APHIDS AND OTHER HEMIPTEROUS INSECTS | VOL.18 (2012) 57–69

Arthropods on rose bushes in the Botanical Garden of UMCS (Maria Curie-Skłodowska University) in Lublin (South-Eastern Poland)

Magdalena Lubiarz[1], Marek Solski[2]

Departament of Nature Preservation[1],
Departament of Plant and Landscape Protection[2]
The John Paul II Catholic University of Lublin
ul. Konstantynów 1H, 20-708 Lublin, Poland
lubiarz@kul.pl[1], msolski@kul.pl[2]

ABSTRACT

The paper presents results of observation regarding the occurrence of arthropods on three rose bush species: *Rosa rugosa*, *Rosa* x*damascena* and *Rosa canina*. According to the conducted research, the most numerous group was that of herbivorous arthropods, mainly those with piercing-sucking mouthparts. The most abundant among the herbivores were the Arthropoda representing the family Aphididae and the Acari belonging to the family Tetranychidae. Among the predatory and parasitic Arthropoda, dominating groups included the Acari of the Phytoseiidae family and beetles of the Coccinellidae family. The arthropods feeding on mixed nutrients were few; the group was represented only by the Psocoptera and the Acari of the Tydeidae family.

KEY WORDS: arthropods, trophic groups, rose shrub, *Rosa rugosa*, *Rosa* x*damascena, Rosa canina*

INTRODUCTION

The aim of the study was to identify the species composition of arthropods occurring on three rose bush species: *Rosa rugosa* Thung., *Rosa* x*damascena* Mill. and *Rosa canina* L. in the collection of the Botanical Garden of UMCS in Lublin. Out of the studied species only *R. canina* is native to Poland, and the other

two originate from Asia, however, they have been cultivated for a long time in our country (Gałczyński, 1927; Rutkowski, 2007; Popek, 2007). *R.* x*damascena* has been cultivated for quite a long time as a park rose but is presently becoming less and less frequent, while *R. rugosa* is still very popular in parks, gardens and as an element of urban greenery (Ciesielski, 2005).

The studies of arthropods inhabiting rose plants usually focus on the occurrence of aphids on these plants. In Lublin, such studies have been conducted by Kmieć (2006, 2007), Jaśkiewicz (2004, 2005ab, 2006) and Jaśkiewicz & Kmieć (2005). Cichocka & Jaśkiewicz (2003) have provided data regarding the occurrence of aphids on rose plants in Lublin Voivodeship and Mazovia across many years, whereas in Kraków Wnuk (2001) has conducted a study focusing on the occurrence of *Syrphidae* in the colonies of *Macrosiphum rosae* (Linnaeus 1758).

MATERIAL AND METHODS

In the Botanical Garden of UMCS in Lublin 3-5 bushes of each rose species were selected. From each bush 5 shoots with leaves were collected (100 in total), as well as buds, flowers and fruit. Samples were collected at ca. 14-day intervals during the period from April until the first decade of November. Samplings took place in the years 2002-2004. In total, samples were collected from the selected rose plants in 46 series: 15 series in 2002, 15 in 2003 and 16 in 2004, respectively. The collected material was studied under the microscope, being counted and identified with respect to species and higher taxa. The arthropods were identified according to the following keys: Blackman & Eastop (2000), Wojdyła *et al.* (2002) Kropczyńska-Linkiewicz (2001), Kropczyńska (1999), Martini (1975). Names of the arthropods were quoted after Fauna Europaea (2011).

For the purposes of the study, the identified arthropods were divided into groups according to their trophic preferences. The following trophic groups were distinguished: herbivorous, predatory and parasitic, and those which showed mixed trophic preferences. Herbivorous arthropods were further divided with respect to the types of their mouthparts (biting or piercing-sucking), since the manner of acquiring nutrition had a considerable influence on the condition of host plants.

RESULTS AND DISCUSSION

In the course of the present study the total number of 42478 specimens was collected. Percentage shares of arthropods representing particular trophic groups (piercing-sucking herbivores, biting herbivores, predators and parasites, and those feeding on mixed nutrients) are shown in Figure 1. It can be observed that herbivo-

rous arthropods have been the most abundant on the studied rose plants. Similarly, while conducting the study on hawthorn fauna in Warsaw and Gdańsk, Tykarska (2002) observed that phytophages were the most numerous group. The occurrence of arthropods on different species of roses shows Table 1.

