

Full Length Research Paper

# ***Metcalfa pruinosa* Say (insecta: homoptera: flatidae): A new pest in Romania**

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A new invasive species has been detected in Romania in the past two years. The scientific name of this species is *Metcalfa pruinosa* Say (1830), also known as citrus flatid plant hopper. Its importance as a pest species is assessed in different ways by specialists. In North America (where the insect comes from) minor damages have been reported, with insignificant economic importance, while in Europe it is considered a very important invasive species, due to its high population density and to its wide range of host plants. Another important aspect is the damage produced by this insect, especially the damage they cause to agricultural plants. Currently, the invasive species is only present in some European countries, but there is a tendency of rapid spread to uninfested areas. A number of studies have been conducted in Europe on *M. pruinosa* Say, on its distribution, morphology, biology, ecology, mating behaviour, range of host plants and control measures. Because this species has only recently been detected in Romania, the researchers have only begun to monitor it. Actually, isolated research has been run in two places where the insect appeared. That is why we considered it necessary to focus the information related to *M. pruinosa* Say at a national level, thus promoting the development of a national monitoring system. Another aspect that we want to emphasize in the present paper is the range of host plants, which differs greatly from one country to another, but also from county to county within the same country. We noticed that in the west of Romania the insect feeds on a wide range of host plants (herbaceous or woody, agricultural or ornamental plants). Taking all of the above into consideration, we find it necessary to take measures against its spreading, especially in the areas that have not been infected yet. Until now, the presence of *M. pruinosa* in Romania has not been mentioned at European level; one of the reasons might be that the phytosanitary quarantine units have not issued any official statement on this matter.

**Key words:** *Metcalfa pruinosa* Say, insect, distribution, Romania, Europe, host plants.

## INTRODUCTION

*Metcalfa pruinosa* (Say, 1830) is known under various common names, such as citrus flatid plant hopper (Lauterer, 2002; Mead, 2004), citrus plant hopper (Malumphy et al., 1994), citrus fulgoroid (Wene, 1950), flatid plant hopper (Dean, 1961), frosted moth-bug (EFSA,

2008), Nearctic Plant hopper (Trivelone et al., 2006) or just simple white plant hopper (especially as title for images). The name of citrus flatid plant hopper was given by American specialists, based on the frequency of this species on citrus plants. The names that do not contain the word "citrus" are used by European specialists.

This invasive species is originally from America (Wilson and McPherson, 1981). At present, it covers areas from various regions of North America (Texas, Florida, Ontario, Great Plains and Quebec) and South America. Research conducted in Florida shows that insects

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pertaining to this species have been collected from all regions, except for the southern part, where no such insect has been found (Mead, 2008). In Europe, the plant hopper was introduced accidentally from North America. It first appeared in Italy (Treviso province) in 1979, and the first official report concerning it was issued in 1980 (Zangheri and Donadini, 1980; Clair et al., 2001). From this first hotbed, the species has spread all over Italy, including the insular regions (Girolami and Conte, 1999). After reading the most recent references in this domain (Strauss, 2010), one can state that the invasive species has been noticed in Italy, France, Slovenia, Croatia, Switzerland, Spain, Serbia Montenegro, Austria, Hungary, Greece, Turkey, Bulgaria, Bosnia Herzegovina, Slovakia and Albania.

In Romania, the current research on the flatid plant hopper (*M. pruinosa*) reveals two points of occurrence: in the southeast of the country (Preda and Spolka, 2009) and in the west of the country (Gogan et al., 2010).

As for the range of host plants, it is different from one region to another. Generally, in North America these insects prefer citrus plants, being found on these plants in large numbers. Nevertheless, individuals belonging to species *M. pruinosa* have also been found on dahlia, privet and salvia (Wene and Riherd, 1954). The citrus flatid plant hopper can be considered a harmful polyphagous pest, as it is encountered on approximately 120 plant species belonging to 50 botanical families (Mead, 1969). Research carried out on the American continent shows that the citrus plants affected by late frosts and subsequently attacked by colonies of *M. pruinosa* suffered important economic damage, as compared to those that were not affected by frost (Wene and Riherd, 1954).

