceful new environment especially when many formerly established plants make easier this process.

Table 1

Occurrence of adults, filaments and nymph cuticles of *Metcalfa pruinosa* on trees and shrubs of a Gödöllő hedgerow

Plant species examined	Number of infested plants	Number of plants with adults	Number of plants with vaxy filaments	Number of plants with rests of nymph cuticles
Acer negundo	1		1	
Celtis occidentalis	1		1	
Clematis vitalba	4		4	2
Crataegus monogyna	1	1	1	1
Lycium helimifolium	1		1	
Morus alba	2	1	2	
Prunus padus	1		1	
Prunus serotina	2	2	2	1
Prunus spinosa	15	4	15	5
Robinia pseudoacacia	7	2	7	2
Rosa canina	1	1	1	1
Ulmus campestris	10	1	10	2
Total	46	12	46	14

How is possible to manage this situation? In Great Britain and Bohemia eradication was successful (C. Malumphy and P. Lauterer, personnel communication in Strauss 2009). Perhaps, it was due to the generally colder and more humid climate of both countries which did not favoured the development and reproduction of the pest. Thus, this eradication with pesticides in Hungary cannot be a right answer. In Austria there was a mass outbreak in Vienna in 2003 and the pest continued spreading and was found also in Graz. According to the risk analysis of Strauss (2010) mainly organic orchards and vineyards in Burgerland, Lower Austria and Styria are threatened by *M. pruinosa*. She proposed inspection of trade and trade pathways of trees and ornamentals, parking sites and gardens along transport routes, pesticide application and the introduction of *N. typhlocybae.* What can we do in Hungary? Our climatic conditions are more favourable for the planthopper than those in Austria. Our facilities (personnel and material) are limited. The spread of *M. pruinosa* is not estimated and

known. The only efficient and environmental friendly control opportunity might be the introduction of natural enemies in this case *N. typhlocybae* already used in Italy and tested for not target organisms in Austria (Strauss 2009).

CONCLUSIONS

Occurrence and reproduction of *M. pruinosa* have been observed in an agricultural hedgerow at Gödöllő. Adult *M. pruinosa*, nymphs cuticles and their waxy secretions were observed but the trees and shrubs did not damage. This is the first verified appearance of this IAS in this area. The author has been studied this shrubbery and the fields around for more then 10 years but has not observed this planthopper until now. Regarding the hedgerow management, there are excellent conditions (high plant diversity with many American plant species) for the quick and long-lasting establishment of *M. pruinosa*. The only efficient control opportunity would be the introduction of its natural enemy, *N. typhlocybae*. Regarding the environmental and climatic conditions of the country it is dubious that continual inspections or verifications could help not to mention the chemical eradication. A list of host plants and their preference can make more accurate the known diversity of this pest.

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