

Present situation of plant health in urban habitats of Budapest

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Abstract: Author reports on the results of studies on phytophagous arthropod fauna during 1986-2003 on 307 woody ornamental species. Recently several scale insect, aphid, spider mite, flat mite, gall mite, thrips, bug, gall midge, psyllid and lepidopteran species have caused damages in urban habitats. Among them *Pseudaulacaspis pentagona*, *Unaspis euonymi*, *Periphyllus testudinaceus*, *Eucallipterus tiliae*, *Aphis fabae*, *Tetranychus urticae*, *Eotetranychus tiliarium*, *Stenacis palomaris*, *Eriophyes tiliae*, *Aceria populi*, *Dendrothrips ornatus*, *Corythucha ciliata*, *Cameraria ohridella*, *Hyphantria cunea*, *Dasineura gleditchiae* are very frequent. Spreading and colonization of *Ailanthus altissima*, *Negundo aceroides*, *Celtis occidentalis* and *Koelreuteria paniculata* have caused problem in urban habitats

Keywords: woody ornamentals, urban habitat, phytophagous arthropods, coccids, aphids, mites, woody weeds, Hungary.

The state of plant health and decorative value of native (apophytes) and alien woody species (anthropophytes) planted in cities and rural settlements have determined the views of them.

Provident planning of urban vegetation and preventive control of it are very important: planting such plants, which do not have pest and disease, or which have only few pests of minor significance, and which can tolerate the negative effects of urban environment.

On the other hand there is an other factor what we have to take into consideration. In our age due to the globalization the two most dangerous

processes for plant and animal species are the destruction of habitats and the introduction also spreading of IAS (Invasive Alien Species) (biological pollution). This process is going on in the ground, in the sea and in rivers and ponds, too. The aggressive invasion of alien plants and animals is a menace not for the biodiversity only, but they cause economic problems, too.

Some examples of dangerous IAS in today's world:

A marine green alga (*Caulerpa taxifolia*, native to Australia), escaped from an aquarium of Monaco squeezes out the native plant and animal species from the Mediterranean Sea and Sea of California.

Water hyacinth (*Eichhornia crassipes*, of South American origin) is almost an unmanageable water weed of Africa and SE Asia.

Old man's beard (*Clematis vitalba*, an European deciduous climber) is a destructive species for the forest of New Zealand.

Gum tree (*Eucalyptus* spp., native to Australia) have been causing ecological problem in Africa and North America. They are inflammable, and indigestible for many herbivores.

In Hungary the most problematical anthropophytes are as follows:

Trees and shrubs:

Tree of heaven (*Ailanthus altissima*)

Box elder (*Negundo aceroides*)

False indigo (*Amorpha fruticosa*)

Red ash (*Fraxinus pennsylvanica*)

Oleaster (*Elaeagnus angustifolia*)

Common lilac (*Syringa vulgaris*)

Herbaceous plants:

Ragweed (*Ambrosia artemisiifolia*)

Common milkweed (*Asclepias syriaca*)

Canadian horseweed (*Conyza canadensis*)

Johnson grass (*Sorghum halepense*)

Golden rods (*Solidago* spp.)

To prevent the invasion of invasive neophytes is important both in cultivated fields and artificial habitats. To plant and propagate those alien species which have caused problem as a weed are inexpedient, e. g. *Ailanthus altissima*, *Amorpha fruticosa*, *Negundo aceroides*, *Celtis occidentalis*, *Fraxinus pennsylvanica* and *Koeleria paniculata*. Colonization, spreading, and expansion of escaped alien species (by seeds and corms) in natural habitats and communities is much larger problem than in urban habitats. Although their presence is not negligible in the latter habitats.

In Hungary the important invasive insect pests are as follows:

Grape phylloxera (*Viteus vitifoliae*)

Mulberry scale (*Pseudaulacaspis pentagona*)

San Jose scale (*Diaspidiotus perniciosus*)

Fall webworm (*Hyphantria cunea*)

Colorado potato beetle (*Leptinotarsa decemlineata*)
Tobacco whitefly (*Bemisia tabaci*)
Western flower thrips (*Frankliniella occidentalis*)
Horse chestnut leaf miner (*Cameraria ohridella*)
Western corn rootworm (*Diabrotica virgifera virgifera*)
Serpentine leaf miner (*Liriomyza huidobrensis*)

Several pests of anthropophytes were delayed for a short or long period of time as compared to the introduction of their host plants, e. g. *Argyresthia thuiella*, *Argyresthia trifasciata*, *Cameraria ohridella*, *Parectopa robiniella*, *Phyllonorycter robiniella*, *Corythucha ciliata*, *Dasineura gleditchiae*, *Cacopsylla pulchella*, *Chloropulvinaria floccifera*, *Eupulvinaria hydrangeae*, *Pseudaulacaspis pentagona*, *Aphis catalpae*, *Cinara cedri*, *Cinara tujaefilina*, *Drepanosiphum oregonensis*, *Tinocallis platani*, *Tinocallis saltans*, etc. Host plants of some pests have been being planted in Hungary for a long time, e. g. *Robinia pseudoacacia*, *Aesculus hippocastanum*, *Thuja* spp., *Gleditsia triacanthos*, *Platanus hispanica*, *Morus alba*.

