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Entomofauna of decideous shrubs of the city of Lublin (2005-2006)

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Abstract

In years 2005-2006 in a housing estate Czechów in the city of Lublin during research conducted on hedges formed with deciduous shrubs such as privet (*Ligustrum* sp.), barberry (*Berberis* sp.), cotoneaster (*Cotoneaster* sp.) and jasmine (*Philadelphus* sp.) an insect fauna representing 8 orders and 30 families was registered. Out of the collected phytophagous insect species feeding on plant tissue dominated. Hemiptera insects from the Sternorrhyncha suborder were the most numerous (8957 specimens), while the Hymenoptera order was represented by 227 specimens. All the herbivorous insect species were distinguished due to their number, frequency of appearance and way of feeding which all made them the most important as pests causing harm to plants. On barberry *Lisomaphis berberidis* and hymenopteron of the Argidae family had most impact. On *Cotoneaster* sp. during the two years of research numerous presence of phytophags of two orders, Hemiptera (*Aphis pomi*) and Lepidoptera was confirmed. On *Ligustrum* sp. the representatives of orders: Hemiptera and suborder Sternorrhyncha, Hymenoptera and Coleoptera were considered to be most numerous. Of all the collected specimens *Macrophya punctumalbum* and the representative of Coleoptera from the family Curculionidae – *Otiorrhynchus rotundatus* were distinguished due to its number and frequency. On hedges formed from the *Philadelphus* sp. only *Aphis fabae* was distingui-

shed because of its number. Analysing the composition of the entomofauna of hedges one's attention is caught by a large number of zoophagous insects. The representatives of 6 orders and 13 families were registered. A group of predatory insects, the number of which amounted to 881 specimens, was most numerous. Out of those cockhafers of the Coccinellidae family dominated; they are associated with hemipterous insects of the Aphididae family which were numerous on plants.

Introduction

Hedges are an incredibly important and underestimated spatial element of landscape inextricably linked with urban green spaces. They may be formed almost out of all trees and shrubs, both deciduous and coniferous. Their basic function is decorativeness, formation of tight fences, isolation from noise, wind and air pollution or division of land (http://www.iglak.pl/zywoplot.htm). Hedges which are a constituent part of urban structures and they establish a specific habitat for insects. However, plants growing in tight compositions make it more difficult to take care of them.

When analyzing the accessible publications on the theme, one can conclude that not much has been researched with respect to entomofauna on hedges in urban spaces in particular (Gantner, 2000; Jaśkiewicz, 2004; Jaśkiewicz *et al.*, 2001; Wiech, 1998, 2002). One can find little published information concerning the selected insect species that occur on hedges formed out of deciduous shrubs (Brewer & Skuhravy, 1980; Brewer *et al.*, 1984; Gantner, 2000; Klimaszewski, 1973; Pyenson, 1946; Vondracek, 1957; Wiech, 1993; 1994; 1998; 2002) and their natural enemies (Gantner, 2000; Wiech, 2002) The data concerning the protection of decorative deciduous shrubs is to be found in a publication by Łabanowski (2000), which provides information about harmfulness, biology and treatment of pests.

The aim of this paper was to present and compare the insect fauna which occurs on trimmed hedges formed out of deciduous shrubs: barberry (*Berberis* sp.), cotoneaster (*Cotoneaster* sp.), privet (*Ligustrum* sp.) and jasmine (*Philadelphus* sp.) which are part of urban green areas of the city of Lublin. Special attention was given in the paper to phytophagous species which can be distinguished on the observed plants in terms of numbers and frequency.

Material and methods

The observation was carried out since May 2005 until the end of September 2006, in a housing estate Czechów situated in the north-western part of Lublin (UTM FB08). The insects were observed on four types of deciduous shrubs: barberry (*Berberis* sp.), cotoneaster (*Cotoneaster* sp.), privet (*Ligustrum* sp.)

and jasmine (*Philadelphus* sp.) These plants underwent a systematic care treatment (trimming) by a specially designated local urban service. Trimming took place at least twice a year (in the beginning of summer and in autumn), a given year's shoots were shortened by 10 cm.