It is worth noting that in Europe the number of host plants is much larger than in the country of origin: in the year 2000, *M. pruinosa* was detected on 330 plants and 78 botanical families (Bagnoli and Lucchi, 2000). In Switzerland, for instance, according to EPPO RS 96/040/1998, the species was found on the following plants: basil, bean, cherry, cucumber, grapevine, kaki, parsley, pepper, potato, strawberry, tomato, *Rubus*. In Lazio province in Italy, the flatid plant hopper was discovered on many plants (horsetail, pomegranate, boxwood, citrus, butter bush, laurel, nettle, privet, Acer, plum tree, kiwi fruit, mulberry, olive, elm, bramble, oak, grapevine, tomato, fig, maple and species of *Solanum*) (Olmi, 2003; Progetto, 2003/123). In Spain (Cataluna region), *M. pruinosa* Say was noticed on: *Acanthus mollis*, *Acer campestre*, *Philodendron sellowianum*, *Fatsia japonica*, *Cycas revolute*, *Laurus nobilis*, *Fraxinus excelsior*, *Citrus limon*, *Asparagus sp.*, *Datura arborea*, *Tilia sp.*, *Urtica sp.*, *Populus sp.*, *Hedera helix*, *Magnolia grandiflora*, *Castanea sativa*, *Ricinus communis*, *Platanus hispanica* and many others (Pons et al., 2002). It is clear that there is great diversity of the host plants, with no clear stability of preference. Hence, we do not

know what to expect when the insect moves to a new territory.

## MATERIALS AND METHODS

Starting from the idea that when it enters a new region, an invasive species such as the flatid plant hopper (*M. pruinosa*) can hardly be controlled, we found it appropriate to make some investigations, both at a national and at a European level. We wanted to get to know the current stage of settling, spreading and propagation tendencies. For this reason, in Romania we took into consideration the first mass occurrences of the species, in the eastern and the western parts of the country.

In our studies, we considered it important to mark the area of host plants in the two zones by comparative analysis. For the western part (Timis County), we analyzed hundreds of plants attacked by *M. pruinosa* individuals in different stages of biological development. Plants pertaining to several botanical families were taken from various places (public parks, small private gardens, and green spaces between buildings) and transported to the research laboratory of Entomology and Agricultural Zoology at USAMVBT for the plant species to be identified, both biologically and tropically. The insects were collected with insect vacuum and the plants were taken in paper bags. Once prepared, the specimens were taken to the laboratory for detailed analysis.

To know the current situation of the flatid plant hopper at a European level, we drew a map with all the countries where it was detected. Where the data were not enough and there was uncertainty about the existence of the insect, we marked that by "?". For the purpose of this map, we consulted numerous representative articles (written from 1979 to 2011). After drawing the map that depicted the spreading of this insect, we found it useful to mark the directions of movement, too.

We consider it necessary to present the potential risks represented by the spreading of this insect, emphasizing the dangers for the agricultural plants rather than the ornamental ones.

## RESULTS AND DISCUSSION

Based on our observations in the past year (Timis County, Romania) regarding *M. pruinosa* Say (*Homoptera: Fulgoroidea: Flatidae*) as well as the observations of other Romanian researchers, we tried to centralize the data referring to the areas of occurrence and to the range of host plants. Currently, there is no available information that reflects the real situation of this new species in our country: the existing studies are isolated in different regions.

### Present distribution of *M. pruinosa* Say in Romania

The present distribution of the species in Romania shows two points of occurrence. The first point is located in the southeast (Constanta County). It was reported in 2009 (Preda and Spolka, 2009). The second mass occurrence was reported by Banat University of Agricultural Science and Veterinary Medicine from Timisoara, Plant Protection Department in the western part (Timis County) in 2010. The next years, we expect the species to spread to other

**Table 1.** Predictions of the direction of movement from the main points of occurrence.

Point of occurrence	Direction of movement	Point of occurrence	Direction of movement
Timis County (found in the western part of the country)	Southeast	Constanta County (in the EastRomania)	Southwest
	West-central		East-central
	West-northern		East-northern

**Figure 1.** The likely directions of spreading from those two points of occurrence (Timis County and Constanta) of the invasive species *Metcalfa pruinosa* (Say) in Romania, relying on the nearest vineyards.

regions of Romania, especially in wine regions. In Romania, there are 34 vineyards located everywhere except in the mountain chain. The most of them are placed on southern and eastern part. Currently, the area occupied with wine of Romania is 182,562 hectares according to data from vineyard Register. As regards to place in Europe, according to Eurostat in 2008 the chapter area occupied by vineyard Romania ranks 5. As the two points of occurrence are at a considerable distance from one another (at the extremities of the country). Direction of movement from point of occurrence in the western part of Romania could have a Southeast, West-northern or West-central orientation (Table 1). Considering the nearest vineyard (Recas) situated at a distance of 21 km, the West-northern direction might be most likely one (Figure 1). On the other hand, in the East Romania, the Southwest direction is favoured by vineyard Murfatlar, situated only 18 km from the place of

occurrence (Figure 1).

