

HOST PLANTS AND CLIMATIC PREFERENCES OF THE INVASIVE SPECIES *METCALFA PRUINOSA* (SAY 1830) (HEMIPTERA: FLATIDAE) IN SOME PLACES FROM SOUTHERN ROMANIA

Daniela Barbuceanu*, Mihaela Codruța Dobrescu, Violeta Boruz***, Asea Timuș******

*University of Pitești, Faculty of Sciences, Târgu din Vale St. 1, 110040, Pitești Romania
E-mail: daniela_barbuceanu@yahoo.com

**University of Pitești, Faculty of Sciences, Târgu din Vale St. 1, 110040, Pitești Romania
E-mail: codrutza_dobrescu@yahoo.com

*** Botanical Garden, C-tin Lecca St. 26, Craiova, Romania
E-mail: violetaboruz@yahoo.com

**** The State Agrarian University of Moldova, Kishinev, Republic of Moldova
E-mail: asea_timus@yahoo.com

Abstract

Observations carried out in May-September 2015 in two sites of Southern Romania reveal a rich spectrum of host plants for *Metcalfa pruinosa*, which consists of 204 species in 56 families. The species it is noticed on weeds and cultivated plants. The remarkable polyphagia of this species, the lack of natural enemies, and the climatic conditions of 2015 - warm and dry summer, had lead to an invasion of *M. pruinosa*, in the researched areas; the highest numerical abundances are noticed in shady habitats. Furthermore, on herbs, such as *Levisticum officinale*, *Artemisia dracuncululus*, *Ocimum basilicum*, *Mentha spp.*, usually avoided by pests, were observed colonies of the species. It is recorded high numerical abundance on fruit trees and shrubs: *Hippophaë rhamnoides*, *Juglans regia*, *Prunus cerasus*, *Vitis vinifera*, *Rubus idaeus*. The harmful effect occurs on apple trees *Romus 1* variety as a result of the association with another pest of American origin, *Eriosoma lanigerum*, situation that favors the attack of the *Erwinia amylovora* bacteria, causing the collapse of the tree. It is found that altitudes higher than 200 m do not represent a limitative factor in the spreading of species, one of the investigated sites being located at 304 m altitude.

Keywords: *Metcalfa pruinosa*, host plant, polyphagous, pest, abiotic factors

1. INTRODUCTION

In the last decades, the invasive species *Metcalfa pruinosa* (Say, 1830) native from eastern North America focuses the attention of specialists from all over the world.

The plants trade, the polyphagous behaviour and the lack of natural enemies, allows the species to easily spread. Since 1979, when it was first signalled in Italy, until now, the species has conquered a large part of European continent and its expansion continues in Asia (Karsavuran & Güçlü, 2004; Strauss, 2010; Yeyeun et al., 2011).

Its remarkable polyphagia is revealed by the high number of host plants identified: more than 120 species in 50 families have been reported in the United States (Wilson & Lucchi, 2000), over 300 species in 78 families in Europe (Bagnoli & Lucchi, 2000; Alma et al. 2005), and 74 species in 41 families in Korea (Yeyeun et al., 2011).

In Romania, Preda & Skolka (2011) mention 110 species as host plants belonging to 49 families in eastern south part.

Generally, regarding the relation between the insects with the host plants, specialists consider to be important chemicals synthesized by plant which modify the behavior of insects, being attractant, repellent, and feeding or oviposition stimulant, deterrent (Bernays & Chapman, 1994).

Regarding the case of this invasive species, well-known repellent plants, such as *Lavandula* spp., *Tagetes* spp., *Mentha* spp., *Thymus* spp., are mentioned as host plants (Souliotis et al., 2008; Strauss, 2008), and Kim et al. (2013) remarks the low effects of their essential oils against *M. pruinosa* larvae and adults.

The purpose of this study is to complete the list of the host plants for *Metcalfa pruinosa*, to emphasize its polyphagous behavior and its attachment for certain host plants, and to signal its importance as a pest.