Table 1. The occurrence of arthropods on each species of roses

	Rosa rugosa	***Rosa xdamascena***	***Rosa canina***
herbivorous arthropods			
Tetranychidae			
Tetranychus urticae	+	+	+
Amphitetranychus viennensis	+	-	+
Panonychus ulmi	+	+	+
Aphididae			
Chaetosiphon tetrarhodum	+	+	+
Longicaudus trirhodus	+	-	+
Macrosiphum rosae	+	+	+
Metopolophium dirhodum	+	+	+
Myzaphis rosarum	+	-	-
Cicadellidae			
Edwardsiana rosae	-	+	+
Thysanoptera	+	+	+
Heteroptera	+	+	+
Tenthredinidae	+	+	+
Elateridae	+	+	+
Curculionoidea	+	-	-
Tortricidae	+	+	+
Geometridae	+	-	+
Cecidomyiidae	-	+	+
predatory and parasitic arthropods			
Phytoseiidae	+	+	+
Coccinellidae	+	+	+
Araneae	+	+	+
Raphidioptera	+	-	-
Formicidae	+	+	+
Syrphidae	+	+	+
Aphidiinae	+	+	+
arthropods feeding on mixed nutrients			
Psocoptera	+	+	+
Tydeidae	+	-	+

\+ prasence
\- absence

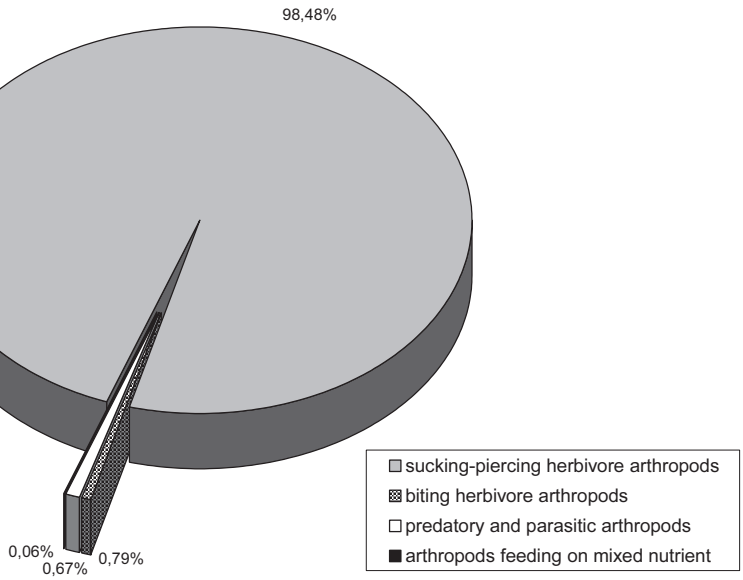

Figure 1. Percentage shares of particular trophic groups on the studied rose bushes

Herbivorous arthropods

In the present study the most numerous group was that of herbivorous arthropods with piercing-sucking mouthparts: they constituted 98.48% of the collected material. Studying hawthorns, Tykarska (2002), Mackoś (2010), Mackoś-Iwaszko (2012) had also observed a similar domination of piercing-sucking phytophages. The most numerous herbivores with piercing-sucking mouthparts included the Acari of the family Tetranychidae (Acari, Prostigmata) and aphids of the family Aphididae (Hemiptera: Sternorrhyncha). Percentage shares of the most numerous herbivorous arthropods with piercing-sucking mouthparts on particular rose plant species are shown in Figures 2 and 3.

During three years of research 23122 representatives of the Tetranychidae were collected. Among spider mites the following species were identified: *Tetranychus urticae* Koch 1836, *Amphitetranychus viennensis* (Zacher 1920), and *Panonychus ulmi* (Koch 1836). *T. urticae* was a dominating species, whereas the remaining two were recorded only sporadically. Spider mites inhabited the undersides of leaves, forming colonies surrounded by a protective silk side. The feeding of spider mites on the plants resulted in the appearance of small, yellow spots on the surfaces of leaves; if the spider mites were abundant, leaves yellowed and their edges dried out, and finally they were shed. Apart from spider mites, another, equally numerous group of arthropods were aphids. During three years of research 18422 individuals were collected, belonging to 5 species: *Chaetosiphon*