After a short period of observations in the west of Romania, we concluded that the first mass occurrence of *M. pruinosa* took place mainly because adults flew in from neighbouring countries (Serbia and Hungary). Timis County is situated at the border between Romania and these two countries. A explanation of entry in the southeast of the country, as Constanta County can be attributed to the accidental introduction of infested plants directly from the Italy for firms engaged in the sale of trees and ornamentals shrubs (Preda and Spolka, 2009), Naturally, there are other hypotheses about the ways this species came into this county. The entry of adults from Bulgaria, by South Romania might be another hypothesis, considering the fact that in 2009 year *M. pruinosa* was not recorded yet in other places in Romania. This was the only way to entry through adults' movement.

**Table 2.** Year, country and reference of the first mass occurrence of *Metcalfa pruinosa* in different European countries.

<b>Metcalfa pruinosa (Say, 1830) in Europe</b>		
<b>First mass occurrence</b>		
<b>Year detected</b>	<b>Country</b>	<b>Reported by/in</b>
1979	Italy	Zangheri and Donadini, 1980
1986	France	Della Giustina W., 1987
1988	Spain	Pons et al., 2002
1990	Slovenia	Seljack, 1993
1992	Croatia	Gotlin et al., 2007
1993	Switzerland	Jermi et al., 1995
2001	Czech Republic	Lauterer, 2002
2001	Greece	Drosopoulus et al., 2004
2003	Austria	Kahrer, 2005
2003	Turkey	Karsavuran and Güçlü, 2004
2004	Hungary	Osz and Der, 2004
2003\ 2006	Serbia and Montenegro (before formally splitting) Serbia (after splitting)	Hrnčić, 2003 (Serbia and Montenegro) Mihajlovic, 2007 (Serbia)
2006	Bulgaria	Trenchev et al., 2006
2006	Bosnia Herzegovina	Gotlin et al., 2007 cited by EPPO Report, 2008
2009	Romania	Preda and Spolka, 2009; Gogan et al., 2010
Unknown	Albania	NISS, 2011 based on DAISIE 2009
Unknown	Slovakia	DAISIE, 2009

