

Metcalfa pruinosa Say, a dangerous invasive species for various plants in some landscaping from Craiova

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Abstract Metcalfa pruinosa (Say), is an invasive species originating from North America, was accidentally introduced into Italy spreading out to other countries from European continent.

In Romania, it was reported in 2009 in Constanta, in Timisoara in 2010, and in 2011 in Bucharest. It has an accentuated polyphagism, attacking around 330 plant species from 78 botanical families.

As a result of the researches done in Craiova we identified 87 host plants belonging to 44 botanical families, from spontaneous woody species and ornamentals to spontaneous herbaceous plants and ornamentals from Botanical Garden Al. Buia and Nicolae Romanescu Park where vegetation is very dense.

The sweet secrets produced by the cicada favors the appearance of the fungus *Capnodium salicinum*, which is found on the leaves and fruits of several woody species. On long distances the spread of this species is carried out by vehicles and accidentally by trade of infested plants with eggs.

The observations done have revealed that the species particularly attacks young branches and prefers shady places with dense vegetation. If the diversity of host plants is high the cicada shows a high population level and effectively can targeted any plant species which are available.

Metcalfa pruinosa (Say) is an invasive species originating from eastern North America, expanding its area from Ontario and Quebec to Florida, west to Great Plains state, south to Texas, New Mexico, Arizona, California and Mexico⁹. This pest was accidentally introduced into Italy near Trevisio in 1979 (Zangheri and Donadini, 1980) in (8), subsequently spreading to other countries from the European continent, and in 2010 it was also reported on the Asian continent in Korea (6).

In Romania, it was firstly reported in Constanta in 2009 (14), in 2010 in Timisoara (5), and one year later also in Bucharest (4).

Metcalfa pruinosa (Say) has a single generation per year and 5 developmental larval stages, the adults live on average several weeks and winter as eggs deposited under the bark of the attacked plants. In its origins area where the climate is characterized by a warm climate, the eggs hatch at the beginning of March, and the first adults appear after 69 days from the appearance of the first larvae, being observed until October, with a lifetime of several weeks (9).

Since the European continent is characterized by a temperate climate, the activity of the species begins at the end of May until September (17). In France and Austria, larvae are encountered from May to mid-July feeding on excessive flowing sucking and producing a

Key words

Metcalfa pruinosa Say, polyphagism, host plants, attack, spread

large amount of honeydew. Full adult development is completed in August, after mating, the females lay the first eggs (2).

Metcalfa pruinosa Say has a pronounced polyphagism, in the area of origin attacks more than 120 species of plants from 50 botanical families, and in Europe 330 plant species were identified from 78 botanical families (1).

Method and Material

The research was carried out between July and October 2018, the observations being made in the Botanical Garden Al. Buia and Nicolae Romanescu Park on various plant species, for their identification we have used (3).

The purpose of the research was to identify the plants attacked by the cicada from some landscaping in Craiova, by tracking the stages of species, development, attack, and the damage they had caused.

A plant was considered „host“ for the cicada only after several individuals (larvae at different stages of development/adults) were present and signs of their activity were evident on the plant (white waxy filaments and honeydew secretions as traces of feeding).

Results and Discussions

In 2018 *Metcalfa pruinosa* Say was observed on several spontaneous and cultivated woody species, but also on spontaneous and cultivated herbaceous plants from the Botanical Garden. Al Buia and Nicolae Romanescu Park.

Among the most frequently attacked woody species were *Ulmus glabra* Hidds, *Amorpha fruticosa* L.,

Mahonia aquifolium (Pursh) Nutt, *Prunus cerasifera* Ehrh., *Acer pseudoplatanus* L., *Buxus sempervirens* L., *Cornus sanguinea* L., the attack being present on young branches and leaves, in terms of herbaceous plants the most attacked were *Rudbeckia* spp. Aiton, *Iris* spp L., *Cephalaria uralensis* (Murray) Roem. & Schult (Figure 1, Figure 2, Figure 3).



Fig. 1. Attack of adults larvae on leaves, branch and fruit at *Cornus sanguinea* L. (Left) and attack on stalk from *Rudbeckia* spp. Aiton (Right), Original.



Fig. 2. Adults on the branch of *Amorpha fruticosa* L. (left) and larvae on **Hosta plantaginea* (Lamarck) Asch. Original



Fig. 3. Larval attack on species *Ulmus glabra* Huds. Original.

In America, this pest attacks various woody species such as and others citrus, grapevine, peach, cherry laurel, camellias, azaleas, magnolias, hollies, *Viburnum* spp. (Mead, 1969) in (8).