2. MATERIALS AND METHODS

The studies were carried out during May – September 2015 in two sites of Southern Romania, one of them in a hilly area, the other in a plain one. The first site was represented by a private garden from Pitești with an area of about 1000 sqm, placed in the city center on a hill. In this garden are being grown vegetables, ornamental plants and shrubs, fructiferous trees and shrubs, many of them placed on terraces with northern exposure, fact which creates a shady micro-climate. Only a small part of plants are arranged on sunny, flat ground. GPS coordinates: 44.85212 N/24.87466 E, 298 - 304 m altitude.

The second site was represented by the Botanical Garden "Al. Buia" of Craiova, located in the central part of the city, containing a great diversity of plants native from various regions of the Globe, cultivated on a surface of 12.8 ha. GPS coordinates: 44.323013/23.787573, 99 m altitude.

Regarding the climatic conditions, the summer of 2015 was warm and dry in Southern Romania, characterized by a reduced precipitation level. Thus, in Pitești, in the summer months were recorded the following values: 92.6 l/sqm in June, 19 l/sqm in July, and 56 l/sqm in August. Furthermore, it was the warmest summer from the last 50 years with the average of maximum temperature of 27.2⁰ C (June), 32.2⁰ C (July), 30.1⁰ C (August). In September 2015, were recorded during 3-11 September, abundant rainfall, 10.4 – 44.4 l/sqm, and low values of temperature: 13.4⁰ C, the average of maximum temperature.

In comparison, in 2014 in the summer months were recorded the following values of precipitations: 123.4 l/sqm in June, 155.8 l/sqm in July, and 37.8 l/sqm in August. The average of maximum temperature was of 25.2⁰ C (June), 28⁰ C (July), 29⁰ C (August).

Numerical abundance of individuals (larvae and adults) was visually evaluated. In order to estimate the level of infestation we use a scale from 1 to 3 as follows: 1 – less than 10 individuals; 2 – 10-50 individuals; 3– over 50 individuals or entire plant covering with abundant wax exudates for the small herbaceous plant.

The plant species were identified using Ciocârlan (2009) and Flora Europaea.

Geographic coordinates were measured with a Garmin GPSmap 60 CSx.

3. RESULTS AND DISCUSSIONS

a. *Metcalfa pruinosa* in a private garden from Pitești

In the private garden, the first observations regarding planthopper date from May 2014, but the especially rainy weather of that year made its presence discreet. Furthermore, extended observations have revealed the species in all over green areas of Pitești, with low abundance values in 2014 (Bărbuceanu & Mihăescu, 2015).

Considering climatic conditions of 2015, it was observed the high density of *M. pruinosa* populations, which has colonized a high number of plant species, causing a real invasion (Table 1). We mention from the beginning the interest of owners for organic food so that in this garden is no use of chemical treatments, fact which favors activity of the planthopper.

The presence of species was also signaled in the nearby cities, Bucharest, in 2011 (Chireceanu & Gutue, 2011) and Slatina (Olt County), in 2014 (Vlad & Grozea, 2015), therefore we are determined to consider its presence in our city at least since 2012.

The rate of natural spread, slowly and only locally (up to 0.5 km/year) (Kahrer et al., 2009) is compensated by intense vehicle traffic between the two cities and by the trade plant.

Adult and larva stages and a great quantity of honeydew secretions were observed at most of the investigated plants: vegetables, ornamental plants and shrubs, fructiferous trees and shrubs, weeds, belonging to 55 host plants from 29 families.

The species was first noticed on a summer apple tree, Romus 1 variety, aged 10, who presented a low attack of *Eriosoma lanigerum*, fact which has first hidden its presence. Afterwards, investigation on the colonies from the branches and from the lower surface of the leaves showed the presence of the *M. pruinosa* pest. We mention that *E. lanigerum* was not present before 2014 on any apple tree variety of the private garden, but it was observed in 2013 on apple trees from a nearby garden.

In 2015, *M. pruinosa* colonies are visible all over the branches of the Romus 1 variety and together with *E. lanigerum*, led to debility of the tree, the drying of twigs, and by the end of the summer, an *Erwinia amylovora* attack appears, which determines the collapse of the tree (Fig. 1).

A great amount of honeydew secretion was found on the leaves and weeds under the tree. It is important to mention that in the garden are ten more apple trees from the Florina variety which had not been colonized by *M. pruinosa* and also were not attacked by *E. lanigerum*.