### Present distribution in Europe

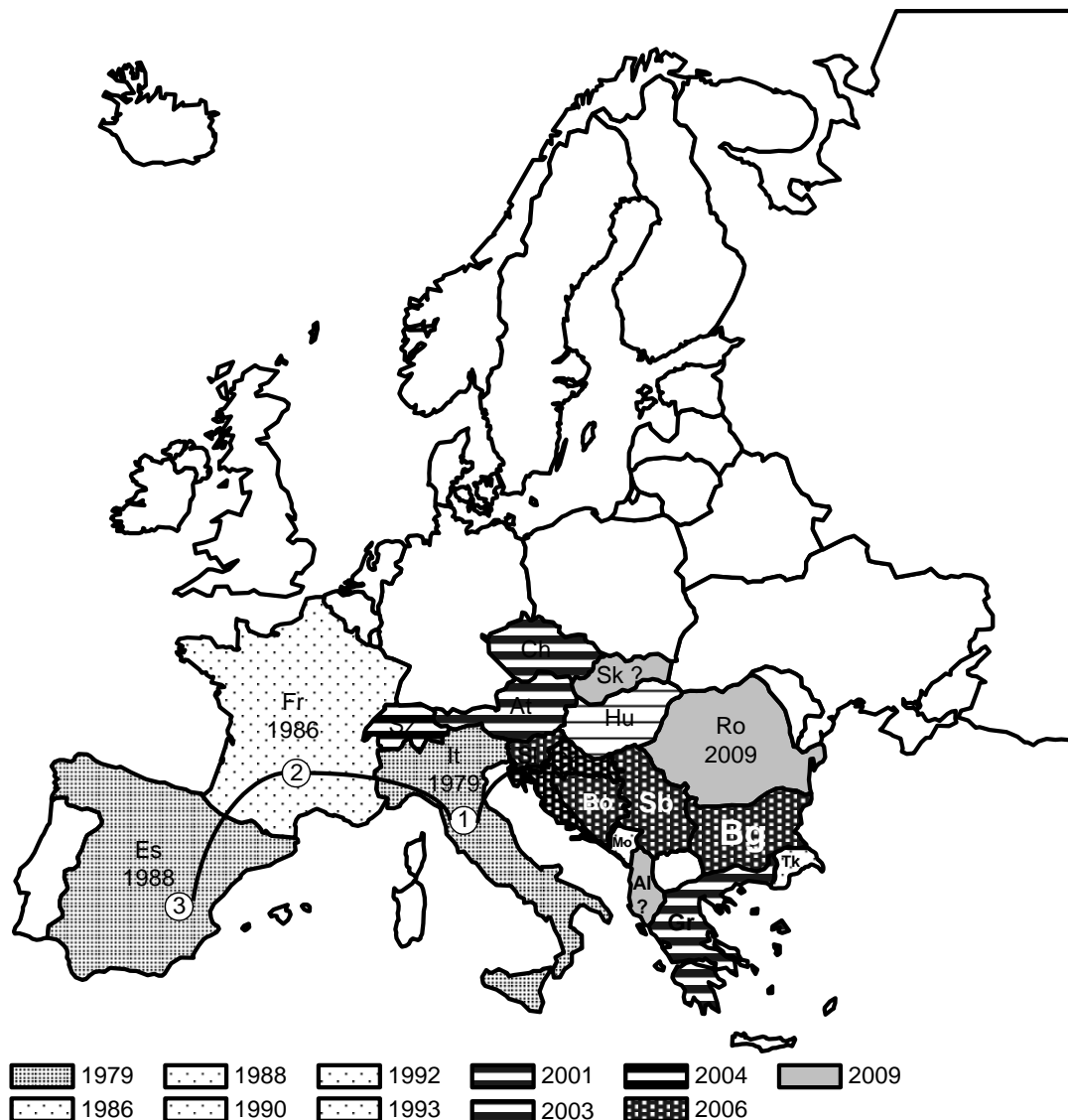
Thirty-two years ago, namely in 1979, a new invasive species was detected in Europe; it was identified as *Metcalfa pruinosa*. The presence of the species was signalled a year later by Zangheri and Donadini (1980). From this first hotbed, the insect has had a fast distribution, and today it is present in 16 countries (according to reports), plus other two countries for which no data have been reported in scientific publications (Table 2). The countries where there are official reports are the following: Italy, Czech Republic, France, Slovenia, Croatia, Switzerland, Spain, Serbia, Montenegro, Austria, Hungary, Greece, Turkey, Bulgaria, Bosnia Herzegovina and Romania (Figure 2). The information regarding the presence of this insect in Slovakia is not official for the moment; we cannot make an opinion because there has only been one report. It is assumed that the species is present in Albania, according to NISS, 2011 and DAISIE (2008), but the data are not official yet.

Actually, the insect is settled in southern Europe, in almost all countries, with small exceptions. There can be various causes for these exceptions, maybe they are present but have not been detected yet. On the other hand, if they have not reached those countries, they most probably will, if we take into account the history of the propagation of these insects and the law of proximity.

The first hotbed in Europe was Italy, so the location is somewhat in the central-southern part of the continent. From there, starting from 1979, the species has moved in two directions. The first direction was south-west (within 10 years, from 1979 to 1988), towards three countries: Italy, France and Spain. The second direction was southeast; this took longer: 20 years passed from the first to the last report (2009 in Romania, and probably Albania or Slovakia too).

### Host plants preferred by the flatid plant hopper in Romania

Taking into account our first observations in the west of the country (Timis County) regarding the host plants preferred by the flatid plant hopper, we could identify 16 herbaceous or woody, ornamental or agricultural plants. In this part of the paper, we tackle them in more detail: *Acer saccharinum* L., *Juglans nigra* L., *Juniperus* sp., *Thuja occidentalis* L., *Buxus sempervirens* L., *Albizia julibrissin* Durazz, *Potentilla (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., *Rosa* sp. L. (Figure 3). These correspond to the following common names (used by most specialists in the current scientific literature): Norway maple, walnut,



**Figure 2.** Current distribution of the invasive species *Metcalfa pruinosa* (Say, 1830) in Europe (1979-2010).

juniper, white cedar, box, silk tree, bush cinquefoil, palm sago, grape vine, mountain spinach, black elderberry, lemon balm, jasmine, private wood, China rose and rose.