In Europe, in addition to the plants mentioned above, other new species have been reported in Czech Republic the most attacked species were *Thuja occidentalis* L., *Juniperus communis* L., *Sorbus aucuparia* L., *Lilium* spp, the attack being encountered on young branches (8).

The following host species were observed in Austria (Vienna): *Acer* spp., *Ailanthus altissima* L., *Buxus microphylla* L., *Catalpa bignonioides* L., *Clematis* spp., *Deutzia* spp., *Euonymus* spp., *Fraxinus excelsior* L., *Hibiscus* spp, *Lonicera* spp., *Mahonia quifolium* L., *Parthenocissus quinquefolia* L., *Paulownia tomentosa* L., *Prunus* spp., *Robinia pseudoacacia* L., *Rubus fruticosus* L., *Sambucus nigra* L., *Spirea* spp., *Symphoricarpus albus* L., *Viburnum burkwood* (7) and *Urtica dioica* L. (17).

In Greece, besides the woody and herbaceous species, the cicada was also found in cultivated trees such as *Citrus sinensis* L. *Citrus limon* Burn, *Citrus reticulata* Blanco, *Citrus aurantium* L., *Olea europaea* L., *Persea americana* Mill., *Pyrus communis* L., *Prunus* and two species of the family *Solanaceae*, *Lycopersicon esculentum* Mill., *Solanum melongena* L. (16).

In Serbia (Belgrade), *M. pruinosa* has been reported on woody species in general as *Acer* spp, *Aesculus* spp,

Gleditchia spp, *Robinia* spp, *Ailanthus* spp, *Populus* spp *Platanus* spp, *Prunus* spp, *Pyrus* spp, *Ulmus* spp, *Tilia* spp, *Cornus* spp, *Fraxinus* spp, *Quercus* spp and *Thuja* spp. (10).

In Cataluña 107 species of 56 botanical families were identified, the highest affected plants are *Hedera helix* L., *Hibiscus syriacus* L., *Ligustrum vulgare* L. (13).

In 2010, in Romania 110 host plants belonging to 49 families were identified in Constanta (15), and in 2014, 66 host plants from several botanical families were identified in 8 other counties, most attacked species were: *Prunus* spp, *Buxus* spp, *Rosa* spp, *Hibiscus* spp, *Acer* spp and *Ligustrum* spp. (18).

In the landscaping of Craiova in 2017 the cicada it was reported on a number of 33 host plants, the most affected being the species *Hibiscus syriacus* L., *Paulownia tomentosa* (Thunb.) Steud, *Cornus sanguinea* L (11).

Depending on the climate, the biological reserve and spread, this species target a smaller or a larger number of plants in an affected area, with predilection to the woody species, but also attacks spontaneous and ornamentals herbaceous species near to the woody ones. We also found that this species is attacking plants from shady areas with dense vegetation. In 2018, based on researches carried out in the Botanical Garden and Nicolae Romanescu Park, the presence of the pest was reported on a number of 87 species belonging to 44 botanical families. (Table 1 and 2).

