

## EVOLUTION OF *METCALFA PRUINOSA* SPECIES ON VINES AND FRUIT TREES

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**Abstract:** A new invasive species (*Metcalfa pruinosa* Say) was signalled in the western part of Romania one year ago. Immediately, specialists in this part of the country began to focus their research on it; more precisely, they have conducted various studies of monitoring and identification of host plants for this invasive species. The range of attacked plants seems to get larger and larger every year. In 2011, the species was observed in vines and orchards. Up to now, *Metcalfa pruinosa* has been considered an invasive species in Romania, present on various ornamental plants in parks, urban green spaces and on vine. In other European countries, it has also been identified on *Prunus persica*, *Prunus armeniaca*, *Prunus domestica*, *Prunus avium*, *Vitis vinifera*. Between June and October 2011, during the observations made for our PhD studies, we ran some monitoring activities in order to detect the presence of *Metcalfa pruinosa* in the vineyard and in the orchard at Timișoara Didactic Station. The purpose of the readings and observations was to identify the species in vineyards and orchards and to emphasize the population dynamics in the period from June to September. In order to determine the hibernating material, we made observations directly on the bark of trees and vine from October 1st to October 31st. In the orchard, we recorded data referring to the number of insects present on the following tree species: *Prunus armeniaca*, *Prunus persica*, *Persica vulgaris*, *Malus domestica* and *Prunus domestica*. The organs *Metcalfa* prefers are leaves, shoots, fruits and respectively grape clusters. Observing the evolution of the species from June to September, we noticed that the first individuals appeared in the middle of June, the maximum number was recorded in mid-August and then the numbers decreased gradually towards the end of September. In October, we observed hibernating eggs in the bark of the plants under study. The data present quite a low number of *Metcalfa pruinosa* individuals in the plantation under study; this happens primarily because of the moment of initial installation of the species in this plantation. Careful monitoring of this species is a priority for all specialists in Romania and especially for the ones in the west of the country, as *Metcalfa pruinosa* Say is an invasive insect.

**Key words:** *Metcalfa pruinosa*, insect, invasive species, vines, fruit trees, western part of Romania

### INTRODUCTION

Specialists in Romania began to focus their attention on species *Metcalfa pruinosa* Say in 2009; it was then that this species was first noticed in the country, more precisely in Constanta County (PREDA and SKOLKA, 2009). One year later, it was signalled in Timiș County (GOGAN et al, 2010). Currently, this species is present on three continents: America, Europe, and more recently in Asia, Korea to be more exact. (KIM et al, 2011).

The range of plants it attacks is different from one area to another and that is why our research focuses mainly on the identification of the species of attacked plants. Recognizing its stages of development is an important aspect in the determination of the favourite plants for *Metcalfa*. *Metcalfa pruinosa* can be identified from other similar Flatids by its distinctive colours. The larvae and adults are clearly visible on trunks and their ramifications. The eggs are more or less hidden in the bark and other wooden parts (LUCCHI, 1999). This species

spends its winter as eggs, in wooden tissues or under the bark of the trees (WILSON and MCPHERSON, 1981).

It is a polyphagous species (it colonizes almost 300 plant species), and its complex biology, the way it spreads, its adaptability, the lack of methods to control the population are all factors that lead to the development of the species (GIROLAMI et al., 1996; LUCCHI, 1999).

In all larval stages, this species eliminates masses of white wax, which leads to easy detection of these organisms. The wax is responsible for the damage caused to ornamental plants and fruits. The larvae and the adults secrete honeydew, which sticks to leaves, fruit or other vegetative organs. Where fungi develop (mould covered in soot) on the entire surface of the organs, depreciating their aspect, at the level of the foliar limb, they inhibit photosynthesis. While feeding on the sap, *Metcalfa pruinosa* can also have a negative impact on the development of the plant, if the infestation is a strong one; thus, it can lead to whitening of young shoots, malformations and shrunken seeds (CIAMPOLINI et al., 1987).

In most cases, the negative effects are aesthetic ones: *Metcalfa pruinosa* represents a real problem in the urban area for the gardens and parks where it develops and secretes honeydew (ROSSI et al., 2000; PONS et al., 2002). In what crops are concerned, grapevine seems to be the most severely affected, but it also attacks fruit trees, such as fig trees, lemon trees, apple trees, plum trees and peach trees (DUSO, 1984). The fruit and ornamental plants covered in fungus and honeydew will not be appropriate for selling (FAIVRE D'ARCIER 2001; LUCCHI, 1999).

In literature, *Metcalfa pruinosa* was detected on the following crops, as well: *Actinidia deliciosa*, *Cucumis melo* ssp., *Diospyros kaki*, *Ficus carica*, *Juglans regia*, *Malus* sp. (GREATTI and GIROLAMI 1994), *Medicago sativa*, *Olea europaea*, *Prunus persica*, *Prunus armeniaca*, *Prunus domestica*, *Prunus avium*, *Pyrus* sp., *Vitis vinifera*, *Zea mays* (DUSO 1984; STEFANELLI et al. 1994; CIAMPOLINI et al. 1995).