The high abundance of larvae and adults was observed on another Rosaceae: *Rubus idaeus*, *Prunus cerasus*, roses, and blackberry.

Also it is observed the presence of larvae and adults on vegetables. Thus, in a small tomato culture, waxy filaments were observed on the stems and the lower surface of the leaves. In time new necrotic areas have appeared and the specific plants remained weak, but the damage was not so important. Larvae and adults were observed on cucumbers, beans and peppers.

There were colonized plants like *Levisticum officinale*, *Artemisia dracunculus*, *Mentha* spp., *Ocimum basilicum*, which usually contain repellent substances. In literature, *Mentha* species are mentioned as repellent for a certain host insects series: ants, flies, lice, mosquitoes, and moths (Koul et al., 2008), but with low effects against *M. pruinosa* (Kim et al., 2013).

A particular aspect in the observations refers to *Hippophaë rhamnoides* species, mentioned by Strauss (2008) as a host plant but with a lower infestation level.

Thus, sea buckthorn, a plant less preferred by pests, presented the highest numerical abundance of all investigated plants: 53 adults on a 35 cm twig were numbered during August. In this case, there is the homochromia phenomenon, the adults being harder to see on grey bark (Fig. 1).

In Table 1 it is noticeable that the woody species are preferred by the adults. Besides, research made until now mention the eggs only on woody plants (Strauss, 2010).

From the Poaceae, only on *Hordeum murinum* were observed a few larvae and the waxy exudate.

Futhermore, we remark the presence of planthopper at an altitude of 304 m, given that Vlad & Grozea (2015), referring to the relation between its habitats and altitude in various regions of Romania, considers the species as being present only up to 202 m altitude, on plain areas.

Table 1. Host plants of *Metcalfa pruinosa* in a private garden, Pitesti, 2015

Family name	Scientific name	Level of infestation		Family name	Scientific name	Level of infestation	
		Larva	Adult			Larva	Adult
Fruit trees and shrubs species							
Juglandaceae	<i>Juglans regia</i> L.	3	3	Rosaceae	<i>Rubus idaeus</i> L.	3	3
Grossulariaceae	<i>Ribes nigrum</i> L.	2	2		<i>Rubus</i> spp. (blackberry)	3	3
	<i>Ribes uva-crispa</i> L.	2	2		<i>Fragaria moschata</i> Duchesne	1	-
Eleagnaceae	<i>Hippophaë rhamnoides</i> L.	3	3		<i>Malus domestica</i> Borkh. "Romus 1" variety	3	3
Vitaceae	<i>Vitis vinifera</i> L.	3	3		<i>Pyrus communis</i> L.	1	1
					<i>Prunus cerasus</i> L.	3	3
				<i>Prunus domestica</i> L.	1	1	
Vegetables and aromatic plant							
Fabaceae	<i>Phaseolus vulgaris</i> L.	1	2	Lamiaceae	<i>Mentha</i> spp.	1	1
Apiaceae	<i>Levisticum officinale</i> Koch	1	1		<i>Ocimum basilicum</i> L.	1	1
Cucurbitaceae	<i>Cucumis sativus</i> L.	1	2		<i>Artemisia dracunculus</i> L.	1	1
Solanaceae	<i>Solanum lycopersicum</i> L.	1	1				
	<i>Capsicum annuum</i> L.	1	2				
Ornamentals							
Rosaceae	<i>Rosa</i> spp.	3	3	Oleaceae	<i>Syringa vulgaris</i> L.	2	2
Hydrangeaceae	<i>Hydrangea macrophylla</i> (Thunb.) Ser.	1	1		<i>Fraxinus excelsior</i> L.	3	3
Caesalpinia-ceae	<i>Gleditsia triacanthos</i> L.	3	3	Lamiaceae	<i>Physostegia virginiana</i> var. <i>alba</i> (L.) Benth.	1	1
Vitaceae	<i>Parthenocissus quinquefolia</i> (L.) Planch.	2	2				
Weeds							
Rosaceae	<i>Geum urbanum</i> L.	2	2	Urticaceae	<i>Urtica dioica</i> L.	3	2
Fabaceae	<i>Medicago lupulina</i> L.	1	1	Convolvulaceae	<i>Convolvulus arvensis</i> L.	1	1
	<i>Trifolium repens</i> L.	1	1	Solanaceae	<i>Solanum dulcamara</i> L.	3	3
Oxalidaceae	<i>Oxalis corniculata</i> L.	1	1	Lamiaceae	<i>Lamium maculatum</i> L.	1	1
Euphorbiaceae	<i>Euphorbia cyparissias</i> L.	1	1		<i>Prunella vulgaris</i> L.	1	1
Araliaceae	<i>Hedera helix</i> L.	2	2		<i>Ballota nigra</i> L.	1	1
Apiaceae	<i>Daucus carota</i> L.	1	1	Asteraceae	<i>Erigeron annuus</i> (L.) Desf.	1	1
Papaveraceae	<i>Chelidonium majus</i> L.	1	1		<i>Erigeron canadensis</i> (L.) Cronquist	1	1
Malvaceae	<i>Malva sylvestris</i> L.	3	2		<i>Taraxacum officinale</i> F.H. Wigg	1	1
Violaceae	<i>Viola odorata</i> L.	1	1		<i>Sonchus arvensis</i> L.	1	1
Primulaceae	<i>Anagalis arvensis</i> L.	1	1	Rubiaceae	<i>Galium mollugo</i> L.	1	1
Caryophyllaceae	<i>Silene vulgaris</i> (Moench) Garcke	1	1	Scrophulariaceae	<i>Verbascum phlomoides</i> L.	1	1
Chenopodiaceae	<i>Chenopodium album</i> L.	1	1	Plantaginaceae	<i>Plantago major</i> L.	1	1
Amaranthaceae	<i>Amaranthus retroflexus</i> L.	1	1	Poaceae	<i>Hordeum murinum</i> L.	1	-