Table 1

Woody host plants

Nr. crt.	Woody plants		Location		
	Scientific name	Family	Botanical Garden Buia	Al. Nicolae Park	Romanescu
1.	<i>Rosa sp. L.</i>	Rosaceae	X		
2	<i>Rosa canina L.</i>	Rosaceae	X		
3	<i>Prunus cerasifera var. Pissardii Ehrh.</i>	Rosaceae	X		
4	<i>Crataegus monogyna Jacq.</i>	Rosaceae			X
5	<i>Pyracantha coccinea M. Roem</i>	Rosaceae	X		
6	<i>Prunus cerasifera Ehrh.</i>	Rosaceae	X		X
7	<i>Poncirus trifoliata L.</i>	Rutaceae	X		
8	<i>Ptelea trifoliata L.</i>	Rutaceae			X
9	<i>Parthenocissus quinifolia Planch.</i>	Vitaceae	X		
10	<i>Ulmus glabra Huds.</i>	Ulmaceae	X		X
11	<i>Wisteria sinensis (Sims) DC.</i>	Fabaceae	X		
12	<i>Cercis siliquastrum L.</i>	Fabaceae	X		
13	<i>Amorpha fruticosa L.</i>	Fabaceae	X		
14	<i>Robinia pseudoacacia L.</i>	Fabaceae			X
15	<i>Cornus sanguinea L.</i>	Cornaceae	X		
16	<i>Berberis vulgaris L.</i>	Berberidaceae	X		
17	<i>Mahonia aquifolium (Pursh) Nutt</i>	Berberidaceae	X		
18	<i>Fontanesia phillyraeoides Labill.</i>	Oleaceae	X		
19	<i>Forsythia intermedia Vahl</i>	Oleaceae	X		
20	<i>Fraxinus excelsior L.</i>	Oleaceae	X		
21	<i>Ligustrum vulgare L.</i>	Oleaceae			X
22	<i>Celtis australis L.</i>	Cannabaceae	X		
23	<i>Broussonetia papyrifera L.</i>	Moraceae	X		
24	<i>Ficus carica L.</i>	Moraceae	X		
25	<i>Buxus sempervirens L.</i>	Buxaceae	X		X
26	<i>Acer platanoides L.</i>	Aceraceae	X		
27	<i>Hibiscus syriacus L.</i>	Malvaceae	X		
28	<i>Hedera helix L.</i>	Araliaceae	X		
29	<i>Koelreuteria paniculata L.</i>	Sapindaceae	X		
30	<i>Acer campestre L.</i>	Sapindaceae	X		
31	<i>Acer pseudoplatanus L.</i>	Sapindaceae	X		X
32	<i>Acer negundo L.</i>	Sapindaceae	X		
33	<i>Magnolia tripetala L.</i>	Magnoliaceae	X		
34	<i>Liriodendron tulipifera L.</i>	Magnoliaceae	X		
35	<i>Philadelphus coronarius L.</i>	Hydrangeaceae	X		
36	<i>Juglans regia L.</i>	Juglandaceae	X		X
37	<i>Ailanthus altissima (Mill.) Swingle</i>	Simaroubaceae	X		
38	<i>Tamarix tetrandra Pall. Ex M. Bieb.</i>	Tamaricaceae	X		
39	<i>Paulownia tomentosa (Thunb.) Steud</i>	Paulowniaceae	X		
40	<i>Symphoricarpos albus(L.) S.F. Blake</i>	Caprifoliaceae	X		
41	<i>Rhus hirta L.</i>	Anacardiaceae	X		X
42	<i>Thuja occidentalis L.</i>	Cupressaceae	X		
43	<i>Malus domestica Borkh</i>	Rosaceae	X		
44	<i>Rhododendron spp.L.</i>	Ericaceae	X		
45	<i>Rubus fruticosus L.</i>	Rosaceae	X		X
46	<i>Morus alba L.</i>	Moraceae	X		X
47	<i>Salix alba L.</i>	Salicaceae	X		
48	<i>Diospyros virginiana L.</i>	Ebenaceae	X		
49	<i>Calycanthus fertilis Walter</i>	Calycanthaceae	X		

Table 2

Herbaceous host plants

Nr. crt.	Herbaceous plants		Location	
	Scientific name	Family	Botanical Garden Al. Buia	Nicolae Romanescu Park
1	<i>Canna indica</i> L.	Cannaceae	X	
2	<i>Humulus lupulus</i> L.	Cannabaceae	X	
3	<i>Rudbeckia</i> ssp. Aiton	Asteraceae	X	
4	<i>Geranium pyrenaicum</i> Burm f.	Geraniaceae	X	X
5	<i>Verbena officinalis</i> L.	Verbenaceae	X	
6	<i>Dipsacus fullonum</i> L.	Caprifoliaceae	X	
7	<i>Buddleja davidii</i> Franch.	Scrophulariaceae	X	
8	* <i>Hosta plantaginea</i> (Lamarck) Asch.	Asparagaceae	X	
9	<i>Salvia</i> spp.L.	Lamiaceae	X	
10	<i>Asparagus pseudoscaberr</i> Grecescu	Asparagaceae	X	
11	<i>Pulicaria dysenterica</i> L. Bernh	Asteraceae	X	
12	<i>Inula helenium</i> L.	Asteraceae	X	
13	<i>Stachys officinalis</i> (L.) Travis.ex Briq	Lamiaceae	X	
14	<i>Helianthus tuberosus</i> L.	Asteraceae	X	
15	<i>Cephalaria uralensis</i> (Murray) Roem. & Schult.	Caprifoliaceae	X	
16	<i>Yucca filamentosa</i> L.	Asparagaceae		X
17	<i>Iris</i> spp. L.	Iridaceae	X	
18	<i>Erigeron annuus</i> subsp. strigosus L.	Asteraceae	X	
19	<i>Dianthus chinensis</i> L.	Caryophyllaceae		
20	<i>Capssella bursa pastoris</i> (L.) Medik	Brassicaceae		X
21	<i>Lythrum salicaria</i> L.	Lythraceae	X	
22	<i>Geum urbanum</i> L.	Rosaceae	X	X
23	<i>Silene latifolia</i> subsp. alba Poir.	Caryophyllaceae	X	X
24	<i>Rumex</i> spp.L.	Polygonaceae	X	
25	<i>Aquilegia vulgaris</i> L.	Ranunculaceae	X	
26	<i>Oenothera biennis</i> L.	Onagraceae	X	
27	<i>Nepeta</i> spp. L.	Lamiaceae	X	
28	<i>Ambrosia</i> ssp. L.	Asteraceae	X	X
29	<i>Trifolium repens</i> L.	Fabaceae		X
30	<i>Trifolium pratense</i> L.	Fabaceae		X
31	<i>Taraxacum officinale</i> L.	Asteraceae	X	X
32	<i>Sonchus arvensis</i> L.	Asteraceae	X	
33	<i>Calendula officinalis</i> L.	Asteraceae	X	
34	<i>Cirsium arvense</i> L. Scop.	Asteraceae	X	X
35	<i>Lamium purpureum</i> L.	Lamiaceae	X	
36	<i>Lycopus europaeus</i> L.	Lamiaceae	X	
37	<i>Amaranthus retroflexus</i> L.	Amaranthaceae		X
38	<i>Solidgo canadensis</i> L.	Asteraceae	X	
39	<i>Urtica dioica</i> L.	Urticaceae	X	