Among the phytophagous insects mulberry scale (*Pseudaulacaspis pentagona*), maple aphids (*Periphyllus testudinaceus*, *Periphyllus lyropictus*, *Periphyllus obscurus*), linden aphid (*Eucallipterus tiliae*), *Corythucha ciliata*, and horse chestnut leaf miner (*Cameraria ohridella*), among phytophagous mites two-spotted spider mite (*Tetranychus urticae*) and linden spider mite (*Eotetranychus tiliarium*) have caused severe infestations in urban habitats.

The views of cities and even the small villages are also determined by the plants which are planted near the streets, buildings and technical buildings. Native (apophytes) and alien (antropophytes) woody plant species are used as street trees. The well chosen plants tolerating well the special microclimate make many settlements cosy and intimate. The role of aesthetic, biological and environmental effect of greenery is important. While the plants of public places reduce the harmful effects on people they are exposed to the abiotic stresses. The built surroundings change the microclimate of particular environment. Majority of the climatic changes are adverse to the plants. The asphalt road and pavement surface, the lack of water, the extra heat, the airless, and compressed soil, the low air humidity, the air pollution and the winter salt treatment of road against slippery cause damages of foliage of several tree and shrub species. The amenity trees and shrubs planted in adverse circumstances, which are very different from their natural habitats, have to suit the requirements. Out of 307 ornamental tree and shrub species planted in parks, streets, green areas of housing estates, botanical gardens, private gardens in Budapest, 28% and 72% are native (apophyte) and antropophyte species, respectively. Most antropophytes is neophytes.

Arthropods are successful members of the animal kingdom. One of the most important feature of them is the considerable capacity of adaptation. The local

climatic conditions of cities suit several groups of arthropods. Ornamental trees and shrubs have rich and diverse arthropod fauna.

Profound studies were made on phytophagous arthropod fauna during 1986-2003 on 307 woody ornamental species. Scale insects (Homoptera: Coccoidea) suck the sap of the plants. Besides fruit trees, the diaspidids and soft scales threaten especially the ornamental trees and shrubs. A total of 40 coccid species were found on 272 woody ornamental species in Budapest (BOGNÁR & VINIS 1979, RIPKA et al. 1996). Currently mulberry scale (*Pseudaulacaspis pentagona*) is the most frequent species on woody ornamentals (RIPKA & REIDER 1990, RIPKA et al. 1996). Majority of its 74 host plants belongs to families Oleaceae, Rutaceae, Rosaceae, Fabaceae and Moraceae. White scales of it can be found very frequently on branches and trunks of *Sophora japonica*, *Morus alba*, *Syringa vulgaris*, *Broussonetia papyrifera*, *Catalpa bignonioides*, *Ribes aureum*, *Euodia hupehensis* and *Persica vulgaris*.

Euonymus scale (*Unaspis euonymi*) is the most important and dangerous pest of *Euonymus europaeus* and *Euonymus japonica*. There is no natural enemy (predator or parasitoid) which can control effectively the population of the pest in urban areas. On Buda side, in a natural conservation area *U. euonymi* caused much less infestation on *Euonymus europaeus* than in parks of inner city. Brown elm scale (*Parthenolecanium corni*) is a common species which was found on 45 host species. It caused damages on *Tilia cordata*, *Fraxinus excelsior*, *Acer saccharinum*, while its population density was low on the other host plants.

Pear-tree oyster scale (*Epidiaspis leperii*) was found on 29 rosaceous host plants and regularly causes damages on *Crataegus* spp., *Malus* spp., *Pyrus* spp. and *Sorbus* spp. in certain districts of Buda. The damages can be seen on branches and trunks as indentations.

On *Populus* spp. the willow scale (*Chionaspis salicis*) and poplar armored scale (*Diaspidiotus gigas*) caused damages in several districts.