In vineyards, this pest increases the risks on several levels: it can bring about an increase in the attack of sour rot and grey rot, a decrease in the commercialization of table grapes, and a decline in the quality of wine.

#### **MATERIAL AND METHODS**

Between June and October 2011, during the observations made for the PhD studies, we ran some monitoring activities in order to detect the presence of *Metcalfa pruinosa* in the vineyard and in the orchard at Timișoara Didactic Station. The purpose of the readings and observations was to identify the species in vineyards and orchards and to emphasize the population dynamics in the period from June to September. In order to determine the hibernating material, we made observations directly on the bark of trees and vine from October 1st to October 31st.

Readings and observations were made every fifth row for vine and every fifth tree in the orchard. These had support in panels containing details regarding placement, date and number of reading, as well as in GPS for justifying the location.

It is worth mentioning that we had two different variants in the vineyard: a treated one and another that was not treated. In treated variant for vine disease and pest control treatments were performed in 15 in 15 days with the following products: Ridomil Gold; Thiovit; Switch; Mospilan. In fruit growing plantations diseases and pests control treatments were performed in 10 in 10 days with the following products: Scor + Karate.

We sampled components of the plants (leaves, shoots, fruit and bark) infested with *Metcalfa pruinosa* in different stages of development. The samples were collected in plastic bags and then transported to the research lab for identification.

The samples were analyzed in the laboratory of Entomology and Agricultural Zoology in order to be accurately identified. Both plant species and the development stages of the species were analyzed.



(Photo 1 original)  
Direct observation on apricot tree



(Photo 2 original)  
Sampling of *Metcalfa*-infested organs at peach trees



(Photo 3 original)  
Identification of development stages in the laboratory



(Photo 4 original)  
Direct reading on grapevine

Set images 1. Aspects of readings in the orchard and vineyard at USAMVBT Didactic Station, June - October 2011

The examination of *Metcalfa pruinosa* was performed with the help of a binocular magnifier and the identification was made with the help of specialized books and electronic sources.

## RESULTS AND DISCUSSIONS

In the vineyard at USAMV Timișoara Didactic Station, we detected various stages of development of *Metcalfa pruinosa* on vine. In the orchard, we recorded data referring to the number of insects present on the following tree species: *Prunus armeniaca*, *Prunus persica*, *Persica vulgaris*, *Malus domestica* and *Prunus domestica*.

As for the number of individuals present in the vineyard (Table 1), we are now able to state that at the beginning of June there were no individuals of species *Metcalfa pruinosa*. They appeared in the middle of June (June 16th, to be more accurate), when we recorded five specimens on the untreated variant and respectively three specimens on the treated variant.

In July and August, the number of specimens increased on both variants but especially on the one that had not been treated. The maximum number was recorded in August, when we identified 26 individuals on the treated variant and 35 on the untreated variant (reading 3: 18.08.). September brought about a decline in the numbers of *Metcalfa* in both variants. The

data presented in the table below show that the average number in August was 120 on the untreated variant and 88 on the treated variant.

On vine, *Metcalfa pruinosa* was identified both on leaves and on grape clusters (Set images 2. Photo 5.).

Table 1

Presence of *Metcalfa pruinosa* on grape vine in the vineyard at USAMVBT Didactic Station, June-September 2011

Month	Reading	Number of specimens (adults, larvae, nymphae) present on <i>Vitis vinifera</i>	
		Treated variant	Untreated variant
June	Reading 1	0	0
	Reading 2	0	0
	Reading 3	3	5
	Reading 4	5	9
Average/month		8	14
July	Reading 1	7	13
	Reading 2	10	17
	Reading 3	10	19
	Reading 4	14	24
Average/month		41	73
August	Reading 1	18	24
	Reading 2	20	29
	Reading 3	26	35
	Reading 4	24	32
Average/month		88	120
September	Reading 1	23	31
	Reading 2	19	28
	Reading 3	15	23
	Reading 4	10	17
Average/month		67	99

June - reading 1:2.06.; reading 2: 8.06.; reading 3: 16.06.; reading: 24.06.;  
 June – reading 1: 1.07.; reading 2: 7. 07; reading 3: 15.07.; reading 4: 25.07.;  
 August – reading 1: 3.08.; reading 2: 11.08.; reading 3: 18.08; reading 4: 29.08.;  
 September – reading 1: 5.09.; reading 2:13.09.; reading 3: 19.09.; reading 4:27.09.