During the summer months can be observed the different stages of the species development (larvae, nymphs and adults), forming colonies on stems, branches, leaves, inflorescences and fruits, being

recognized by their arrangement and white waxy filaments (the insect exhibiting a gregarious instinct) (Figure 4).



Fig. 4. Colony of larvae by *Metcalfa pruinosa* on *Iris* spp L. (left) and larvae and adults on *Juglans regia* L. (right) Original.

Massive infestations with *M. pruinosa* can cause stunting of shoot and herbaceous plants may be seriously affected and wilt (17). In Italy, grape quality (sugar content and acidity) was negatively affected by feeding nymphs. Significant losses of 30-40% in soybean cultures were recorded by Ciampolini et al. (1987) in (17).

The highest damage is caused by the sweet secretions produced by *M. pruinosa*, which favors the appearance of some fungus leading to the reduction of fruit quality (Della Giustina and Navarro 1993) in (2).

In the Botanical Garden had been identified a series of host plants that were affected by the sweet secretion of the cicada that favored the appearance of the fungus *Capnodium salicinum*, being found on the leaves and inflorescences of several woody species such as *Forsythia intermedia* Vhal., *Buxus sempervirens* L., *Berberis vulgaris* L., *Fraxinus excelsior* L., *Liliodendron tulipifera* L., *Magnolia tripetala* L., *Broussonetia papyrifera* L., *Philadelphus coronarius* L. (Figure 5).



Fig. 5. Honeydew produced by *Metcalfa pruinosa* on leaves from *Fraxinus excelsior* L (left) and the fruit covered by the fungus *Capnodium salicinum* (right)

Several authors have different assumptions about the ways of spreading of this pest, which may be, accidentally by trade of infested plants with eggs or by the beekeepers who deliberately introduce it for honey secretion (10).

Another way of spreading can be through the active flight of adults, but only at small spatial scales: for example, the estimated rate of natural spread of the cicada in Vienna is 0.2-0.5km / year (7).

Long-distance propagation of this species is achieved by vehicles that often park along the road near plants (8) and in public spaces where the biological reserve of this species is abundant, spreading can be achieved by people accidentally (17).

Conclusions

Based on research carried out in some landscaping in Craiova, we identified 87 host plants belonging to 44 botanical families, from spontaneous woody species and ornamentals to spontaneous and ornamentals herbaceous plants. From this total of host plants, 49 are woody species and 39 herbaceous species.

Among the most frequently attacked woody species were *Ulmus glabra* Hidds, *Amorpha fruticosa* L., *Mahonia aquifolium* (Pursh) Nutt, *Prunus cerasifera* Ehrh., *Acer pseudoplatanus* L., *Buxus sempervirens* L., *Cornus sanguinea* L. the attack being present on young branches and leaves and among the herbaceous plants the most attacked were *Rudbeckia* ssp. Aiton, *Iris* ssp., *Cephalaria uralensis* (Murray) Roem. & Schult.

The observations done have revealed that the species particularly attacks young branches and prefers shady places with dense vegetation. If the diversity of host plants is high the cicada shows a high population level and effectively can targeted any plant species which are available.

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