tetrarhodum (Walker 1849), *Longicaudus trirhodus* (Walker 1849), *Macrosiphum rosae* (Linnaeus 1758), *Metopolophium dirhodum* (Walker 1849), and *Myzaphis rosarum* (Kaltenbach 1843). In the study by Cichocka & Jaśkiewicz (2003) as many as 9 aphid species were identified on rose plants, but the study included also decorative roses (*Rosa* hort.) and roses cultivated in greenhouses. On *Rosa muliflora* Thnub., *Rosa rugosa*, *Rosa* 'Grandhotel' and border roses, Jaśkiewicz (2005a) identified the following aphid species: *Aphis fabae* Scopoli 1763, *Aulacorthum* sp., *Eucallipterus tiliae* (Linnaeus 1758), *Ch. tetrarhodum*, *L. trirhodus*, *Macrosiphum euphorbiae* (Thomas 1878), *M. rosae*, *Maculolachnus submacula* (Walker 1848), *M. dirhodum*, and *M. rosarum*. The same rose plants were studied by Kmieć (2006, 2007), who investigated the dynamics of abundance of *M. dirhodum* and *M. rosae,* and by Jaśkiewicz & Kmieć (2005), who investigated the dynamics of abundance of *Ch. tetrarchodum*. Furthermore, on *R. canina* Jaśkiewicz (2000, 2004) identified such species as: *A. fabae, Ch. tetrarhodum, L. trirhodus*, *M. euphorbiae*, *M. rosae*, *M. submacula*, *M. dirhodum* and *M. rosarum*. In the present study, the dominating species on all studied rose plants was *M. rosae*, with 13122 specimens collected in three years. The same species was also featured as a dominating one in studies by Cichocka & Jaśkiewicz (2003) and Jaśkiewicz (2000, 2004). In the course of the study the presence of *M. rosarum* and *L. trirhodus* was not recorded on *Rosa* x*damascena*, whereas the only species unrecorded on *Rosa canina* was *M. rosarum*. Aphids inhabited the undersides of leaf blades, shoot tips and flower buds. *M. rosae* developed large, compact colonies on green shoots, especially on their tips, as well as on the undersides of leaves and on flower buds. *Ch. tetrarhodum* was encountered on the undersides of leaves and on flower buds. The remaining aphid species inhabited the undersides of leaves. Some individuals of the species *L. trirhodus* were found in the colonies of *M. rosae*. Mixed colonies were often developed also by *Ch. tetrarhodum* and *M. rosarum. M. dirhodum* developed one-species-only colonies.

Another herbivore with piercing-sucking mouthparts that ought to be mentioned is the representative of the family Cicadellidae (Hemiptera: Cicadomorpha), i.e. *Edwardsiana rosae* (Linnaeus 1758), which was encountered only on *Rosa* x*damascena* and *Rosa canina*. Despite not being very abundant it caused serious damage to the studied rose plants. Its feeding on the plants resulted in the appearance of characteristic white spots on a leaf surface, first along the midrib and then merging to form large white patches. Furthermore, individual representatives of the Thysanoptera and the Heteroptera were identified on the studied rose plants.

Herbivorous arthropods with biting mouthparts were not very numerous and constituted merely 0.79% of the total amount of collected specimens. The most frequently encountered were larvae of the Hymenoptera, representing the family Tenthredinidae, which were found on all rose plant species in the total number of 238. Among them dominated the species *Arge pagana* (Panzer 1798) and species

representing the genus *Allantus* sp., mainly *Allantus cinctus* (Linnaeus 1758). The larvae of *A. pagana* gradually ate up whole leaves beginning from the edge of a leaf blade; if the feeding was intense all that was left of a leaf was its midrib. Young larvae of *Allantus* sp. fed on the undersides of leaves pulverizing the mesophyll and leaving out the upper epidermis. Then they were biting out irregular, oblong holes between leaf veins. Other representatives of the family Tenthredinidae included individual larvae of *Caliroa* sp., and in 2004 several larvae of *Ardis pallipes* (Serville 1823) were observed on *Rosa canina*. Other herbivorous arthropods with biting mouthparts occurred individually and represented the following taxa: Coleoptera: Elateridae, Curculionoidea, Lepidoptera: Tortricidae, Geometridae and Diptera: Cecidomyiidae.