b. *Metcalfa pruinosa* in Botanical Garden from Craiova

The species was observed in the Botanical Garden of Craiova in May, 2015, and in the favorable conditions of this summer, colonizes a high number of plant species: 162 species in 44 families (Table 2). It is possible that the planthopper has also been present in the previous years, but its small populations went unnoticed.

The highest abundance was observed on both woody and herbaceous plants.

Table 2. Host plants of *Metcalfa pruinosa* in Botanical Garden, Craiova, 2015

Family name	Scientific name	Level of infestation		Family name	Scientific name	Level of infestation		
		Larva	Adult			Larva	Adult	
Ornamental trees and shrubs species								
Calycanthaceae	<i>Calycanthus floridus</i> L.	1	1	Celastraceae	<i>Euonymus europaeus</i> L.	2	2	
	<i>C. occidentalis</i> Hook. et Arn.	1	1	Buxaceae	<i>Buxus sempervirens</i> L.	2	2	
	<i>Chimonanthus praecox</i> (L.) Link	1	1	Rhamnaceae	<i>Rhamnus cathartica</i> L.	2	2	
Juglandaceae	<i>Carya illinoensis</i> (Wangenh.) K. Koch	1	1	Staphyleaceae	<i>Staphylea colchica</i> Stev.	2	2	
	<i>Juglans regia</i> L.	2	2		<i>Staphylea pinnata</i> L.	2	2	
Fagaceae	<i>Castanea sativa</i> Mill.	1	1		<i>Staphylea trifolia</i> L.	3	3	
	<i>Quercus robur</i> L.	1	1	Aceraceae	<i>Acer campestre</i> L. subsp. <i>campestre</i>	2	2	
Betulaceae	<i>Alnus glutinosa</i> (L.) Gaertner	1	1		<i>Acer ginnala</i> Maxim.	1	1	
Corylaceae	<i>Carpinus betulus</i> L.	1	1		<i>Acer monspessulanum</i> L.	1	1	
	<i>Corylus avellana</i> L.	1	1		<i>Acer negundo</i> L.	2	2	
Hydrangeaceae	<i>Philadelphus coronarius</i> L.	1	1		<i>Acer platanoides</i> L.	1	1	
Grossulariaceae	<i>Ribes aureum</i> Pursh	2	2		<i>Acer pseudoplatanus</i> L.	2	2	
	<i>Ribes fasciculatum</i> Siebold et Zucc.	2	2		<i>Acer saccharinum</i> L.	2	2	
	<i>Ribes nigrum</i> L.	1	1		<i>Acer tataricum</i> L.	1	1	
Rosaceae	<i>Physocarpus opulifolius</i> (L.) Maxim.	1	1		Sapindaceae	<i>Koeleruteria paniculata</i> Laxm.	1	1
	<i>Spiraea salicifolia</i> L.	2	2		Hippocastanaceae	<i>Aesculus hippocastanum</i> L.	1	1
	<i>Sorbaria sorbifolia</i> (L.) A. Braun	2	2	Anacardiaceae	<i>Rhus hirta</i> (L.) Sudw.	1	1	