(Photo 3 original)  
 Colony of *Metcalfa pruinosa*  
 on apricot tree



(Photo 4 original)  
 Apricot infested with  
*Metcalfa pruinosa*



(Photo 5 original)  
 Cluster infested with  
*Metcalfa pruinosa*

Set images 2. Aspects of the attack in various forms on apricot and vine

In the orchard at U.S.A.M.V.B.T Didactic Station, *Metcalfa pruinosa* appeared from the beginning of June, especially on apple trees, apricot trees, and peach trees (Table 2), on nectarine trees we identified three individuals in the middle of June (June 16th), while on plum trees this invasive species was not found. July and August brought an increase in the numbers of insects, the maximum average being reached in August: apple tree (74 individuals/month); apricot tree (134 individuals/month); peach tree (127 individuals/month); nectarine tree (17 individuals/month). In September, we recorded a decline in the numbers of individuals. The conclusion drawn after observations made in the orchard at U.S.A.M.V.B.T. Didactic Station is that the leaves, the shoots and the fruits (Set images 2, Photo 3 and Photo 4) of apricot trees, peach trees and apple trees were the most severely infested with this new invasive species, *Metcalfa pruinosa*.

Table 2

Presence of *Metcalfa pruinosa* in the orchard at USAMVBT Didactic Station, June -September 2011

Month	Reading	Number of specimens (adults, larvae, nymphae) present on fruit trees				
		<i>Malus domestica</i>	<i>Prunus domestica</i>	<i>Prunus armeniaca</i>	<i>Prunus persica</i>	<i>Persica vulgaris</i>
June	Reading 1	1	0	5	8	0
	Reading 2	3	0	9	10	0
	Reading 3	3	0	11	13	3
	Reading 4	5	0	11	11	2
Average/month		12	0	36	42	5
July	Reading 1	7	0	15	13	5
	Reading 2	10	0	20	15	3
	Reading 3	10	0	23	17	3
	Reading 4	13	0	25	21	5
Average/month		40	0	83	66	16
August	Reading 1	15	0	28	29	5
	Reading 2	17	0	31	33	7
	Reading 3	19	0	40	35	4
	Reading 4	23	0	35	30	1
Average/month		74	0	134	127	17
September	Reading 1	21	0	27	27	0
	Reading 2	16	0	21	23	0
	Reading 3	10	0	15	18	0
	Reading 4	0	0	7	11	0
Average/month		47	0	70	79	0

June - reading 1: 2.06.; reading 2: 8.06.; reading 3: 16.06.; reading 4: 24.06.;  
 July - reading 1: 1.07.; reading 2: 7.07.; reading 3: 15.07.; reading 4: 25.07.;  
 August - reading 1: 3.08.; reading 2: 11.08.; reading 3: 18.08.; reading 4: 29.08.;  
 September - reading 1: 5.09.; reading 2: 13.09.; reading 3: 19.09.; reading 4: 27.09.

After collecting bark from fruit trees, we observed the presence of hibernating material, mostly on bark covered in moss (Table 3). These were found especially on *Prunus persica* and *Prunus armeniaca*.

**Economic importance**

The data in this paper present a relatively small number of *Metcalfa pruinosa* individuals on the plant under study: this happens mainly due to the moment of initial installation of the species in this type of plantation.

The complex biology of *Metcalfa pruinosa*, the way it spreads, its adaptability, the lack of methods to control it, as well as its polyphagy are all factors that lead to an increase in the numbers of individuals and proliferation of this species. Close study and careful monitoring of this species by the specialists in Romania and especially by those in the west of the country has to be a priority these days, since *Metcalfa pruinosa* is an invasive species.

Table 3

Number of hibernating eggs present on the bark of woody plants in the vineyard and orchard at USAMVBT Didactic Station, October 1st - 31st 2011

Month	Reading	Number of hibernating eggs present on various woody plant species					
		<i>Malus domestica</i>	<i>Prunus domestica</i>	<i>Prunus armeniaca</i>	<i>Prunus persica</i>	<i>Persica vulgaris</i>	<i>Vitis vinifera</i>
October	Reading 1	0	0	1	3	0	0
	Reading 2	0	0	3	5	0	0
	Reading 3	0	0	5	8	0	0
	Reading 4	0	0	15	13	0	0

*Reading 1: 3.10., Reading 2:11.10., Reading 3:17.10., Reading 4: 26.10.*



(Original Photo)  
*Spawning of Metcalfa pruinosa*

**CONCLUSIONS**

*Metcalfa pruinosa* is an invasive species present on a large number of species of ornamental plants in parks and urban green spaces in Romania.

Specialists in the west of Romania have recently observed considerable numbers of individuals of *Metcalfa pruinosa* on the woody plants in orchards and vineyards in this part of the country.

The organs preferred by this species are the leaves, shoots, fruit and respectively grape clusters.

Observing the development of this species from June to July, we noticed that the first individuals appeared in the middle of June, the maximum was recorded in the middle of August, and then the numbers decreased gradually towards the end of September.

During October, we identified hibernating eggs in the bark of the woody plants under study.

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