After Lucchi et al, (2000) more than 200 host plants from different families are known for *M. pruinosa*. Through a comprehensive review of literature the *Cycas revoluta* Thunb is not listed in any scientific evidence, yet. In this case we can say that this is a new host plant recorded for *M. pruinosa*.

Host plants of the species *M. pruinosa* varies from area to area, so that the research in the south-eastern Romania . Thus, we know that there are six species of host plants in that area: *Aesculus hippocastanum*, *Hibiscus syriacus*, *Philadelphus coronarius*, *Evonymus japonicus*, *Fraxinus* sp. and *Ligustrum vulgare* (Preda and Spolka, 2009). By drawing a comparison between the

eastern and western part of Romania, we can conclude that there is a vast diversity of preferred plants, especially in the west (16 species in the west, and 6 in the east, respectively).

#### Potential risks for the agriculture in Romania

Up to now, in the west of Romania (Timis County, Timisoara City), the invasive insect has only been detected in urban areas, in the green spaces between buildings, in public parks or in small private gardens. Most plant species affected are ornamentals. We consider that the quality of an ornamental plant that has dozens of insects present on its leaves and stem is greatly damaged, which is not convenient at all, if we



Damage on *Ligustrum vulgare*Damage on *Philadelphus coronarius*Damage on *Juglans nigra*Damage on *Acer saccharinum*Damage on *Vitis vinifera*Damage on *Buxus sempervirens*

**Figure 3.** Aspects of the damage caused by *Metcalfa pruinosa* on various plants in Timis County (Timisoara city). The plants were collected from public parks, small private gardens and green spaces between buildings (the photos are original and were taken in June - July 2010).

think of the decorative purpose of the plant.

Nevertheless, another aspect might be considered even more important, if we think of the destination of agricultural plants, namely that of being used as food supply: the attack on the agricultural and horticultural plants. In some private gardens and courtyards, we detected populations of *M. pruinosa* on grape vine, especially on the productive one (*Vitis vinifera*). Therefore, if we consider that there is great risk of spreading towards the vineyard areas, especially in the west part of the country. The damage caused to plants may directly affect their growth and development and implicitly the production of grapes and wine. The vineyard plantations in the west of Romania are known especially

for the wine production. We believe that in several years' time the plantations will probably suffer visible damage.

For both ornamentals and agricultural plants we assumed the increased vulnerability of plants after the repeated frosts during the past winter (2010 to 2011) could contribute to a decrease in the production, both qualitatively and quantitatively. Of course, to all that have been mentioned we can add the trade with egg-infested plants from Hungary and Serbia. There is an old tradition in term of plant trade between these neighbouring countries and Western Romania. Lately, it has focussed mainly on importing ornamental plants, trees, shrubs and vine cuttings in Hungary. Limiting the spread of this polyphagous, exotic insect in urbane green spaces and

agricultural areas is difficult (Girolami and Mazzon, 1999) but it might be taken measures for minimize the risk.

As a preventive control measure it is recommended the permanent monitoring of species *M. pruinosa* by specialized units, frequent visual checks in parks, vineyards or orchards, especially in period May-July when the wax filaments are visible, limiting importing of infested plant by rigorous inspection at border with Hungary and Serbia. The biological control with its natural enemies *Neodryinus typhlocybae* (Hymenoptera Dryinidae) is recommended (Strauss, 2010). This non-native species is originated from North America. According to researches conducted in Cehia, the larvae are susceptible to insecticides (e.g. fenitrothion) (Lauterer, 2002).

## Conclusions

The invasive species *M. pruinosa* was detected in Romania in 2009 and it has been under research in this country ever since. It is considered a real danger, both for ornamental plants and for agricultural plants. At present, it is quite harmless, because it is still in the settling period, but we estimate an extension of the insect in much of vineyards from eastern and western Romania. The direction of movement in Romania cannot be certainly estimated yet, because the two points of occurrence are situated at the extremities of the country. Considering the nearest vineyards from each points of occurrence the West-northern direction and respectively, Southwest direction might be most likely. We consider this species to be unpredictable because of its wide range of host plants, which is different from one area to another (in the west of Romania it is present on a larger number of species than in the east).

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