On *Thuja* spp., *Chamaecyparis* spp. and *Juniperus* spp. the juniper scale (*Carulaspis juniperi*) is the frequent member of coccid fauna of parks and gardens. The most scale insect species were found on *Fraxinus angustifolia*, *Fraxinus excelsior*, *Crataegus laevigata*, *Fraxinus ornus*, *Fraxinus pennsylvanica* and *Salix alba*, as follows 6,6,6,5,5 and 5, respectively.

The second insect group is the aphids (Homoptera: Aphidoidea). They feed the phloem sap containing sugars and amino acids. Majority of them lives on the shoot tip and on the underside of leaves.

On 222 ornamental tree and shrub species studied belonging to 54 plant families, a total of 183 aphid species live in Budapest. The heaviest infestations were found on maple (*Acer* spp.) and lime species (*Tilia* spp.). The predominant aphids were as follows: *Periphyllus testudinaceus* and *Periphyllus lyropictus* on Norway maple (*Acer platanoides*), *Periphyllus testudinaceus* on sycamore (*Acer pseudoplatanus*), *Periphyllus obscurus* on field maple (*Acer campestre*), *Eucallipterus tiliae* on broad-lived lime (*Tilia platyphyllos*), small-lived lime (*Tilia cordata*) and silver lime (*Tilia tomentosa*) (RIPKA et al. 1993, 1998, RIPKA 2004).

Aphis fabae, *Myzus persicae* and *Phorodon humuli* are host-alternating and virus transmitting pests. Black bean aphid (*A. fabae*) causes leaf shrivelling in spring on *Euonymus europaeus*, after migration it lives mainly on herbaceous host plants (e. g. bean, sugar beet, sunflower) belonging to different families.

Chaitophorus leucomelas, *Ch. populialbae* and the gall-forming *Pemphigus spyrothecae* on poplar species (*Populus nigra*, *P. alba*, *P. canescens*), *Aphis farinosa* and *Chaitophorus salicti* on willow species (*Salix alba*, *S. aegyptiaca*, *S. daphnoides*, *S. viminalis*), *Aphis pomi* on woody rosaceous plants (*Cotoneaster* spp., *Crataegus* spp., *Malus* spp., *Pyrus* spp., *Sorbus* spp.) are the most frequent and abundant aphids. There are aphids, which live in colonies on the inflorescences, fruits and infrutescences. *Aphis fabae* lives on inflorescence of *Yucca filamentosa* and *Hyadaphis foeniculi* on *Lonicera caprifolium*. *Aphis cytisorum* and *Aphis craccivora* live in dense colonies on pods of *Laburnum anagyroides* and *Spartium junceum*, *Robinia pseudoacacia* and *Robinia viscosa*, respectively. In April and May *Aphis catalpae* reached high population density and caused leaf deformation on common catalpa (*Catalpa bignonioides*). The largest number of aphid species were found on plants of families Rosaceae and Salicaceae, 30 and 30 species, respectively. 18 and 15 aphid species were found on families Pinaceae and Aceraceae, respectively. *Aphis fabae* and *Aphis pomi* were found on the most host plants, 62 species (31 plant families) and 19 species (1 family), respectively. The aphid infestations were heavier on the shoots and leaves of strongerly pruned and thinned trees and shrubs than unpruned trees (RIPKA et al. 1998, RIPKA 2001).

Among aphids of coniferous plants *Adelges abietis* and *Adelges viridis* on *Picea abies*, *Elatobium abietinum* and *Cinara pilicornis* on *Picea pungens*, *Cinara pinea* on *Pinus sylvestris*, *Pinus nigra* and *Pinus mugo* are remarkable.

The highest number of aphid species, 10 was found on *Betula pendula* and *Populus nigra*. Seven aphid species were found on *Persica vulgaris* and *Salix alba*.

Psyllids (Homoptera: Psylloidea) are also short-lived and host-specific insects such as aphids. They suck the plant sap and produce honeydew. *Psyllopsis fraxini* and *Psyllopsis fraxinicola* are frequent species on common ash (*Fraxinus excelsior*) and narrow-leaved ash (*Fraxinus angustifolia*). *Cacopsylla peregrina* and *Cacopsylla salicti* are not rare species on *Crataegus laevigata* and on willow species (*Salix* spp.), respectively (RIPKA 1997a).