Research material was collected on 4 sites located in the housing estate of Czechów every 7-10 days using a sweep net. Three one-meter-long parts were selected on each kind of hedge for observation. Each time insects were collected with 25-30 sweeps of the net. Additionally, leaves and wooden parts of the hedges were searched through and insects at different developmental stages were collected into a test-tube. The kind of damage they caused and frequency in which they occurred was recorded. In case of larval stages of the following orders: Lepidoptera, Hymenoptera, Coleoptera, a rearing was carried out on Petrie's dishes which were looked through every 2 days, larvae were fed with fresh leaves and care treatment was done.

Results

Quantative analysis

During the two years of research on deciduous shrubs in the city of Lublin 10818 insect specimens from 8 orders and 30 families were collected. In both years the insect species registered on the observed plants appeared in a similar species composition, though hemipterous insects from the suborder Sternorrhyncha were slightly more numerous in 2006. Phytophagous species which fed on plant tissues dominated among the colleted insects, amounting to 9793 specimens. Hemiptera from suborder Sternorrhyncha were most numerous (8957 specimens), mostly the Alphididae family (8717 specimens). The next order with respect to the number were hymenopterons (Hymenoptera) represented by 360 specimens. Coleopterons (Celeoptera) were also numerous (227 specimens). Insects with other feeding preferences (zoophagous) were less numerous (1025 specimens).

Phytophagous

During the research phytophagous of 5 orders and 14 families were registered on all the observed plants.

Analysing the herbivorous entomofauna on individual shrubs it was found out that it was most numerous on jasmine (2670 specimens). The largest fauna diversity was observed on *Cotoneaster* sp., where representatives of 5 orders and 10 families were recorded. The least diversified insect fauna was observed on *Philadelphus* sp., in which the representatives of only 3 orders of insects were registered (Tab. 1).

On the remaining hedges: *Berberis* sp., *Cotoneaster* sp. and *Ligustrum* sp. phytophags were present in a similar number amounting to respectively 2339, 2305 and 2479 specimens. Aphids were registered to be the most numerous of all the insects on all the plants under observation. During the research on barberry the Aphididae family of the Hemiptera order, Sternorrhyncha subfamily was observed to be the most numerous (2165). The second in terms of number was Hymenoptera order (75 specimens) represented mainly by the Argidae family (72 specimens).

Also on cotoneaster, hemipterous insects of the Aphididae family were numerous (2104) followed by insects of the Lepidoptera order, the Tortricidae family (60 specimens).

On privet the Aphididae family was abundant (2168) followed by a group of herbivorous hymenopterons from the Tenthredinidae family the tenthredinids (120 specimens). Beetles of the Curculionidae (80 specimens) were also numerous.

On *Philadelphus* sp. the Aphididae family was distinguished by its number (2280) and the representatives of superfamily Psylloidea 240 specimens. The remaining groups of phytophagous insects were observed on jasmine in small numbers (Tab. 1).

Table 1. Representatives of phytophagous group collected from observed deciduous hedges in Lublin (2005-2006)

Order/suborder		Family	Number of specimens			
			Berberis sp.	***Cotoneaster* sp.**	***Ligustrum* sp.**	***Philadelphus* sp.**
Lepidoptera		Tortricidae	18	60	78	3
Hymenoptera		Argidae	72	6	–	–
		Tenthredinidae	3	–	120	–
Coleoptera		Chrysomelidae	–	6	12	6
		Curculionidae	6	42	80	40
		Elateridae	–	6	–	35
Orthoptera		Tettigoniidae	–	3	–	–
Hemiptera	Heteroptera	Miridae	36	30	–	36
		Pentatomidae	18	18	–	36
		Pyrrhocoridae	–	–	2	–
	Sternorrhyncha	Aphididae	2165	2104	2168	2280
		Psylloidea	–	–	–	240
	Auchenorrhyncha	Cicadellidae	21	30	15	–
		Aphrophoridae	–	–	6	–
Total			**2339**	**2305**	**2479**	**2670**

Qualitative analysis

Herbivorous species, which were distinguished out of phytophagous insects, were considered special with respect to their number and frequency (Tab. 2).