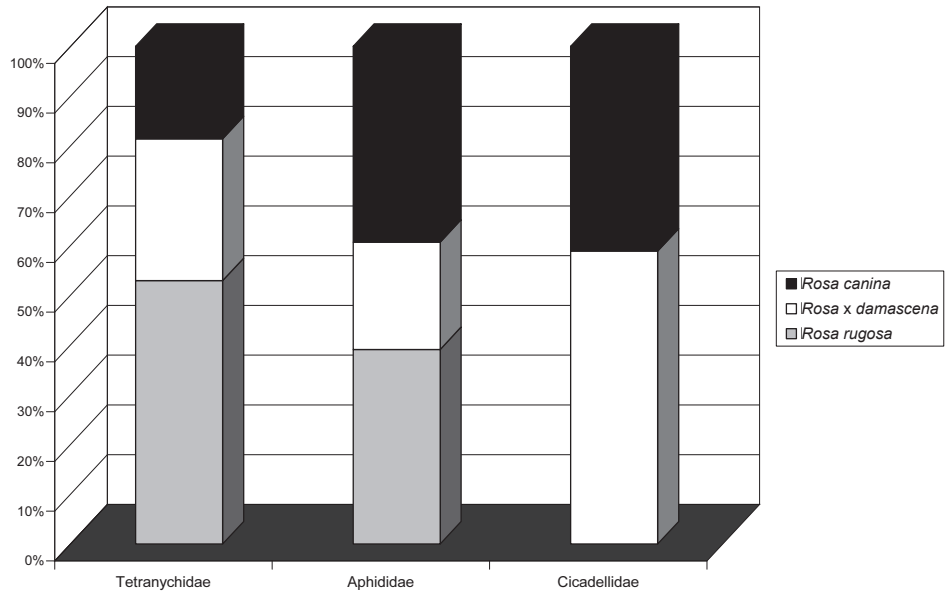

Figure 2. Percentage shares of the most numerous herbivorous arthropods with piercing-sucking mouthparts on the studied rose bush species