Among plant parasitic mites, spider mites (Acari: Tetranychidae) are the most important group. Out of 19 spider mite species, two spotted spider mite (*Tetranychus urticae*) was found on 24 host plants, and caused serious damages on foliage of hackberry (*Celtis occidentalis*) and common ash (*Fraxinus excelsior*) (RIPKA 1998b). *Eotetranychus tiliarium* is the most dangerous phytophagous mite of lime trees (*Tilia* spp.) (BOZAI 1975). *Eotetranychus populi* on poplar species (*Populus* spp.), *Eotetranychus coryli* on hazel (*Corylus avellana*, *Corylus colurna*), *Schizotetranychus schizopus* on *Salix alba* caused yellowing, bronzing of leaves (RIPKA 1997b).

Damages of spider mites occurred in the second half of summer. Among flat mites (Acari: Tenuipalpidae) *Pentamerismus oregonensis* and *Pentamerismus taxi* caused yellowing and leaf fall on *Thuja* spp. and *Juniperus* spp., and *Taxus* spp., respectively (RIPKA 1998b).

Gall mites (Acari: Eriophyoidea) are the most frequent host-specific phytophagous mites on woody ornamentals. A total of 105 eriophyoid mite species were found on 91 tree and shrub species belonging to 24 families. The family Eriophyidae was found the richest in number of species. Usually they cause aesthetic, ornamental damage on the host. Among the gall-forming species, which cause gall or erineum on the leaves, flowers, fruits, buds, bark, *Eriophyes tiliae* on lime species, *Stenacis palomaris*, *Anthocoptes salicis* and *Aculus gemmarum* on willow species, *Aceria populi* on poplars, *Aceria fraxinivorus* on ash species (*Fraxinus* spp.), *Aculus hippocastani* on common horse chestnut (*Aesculus hippocastanum*) are the most widespread species. *Aculus ballei* on lime species, *Aculus mogerii* on poplar species, *Tegolophus califraxini* on ash species, *Shevtchenkella serrata* on maple species, *Tetraspinus lentus* on common lilac (*Syringa vulgaris*), *Epitrimerus trilobus* on common elder (*Sambucus nigra*) are the most frequent leaf vagrant species causing rust, silvering, bronzing, other leaf discoloration, leaf curling, and stunting of the host (RIPKA & DE LILLO 1997).

Among bugs (Hemiptera), *Corythucha ciliata* causes whitish, yellowish then brown spots on the leaves. In case of heavy injury to leaves they fall down in August. It has two generations per year and its damage is significant on several public places of Budapest (REIDER SALLY & RIPKA 1988).

Dendrothrips ornatus (Thysanoptera) feeds on the leaves of privets (*Ligustrum vulgare*, *Ligustrum ovalifolium*) and *Syringa* spp. It causes leaf deformation, silvering, early leaf dropping in unfavourable environment for host plants.

Hyphantria cunea (Lepidoptera) causes damages on leaves of white mulberry (*Morus alba*) and box elder (*Negundo aceroides*). Larvae of second generation cause severe leaf loss at the end of summer. The damages occurred in the northern, eastern and southern part of Pest, and southern part of Buda.

In the last decade horse chestnut leafminer (*Cameraria ohridella*) (Lepidoptera) has been in the focus of interests (SZABÓKY 1994). The tiny moth was delayed for several hundred years from Macedonia after the host plant introduced and spread in Central Europe. It has three generations per year. The larvae of the pest live in the leaf tissue and make mines on it. The mines are browning, the leaves are drying. Severe infestation causes early leaf fall and second blooming of the tree in August and September. During three years the pest spread in all counties of Hungary.

Dasineura gleditschiae (Diptera) came to Hungary in the early 90's of the last century. It causes pod-like galls on the leaflets of honey locust (*Gleditsia triacanthos*), and also early leaf fall (RIPKA 1996).

The first occurrences of *Pseudaulacaspis pentagona*, the following three North American pests viz. *Hyphantria cunea*, *Corythucha ciliata* and *Dasineura*

gleditchiae, and *Cameraria ohridella* were reported in the early 1920's, in 1940, 1976, 1992 and 1991, respectively. In a relatively short time they spread and became the members of the Hungarian fauna. Some of them caused sporadic mass outbreaks on their host plants. It is obvious that the invasive pest come with the neophyte host plants can cause severe infestations in their new habitat. Then the native predatory and parasitoid species find them and can control the population of the alien species. Not only phytophagous arthropods live on the woody ornamentals. A considerable number of predatory and indifferent insect and mite species can be found on them (RIPKA et al. 1997, 1999, 2002, RIPKA & KAŹMIERSKI 1998a, 1998b, RIPKA 2000a, 2000b). They play a significant role in food chain. They feed on microscopic fungi, pollen, honeydew, and become prey to predatory arthropods and vertebrates. The richness of the fauna of willow and maple species is remarkable. Of course, representatives of other arthropod groups are present on the ornamental woody plants.

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