On barberry aphid *Liosomaphis berberidis* and hymenopteron of the Argidae family – *Arge berberis* were registered to be most numerous. The former species was recorded on all the research sites. The appearance of this aphid species on plants took place between April and May. Aphids settled along the vein on the bottom side of the leaf, and then on top plant parts, flowers and leaves. The species' maximum population number was arrived at in both years of the research since the third decade of June until the beginning of July. The laying of overwintering eggs was begun in mid-September. This species was likely to settle top shots causing discoloring and drying out of leaves as well as hampering of shoot growth. Aphids excreted sticky honey dew on which sooty fungi developed. The number of *A. berberidis* as registered on barberry was 72 which was estimated to amount to a 50% frequency (Tab. 2). The feeding larvae of this species were observed to occur twice: in May and in June, the second generation in August and September. Adults of the first generation were caught as soon as the second half of May, whereas the second generation since the second decade of July until the beginning of September. Harmfulness of this species comprises eating out leaf ridges, mostly between its nerves, leading to complete damage of plants.

Numerous phytophags of two orders: Hemiptera and Lepidoptera were registered to occur on *Cotoneaster* sp. shrubs during the two years of the research (Tab. 1). Apple aphid (*Aphis pomi*) was the most numerous (1540 specimens) and it was registered to occur on all the shrubs. Aphid colonies were appearing on plants since the end of the third decade of April and the maximum number was reached between the second half of May and the first decade of June. The specimens of this species were observed on these since the beginning of October. *Aphis fabae* Scop. was the second species of the Aphididae family that occurred on cotoneasters in Lublin. It was registered in a much smaller number and only in one site (Tab. 2). Both species suck sup out of young leaves and shoots, they may also feed on generative parts, settling top parts of plants or even the entire plants. Feeding grounds of caterpillar of the Tortricidae family were observed in more than half of the research sites. In total 60 specimens of this family were collected on cotoneasters (Tab. 2). Butterfly caterpillars of the Torticidae family feed on cocoon, usually top leaves biting out their tissues. These larvae may be observed on plants since the second decade of May until the beginning of July.

Table 2. Selected species of phytophagous on observed deciduous hedges in Lublin (2005-2006)

Hostplants	Order/suborder	Family	Species	Number of individuals	Frequency (%)
Berberis sp.	Hemiptera/ Sternorrhyncha	Aphididae	*Liosomaphis berberidis* (Kaltenbach)	2165	100
	Hymenoptera	Argididae	*Arge berberidis* Schrank	72	49.5
Cotoneaster sp.	Hemiptera/ Sternorrhyncha	Aphididae	*Aphis pomi* de Geer	1540	100
			Aphis fabae Scopoli	564	10.3
	Lepidoptera	Tortricidae	–	60	51
Ligustrum sp.	Hemiptera/ Sternorrhyncha	Aphididae	*Myzodes ligustri* Mosley	2168	100
	Hymenoptera	Tenthredinidae	*Macrophya punctumalbum* (L.)	120	81
	Coleoptera	Curculionidae	*Otiorrhynchus rotundatus* Sieb.	60	70
Philadelphus sp.	Hemiptera/ Sternorrhyncha	Aphididae	*Aphis fabae* Scopoli	2280	100