	<i>Kerria japonica</i> (L.) DC.	1	1	Simaroubaceae	<i>Ailanthus altissima</i> (Mill.) Swingle	2	2	
	<i>Rosa pimpinellifolia</i> L.	1	1	Rutaceae	<i>Poncirus trifoliata</i> (L.) Raf.	1	1	
	<i>Rosa canina</i> L. s. l.	1	1		<i>Ptelea trifoliata</i> L.	2	2	
	<i>Rosa agrestis</i> Savi	2	2	Araliaceae	<i>Aralia elata</i> (Miq.) Seem.	1	1	
	<i>Cydonia oblonga</i> Mill.	3	3		<i>Hedera helix</i> L.	1	1	
	Rosaceae	<i>Cotoneaster dielsianus</i> Pritz. ex Diels	2	2	Oleaceae	<i>Ligustrum ovalifolium</i> Hassk.	2	2
		<i>Cotoneaster distichus</i> Lange	1	1	Oleaceae	<i>Ligustrum sinense</i> Lour. var. <i>stauntonii</i> (DC.) Rehder	2	2
<i>Cotoneaster roseus</i> Edgew.		2	2	Oleaceae	<i>Ligustrum vulgare</i> L.	2	2	
<i>Crataegus monogyna</i> Jacq. subsp. <i>monogyna</i>		1	1	Oleaceae	<i>Syringa vulgaris</i> L.	2	2	
<i>Crataegus pentagyna</i> Waldst. et Kit.		1	1	Verbenaceae	<i>Callicarpa bodinieri</i> H. Lev. var. <i>giraldii</i> (Hesse ex Rehder) Rehder	1	1	
<i>Sorbus torminalis</i> (L.) Crantz		1	1		<i>Callicarpa japonica</i> Thunb.	2	2	
<i>Malus prunifolia</i> (Willd.) Borkh.		2	2		<i>Vitex agnus-castus</i> L.	2	2	
<i>Amelanchier alnifolia</i> (Nutt.) Nutt.		1	1		<i>Vitex negundo</i> L.	2	2	
<i>Prunus avium</i> L.		1	1	Solanaceae	<i>Lycium barbarum</i> L.	2	2	
Caesalpinia-ceae		<i>Cercis canadensis</i> L.	1	1	Bignoniaceae	<i>Catalpa bignonioides</i> Walter	1	1
	<i>Cercis chinensis</i> Bunge	1	1	<i>Catalpa ovata</i> G. Don		1	1	
	<i>Gleditsia caspica</i> Desf.	1	1	<i>Catalpa speciosa</i> (Warder) Warder ex Engelm.		1	1	
	<i>Gleditsia triacanthos</i> L.	1	1	Rubiaceae	<i>Cephalanthus occidentalis</i> L.	3	3	
	<i>Gymnocladus dioica</i> (L.) K. Koch	2	2	Caprifoliaceae	<i>Leycesteria formosa</i> Wall.	2	2	
Fabaceae	<i>Styphnolobium japonicum</i> (L.) Schott	1	1		<i>Lonicera fragrantissima</i> Lindl. et Paxton	1	1	
	<i>Spartium junceum</i> L.	2	2		<i>Lonicera japonica</i> Thunb.	2	2	
	<i>Chamaecytisus hirsutus</i> (L.) Link	2	2		<i>Lonicera tatarica</i> L.	3	3	
	<i>Amorpha fruticosa</i> L.	1	1		<i>Lonicera xylosteum</i> L.	2	2	
	<i>Wisteria sinensis</i> (Sims) Sweet	1	1		<i>Sambucus nigra</i> L.	1	1	
	<i>Wisteria floribunda</i> (Willd.) DC.	1	1					

Fabaceae	<i>Robinia pseudoacacia</i> L.	2	2	Caprifoliaceae	<i>Symphoricarpos albus</i> (L.) S. F. Blake	2	2
	<i>Caragana arborescens</i> Lam.	2	2		<i>Symphoricarpos orbiculatus</i> Moench	2	2
	<i>Caragana frutex</i> (L.) C. Koch	2	2		<i>Viburnum lantana</i> L.	2	2
	<i>Indigofera gerardiana</i> Wall. ex Baker	1	1		<i>Viburnum opulus</i> L.	2	2
Cornaceae	<i>Cornus mas</i> L.	1	1		<i>Weigela florida</i> (Bunge) A. DC.	3	3
	<i>Cornus sanguinea</i> L.	2	2				
Herbaceous species							
Urticaceae	<i>Urtica dioica</i> L.	3	2	Malvaceae	<i>Althaea cannabina</i> L. subsp. <i>cannabina</i>	2	2
	<i>Parietaria officinalis</i> L.	2	2		<i>Althaea officinalis</i> L. subsp. <i>officinalis</i>	1	1
Phytolaccaceae	<i>Phytolacca americana</i> L.	1	1	Convolvulaceae	<i>Convolvulus arvensis</i> L.	2	2
Caryophyllaceae	<i>Silene alba</i> (Mill.) E.H.L. Krause	2	2	Verbenaceae	<i>Verbena officinalis</i> L.	3	3
Saxifragaceae	<i>Heuchera americana</i> L.	3	3	Lamiaceae	<i>Prunella vulgaris</i> L.	2	2
Rosaceae	<i>Potentilla rupestris</i> L.	2	2		<i>Origanum vulgare</i> L.	2	2
	<i>Geum aleppicum</i> Jacq.	2	2		<i>Lycopus europaeus</i> L.	3	3
	<i>Geum urbanum</i> L.	3	3	Scrophulariaceae	<i>Penstemon barbatus</i> (Cav.) Nutt.	1	1
	<i>Filipendula vulgaris</i> Moench	2	2		<i>Scrophularia nodosa</i> L.	1	1
	<i>Filipendula ulmaria</i> (L.) Maxim. var. <i>denudata</i> (J. et C. Presl) Maxim.	2	2		<i>Verbascum blattaria</i> L.	2	2
	<i>Agrimonia eupatoria</i> L.	3	3		<i>Verbascum phlomoides</i> L.	1	1
	<i>Agrimonia procera</i> Wallr.	3	3	<i>Verbascum phoeniceum</i> L.	1	1	
	<i>Sanguisorba officinalis</i> L.	2	2	Solanaceae	<i>Datura stramonium</i> L.	1	1
	<i>Sanguisorba minor</i> Scop. subsp. <i>minor</i>	3	3		<i>Solanum dulcamara</i> L.	3	3
	<i>Sanguisorba minor</i> Scop. subsp. <i>polygama</i> (Waldst. et Kit.) Holub	3	3	Campanulaceae	<i>Campanula bononiensis</i> L.	1	1
Fabaceae	<i>Trifolium medium</i> L. subsp. <i>medium</i>	2	2		<i>Campanula glomerata</i> L.	1	1
	<i>Dorycnium hirsutum</i> (L.) Ser.	2	2		<i>Campanula persicifolia</i> L.	2	2
	<i>Galega officinalis</i> L.	1	1		<i>Campanula rapunculoides</i> L.	1	1
	<i>Astragalus cicer</i> L.	2	2		<i>Platycodon grandiflorus</i> (Jacq.) A. DC.	1	1
	<i>Astragalus glycyphyllos</i> L.	2	2	Rubiaceae	<i>Galium rubioides</i> L. subsp. <i>rubioides</i>	3	3
	<i>Astragalus falcatus</i> Lam.	3	3		<i>Galium verum</i> L.	2	2
	<i>Baptisia australis</i> (L.) R. Br.	2	2	Valerianaceae	<i>Centranthus ruber</i> (L.) DC.	3	3
	<i>Coronilla varia</i> L.	2	2		<i>Valeriana officinalis</i> L.	3	3
	<i>Lathyrus niger</i> (L.) Bernh.	2	2	Dipsacaceae	<i>Cephalaria gigantea</i> (Ledeb.) Bobrov	2	2
	<i>Lathyrus venetus</i> (Mill.) Wohlff.	2	2		<i>Ambrosia artemisiifolia</i> L.	3	3
<i>Glycyrrhiza echinata</i> L.	1	1	Asteraceae	<i>Erigeron canadensis</i> (L.) Cronquist	2	2	
Lythraceae	<i>Lythrum salicaria</i> L.	1		1	<i>Erigeron annuus</i> (L.) Desf. subsp. <i>annuus</i>	2	2
	Onagraceae	<i>Epilobium hirsutum</i> L.		2	2	<i>Solidago canadensis</i> L.	1
<i>Gaura biennis</i> L.		2		2	<i>Sonchus oleraceus</i> L.	1	1
<i>Oenothera biennis</i> L.		2		2	<i>Symphotrichum novae-angliae</i> (L.) G. L. Nesom	2	2
<i>Oenothera rosea</i> L'Hér. ex Aiton		3		3	<i>Symphotrichum novi-belgii</i> (L.) G. L. Nesom	2	2
Apiaceae	<i>Chaerophyllum aromaticum</i> L.	3		3	<i>Vernonia arkansana</i> DC.	2	2
	<i>Cnidium silaifolium</i> (Jacq.) Simonkai	3		3			
	<i>Heracleum sphondylium</i> L. subsp. <i>sphondylium</i>	2		2			
	<i>Laser trilobum</i> (L.) Borkh.	3		3			
	<i>Oenanthe pimpinelloides</i> L.	2	2				