On *Ligustrum* sp. (Tab. 2) the representatives of the order Hemiptera and suborder Sternorrhyncha Hymenoptera and Coleoptera were the species that were most numerous and frequently observed in the research sites. Out of the collected specimens of these orders Myzodes ligustri of the Aphididae family was the most numerous and was registered in all research sites. *M. ligustri* was registered on plants until the end of May. Tiny specimens of this species settled on the bottom part of leaves and their feeding caused rolling of leaf ridges along the middle vein. A large number of *M. ligustri* colonies significantly lowered the plants' aesthetics. Sawfly (*Macrophya punctumalbum* L.) was another species which because of its number and frequency caused visible changes in the plants' appearance with its feeding. Larvae of this hymenopteron initially sceletonize leaves and then bore out irregular holes in them. Scraping off the leaves' skin and their parenchyma by adults of sawfly was also observed. The pest was also recorded on plants amounting to more than an 80% frequency (Tab. 2).

Adults were present on plants since the end of May until the third decade of June, though larval stages were observed throughout the whole of July and August. Another species connected with privet was the representative of Coleoptera from Curculionidae *Otiorrhynchus rotundatus* Sieb. The species was present on plants since the second half of May until the end of September. Leaf damage was caused by the feeding of cockchafers which resulted in irregular feeds usually at ridges of leaf blade often reaching deep nearly up to the main leaf vein. Leaves damaged to such an extent were left on plants until late autumn affecting the decorative value of hedges.

The black bean aphid (*Aphis fabae*) was distinguished in terms of its number on *Philadelphus* sp. (Tab. 2). This species was recorded on all the observed plants. It settled the youngest shoots feeding mostly on the lower side of leaf blades. Plants settled in this way reacted by twisting and bending of the leaves. Aphids were observed on mock-orange since the beginning of May until around mid-August.

Zoophagous

When analyzing the composition of entomofauna on hedges one can notice a large number of insects which are considered to belong to other trophic groups, mainly zoophags. Out of those, the representatives of 6 orders and 13 families can be distinguished. Predatory insects of the following orders were registered: Diptera: Syrphidae i Asilidae, Coleoptera: Cantharidae, Coccilnellidae and suborder Heteroptera: Anthocoridae, Nabidae, Reduviidae, Neuroptera: Chrysopidae; Dermaptera: Forficulidae.

Out of parasitoids mostly representatives of the following orders were distinguished: Hymenoptera: Aphelinidae, Aphidiidae, Braconidae, Ichneumonidae and Diptera: Tachnidae. The group of predators was most numerous amounting to 881 specimens in total. Among them dominated coleopterons of the Coccinellidae family, connected with hemipterous insects of the Aphididae family, which were numerous on the observed plants (Tab. 3).

Table 3. Number of zoophagous insects collected from the observed deciduous shrubs in Lublin (2005-2006)

Order/suborder		Family	Number of specimens			
			***Berberis* sp.**	***Cotoneaster* sp.**	***Ligustrum* sp.**	***Philadelphus* sp.**
Diptera		Asilidae	–	6	3	–
		Syrphidae	12	6	12	–
		Tachnidae	–	–	24	–
Hymenoptera		Aphelinidae	1	–	3	–
		Aphidiidae	18	–	51	–
		Braconidae	6	15	150	–
		Ichneumonidae	6	–	–	3
Coleoptera		Coccinellidae	64	174	48	192
		Cantharidae	54	24	24	64
Neuroptera		Chrysopidae	12	30	12	36
Dermaptera		Forficulidae	–	27	–	30
Hemiptera	Heteroptera	Anthocoridae	--		**6**	–
		Nabidae	–	–	12	6
		Reduviidae	6	18	–	3
Total			128	297	324	276

Discussion

In 2005-2006 at a housing estate Czechów in the city of Lublin during research on deciduous shrubs: privet (*Ligustrum* sp.), barberry (*Berberis* sp.), cotoneaster (*Cotoneaster* sp.) and jasmine (*Philadelphus* sp.) an insect fauna representing 8 orders and 30 families was recorded. Out of the above hedge species growing in Poland's climate conditions, Łabanowski (2000).