Figure 1. a. *Metcalfa pruinosa* on *Malus domestica* Romus 1 variety with *Eriosoma lanigerum* infestation ; b. *Erwinia amylovora* attack; c. *M. pruinosa* on *Hippophaë rhamnoides*; d. detail

c. Comparative aspects of the two sites

Thirteen species infested with *M. pruinosa* individuals are common for the two sites: *Ribes nigrum*, *Juglans regia*, *Gleditsia triacanthos*, *Syringa vulgaris*, *Geum urbanum*, *Hedera helix*, *Urtica dioica*, *Convolvulus arvensis*, *Solanum dulcamara*, *Prunella vulgaris*, *Erigeron annuus*, *E. canadensis*, *Verbascum phlomoides*.

In the case of *Gleditsia triacanthos* species, there are found important differences of the numerical abundance of the two sites, a possible cause being the location of the tree: on the shaded area presents a higher number of individuals.

The remarkable polyphagia is highlighted by the ability of this species to colonize plants of different geographical origins, situation mentioned by Preda & Skolka (2011). In both sites, it is noticed that most of the host plants are Eurasian - 23 species in private garden and 48 species in Botanical Garden (Fig. 2). Most of the host plants with the highest infestation level are too Eurasian (36.6%), and only 20% are native from North America. Thus, in Pitesti, a high number of larvae and adults was observed on *Gleditsia triacanthos* a species of North-American origin, but also to *Hippophaë rhamnoides*, an Eurasian species.