Distinguishes species belonging to 5 orders and 11 families. In Lublin most insects were settling hedges formed with jasmine, though fewer settled on cotoneaster. According to some references, most damage also on jasmine was caused by aphids and tortricids (Łabanowski, 2000). Also in the presented research on *Philadelphus* sp. insects from the Ahididea family were most numerous as their amount constituted almost half of the specimens collected on this plant species. However, during the two years of research only three caterpillars of the Tortricidae family were collected on jasmine. According to Łabanowski (2000) harmful insects belonging to 5 orders (Hemiptera, Thysanoptera, Lepidoptera, Hymenoptera, Coleoptera) and 6 families are registered on *Ligustrum* sp. In the author's own research carried out in the urban zone on privet the presence of insects from 4 orders and 8 families was recorded on this plants, though the representatives of the Aphididae family were most numerous. According to different authors (Jaśkiewicz, 2004; Jaśkiewicz *et al.*, 2001; Łabanowski *et al.*, 2000; Wiech, 1998) aphids belong to the most harmful and most commonly present insect species on hedges formed from the deciduous plants. Their feeding lowers the decorative and health value of the plants (Jaśkiewicz *et al.*, 2001). Also Wiech (1998) in his research carried out in the city of Kraków on privet hedges mentions aphids as one of the most commonly observed species. They caused bending of leaf blade ridges and in the case of their mass appearance leaves yellowed and fell down. In the city of Lublin hymenopterons from the suborder Symphyta, the family Argididae and Tenthredinidae were numerous on *Berberis* sp. and *Ligustrum* sp., respectively. On hedges formed from *Ligustrum* sp. a species from the family Tetredinidae: *Macrophya punctumalbum* (L.) was numerous. *M. punctumalbum* is considered to belong to pests of plants usually grown in parks, mainly trees and shrubs from the Oleaceae family, it may be found in large numbers leading to a decrease in urban plants decorativeness (Piekarska-Boniecka *et al.*, 2008). The presence of this species was also recorded on *Syringa* sp. and *Ligustrum* sp. in a nursery of young trees (Łabanowski *et al.*, 2000). On deciduous shrubs in Lublin also the representatives of coleopterons from the family Curculionidae, *Otiorhynchus* rotundatus were recorded in large numbers. Łabanowski *et al.* (2000) and Wiech (1998) claim it to be a harmful species which is commonly registered on privets. In Kraków *Otiorhynchus* sp. and tortricids were distinguished due to their numbers (Wiech, 1998). According to him the feeding of

O. rotundatus spreads across the period from May to October and usually takes place on the bottom leaves of plants, thus trimming and formation of privet hedges is not limited to the pest number. During his observations he also observed numerous caterpillars of leaf tortricid. In Lublin their number was close to that of *O. rotundatus*. However, probably due to the trimming of plants no damage caused by these insects was observed. Also WIECH (1998) concludes that hedge trimming may control the number of species of this family. Similar results were obtained by GANTNER (2000) in a research conducted in Lublin on a population of butterflies from the Tortricidae family which were recorded on *Prunus cerasifera*. To limit the number of tortricids it is advised to trim hedge shoots by mid-May at the latest, prior to the start of flight of adult butterflies. In 2005-2006 in the city of Lublin, exertions of cultivation were observed to influence the number of little mobile insects mainly from the Hemiptera order and Sternorrhyncha suborder and Lepidoptera (Tortricidae) order. Insects gathered mostly on young, top parts of shoots and leaves of plants which were removed during the seasonal trimming of hedges. If trimming of top shoots was not cared for the number of these insects would have been much higher.

In the presented research on deciduous shrubs one could observe a large number of zoophagous insects of the following orders: Diptera, Hymenoptera, Coleoptera, Neuroptera, Dermaptera and suborder Heteroptera. Their presence on particular plants was related with the presence of phytophagous insects which served as their nutrient. The research concerning parasitic insects on larvae and pupas of tortricids which were present on hedges of *Prunus cerasifera* pointed out to the presence of dipterons of the Tachnidae family and hymenopterons of the Ichneumonidae family (GANTNER, 2000). WIECH & PNIAK (2002) as a result of rearing obtained parasitic insects of the following families Tachnidae, Ichneumonidae, Braconidae i Chalcididae. The representatives of these families were recorded also in the present research. Predatory and parasitic insects associated trophically with aphids (such as: Coccinellidae, Aphidiidae, Cantharidae) were particularly numerous.

Summary

1. In years 2005-2006 insects of 8 orders and 30 families were registered on four genera of deciduous shrubs: privet (*Ligustrum* sp.), barberry (*Berberis* sp.), jasmine (*Philadelphus* sp.) and cotoneaster (*Cotoneaster* sp.). The most numerous and the most frequently present ones were Hemiptera of suborder Sternorrhyncha, mainly the Aphididae family.
2. Out of phytophagous insects the herbivorous species were distinguished by their number and frequency of appearance. All these species are considered to belong to a harmful entomofauna of the discussed species of deciduous shrubs.

3. High percentage of zoophagous insects was registered including the following orders: Diptera, Hymenoptera, Coleoptera, Neuroptera, Dermaptera and suborder Heteroptera. Predatory and parasitic groups of trophic insects associated with aphids which are present on shrubs in a large number (i.e. Coccinellidae, Aphidiidae, Cantharidae) were recorded.

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Entomofauna krzewów liściastych Lublina (2005-2006)

Streszczenie

W latach 2005-2006 na Osiedlu Mieszkaniowym Czechów w Lublinie w czasie badań prowadzonych na żywopłotach formowanych z krzewów liściastych: ligustru (*Ligustrum* sp.), berberysu (*Berberis* sp.), irgi (*Cotoneaster* sp.) oraz jaśminowca (*Philadelphus* sp.) zanotowano faunę owadów reprezentującą 8 rzędów i 30 rodzin. Wśród zebranych owadów przeważały gatunki fitofagiczne, odżywiające się tkankami roślinnymi. Najliczniej reprezentowane były pluskwiaki (Hemiptera) z podrzędu Sternorrhyncha (8957 osobników), rząd Hymenoptera reprezentowany przez 360 osobników. Równie licznie wystąpiły chrząszcze (Coleoptera) (227 osobników). Wśród owadów wyodrębniono gatunki roślinożerne, które ze względu na ich liczebność, frekwencję oraz sposób żerowania odgrywały największą rolę pod względem szkodliwości na roślinach. Na berberysie największe znaczenie miała mszyca kwaśnicowa (*Lisomaphis berberidis*) oraz błonkówka z rodziny obnażaczowatych – *Arge berberis* Schrank, 1802. Na *Cotoneaster* sp. w ciągu dwóch lat badań stwierdzono liczne występowanie fitofagów należących do dwóch rzędów: Hemiptera (*Aphis pomi*) oraz Lepidoptera. Na *Ligustrum* sp. najliczniej obserwowano przedstawicieli rzędów: Hemiptera i podrzędu Sternorrhyncha, Hymenoptera oraz Coleoptera. Wśród zebranych osobników liczebnością i frekwencją wyróżniała się *Macrophya punctumalbum* i przedstawiciel rzędu Coleoptera z rodziny Curculionidae – *Otiorrhynchus rotundatus*. Na żywopłotach formowanych z *Philadelphus* sp. swoją liczebnością wyróżniała się jedynie mszyca burakowa (*Aphis fabae*). Analizując skład entomofauny upraw żywopłotowych zwraca uwagę duża liczba owadów zoofagicznych. Wyodrębniono przedstawicieli 6 rzędów i 13 rodzin Najliczniej reprezentowana była grupa drapieżców, której liczebność ogółem wyniosła 881 osobników. Wśród nich przeważały chrząszcze z rodziny Coccinellidae, związane z licznie występującymi na obserwowanych roślinach pluskwiakami z rodziny Aphididae.