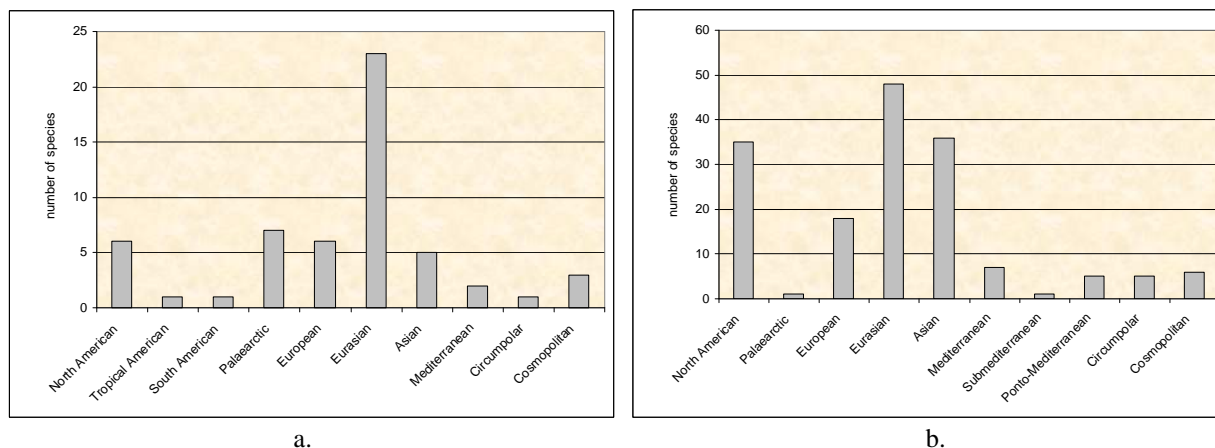


Figure 2. Native range of host plants identified in the two sites in Southern Romania.
a. private garden, Pitești; b. Botanical Garden, Craiova.

d. Influence of abiotic factors on *M. pruinosa* populations

The success of the invasive species in conquering new areas is also conditioned by their relation with abiotic factors. In the case of *M. pruinosa*, it is found in different climatic regions of the native range, from Arizona to south-eastern Canada (Mead, 2004).

Concerning the temperature, according to data from the literature, *M. pruinosa* is a thermophilous species. It is common in warm regions of America (Florida Arizona, California etc.) (Mead, 2004) since April, and much later in temperate areas, towards the end of May (Strauss, 2010). Depending on the worldwide distribution of the species and on the moment of its appearance in spring, Strauss (2010) estimates to 13⁰ C the minimum temperature limit, which reflects the necessity of species for warmth.

Thermophilous behavior is in accordance with our observations, species being identified in both sites in 2014 and 2015, in the last half of May.

Furthermore, visual estimation of the population size on the host plants from the private garden in the two years, 2014 and 2015, reveal its preference for warm summers. While in 2014 the species has a small population, in 2015 it invades the plants in the garden, larvae, white waxy filaments, exuviae, honeydew secretions and adults being everywhere. In 2014, the planthopper was in the expansion phase of the invasion process, but this fact was hidden by the unfavorable climate.

Regarding humidity, Strauss (2010) mentions preference of species for humid regions with annual average precipitation between 610 and 1,625 mm, condition satisfied in both investigated sites.

Our observations show high abundances in warm and dry summers, such as the summer of 2015 with average precipitation between 19 – 92.6 l/sqm. However, in both sites the highest numerical abundances were recorded on the plants which benefited from a shady micro-climate. It was also remarked the presence of the colonies on the lower surface of the leaves from the bottom branches of the tree or in the bottom part of the herbaceous plants.

Due to low temperatures and rainfall, no more adults were observed after 13 September 2015.

4. CONCLUSIONS

Observations carried out in May-September 2015 in two sites of Southern Romania reveal 204 species of host plants in 56 families for the invasive species *Metcalfa pruinosa*.

Its polyphagous behaviour is highlighted by its ability to infest 55 species of plants in 29 families, cultivated and spontaneous, on a surface of cca 1000 sqm.

High numerical abundance was observed on fruit trees and shrubs: *Hippophaë rhamnoides*, *Juglans regia*, *Prunus cerasus*, *Vitis vinifera*, *Rubus idaeus*.

In warm and dry summers, the highest numerical abundances are noticed in shady habitats.

The attack associated with the one produced by *Eriosoma lanigerum* debilitates the apple tree Romus 1 variety and favours appearance of *Erwinia amylovora* pathogenic bacteria.

In favourable climatic conditions, *M. pruinosa* presents high populations who can affect the quality of plants, both in economic terms, for the fruit shrubs and trees, and aesthetically, for ornamental species.

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