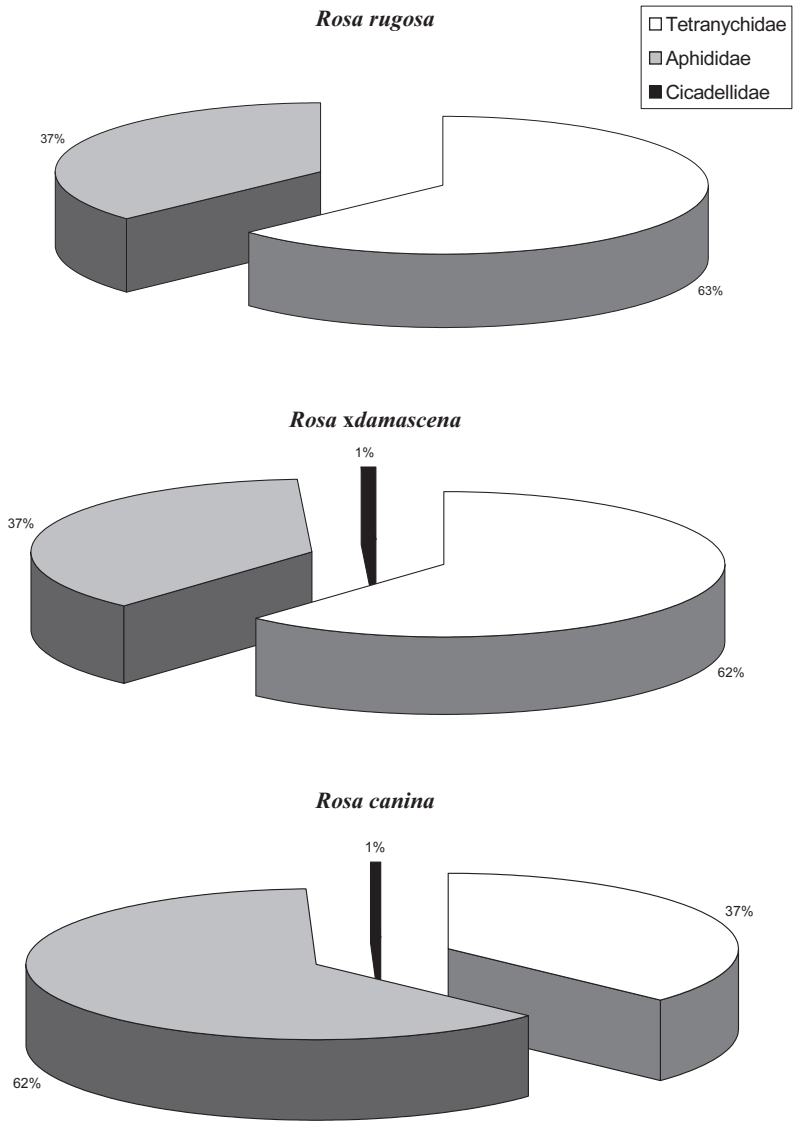

Figure 3. Percentage shares of the most numerous herbivorous arthropods with piercing-sucking mouthparts on particular rose bush species

Predatory and parasitic arthropods

Predatory and parasitic arthropods constituted 0.67% of the total collected material (Figure 1). The most abundant predators on the studied rose plants were the Acari from the family Phytoseiidae, with the total number of 93 specimens col-

lected. The family Coccinellidae was represented by 54 adult individuals and 14 larvae. The results were similar to those of Mackoś (2010), who observed that the Phytoseiidae and the Coccinellidae were dominating predators on *Tilia cordata*. According to Czechowska *et al*. (1979), among predatory arthropods the Coccinellidae were the least sensitive to urban pressure. Similarly, Sahajdak *et al.* (1995) observed no negative influence of environmental degradation on the predatory Acari from the family Phytoseiidae. Furthermore, in the course of the present study there were encountered individual spiders representing the Araneae, adult representatives of the Raphidioptera and the Formicidae, as well as larvae of flies representing the family Syrphidae. Percentage shares of predatory and parasitic arthropods on the studied rose plants are shown in Figure 3. The Phytoseiidae were found on the undersides of leaves, where they accompanied spider mites. The Coccinellidae and the Syrphidae were found in the colonies of all aphid species, mainly *M. rosae*. Spiders built webs on shoots and leaves of the rose plants. Aphids, especially the colonies of *Ch. tetrarhodum*, were visited by ants. Some aphids were attacked by the Hymenoptera belonging to the Braconidae: Aphidiinae (i.a. *Aphidius* sp. and *Ephedrus* sp.). During three years of the study, 51 aphid mummies were collected. Furthermore, in 2004 there was observed the infection of an aphid colony with parasitic fungi. The most affected aphid species was *Ch. tetrarchodum*. Sometimes even 100% of individuals representing the species were infected with the fungi.

Percentage shares of particular taxa of predatory and parasitic arthropods on the studied rose bushes are shown in Figures 4 and 5.

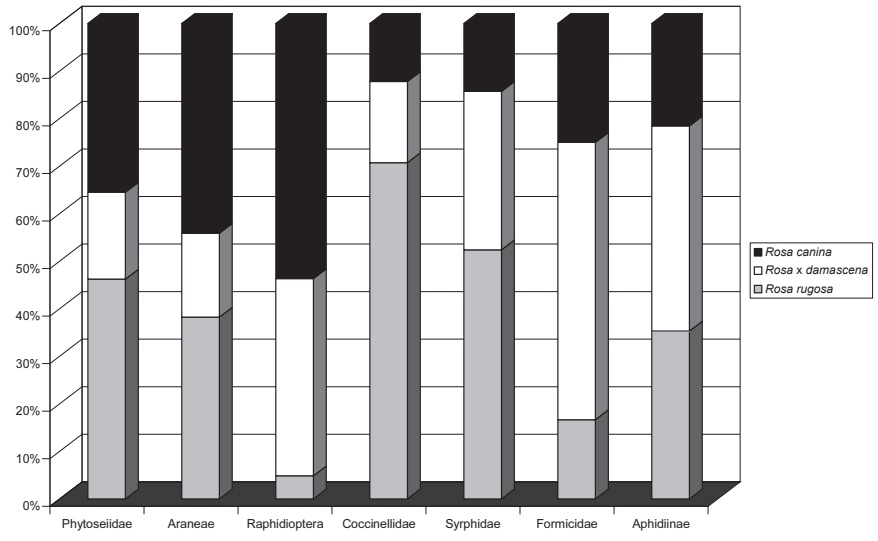

Figure 4. Percentage shares of particular taxa of predatory and parasitic arthropods on the studied rose bushes

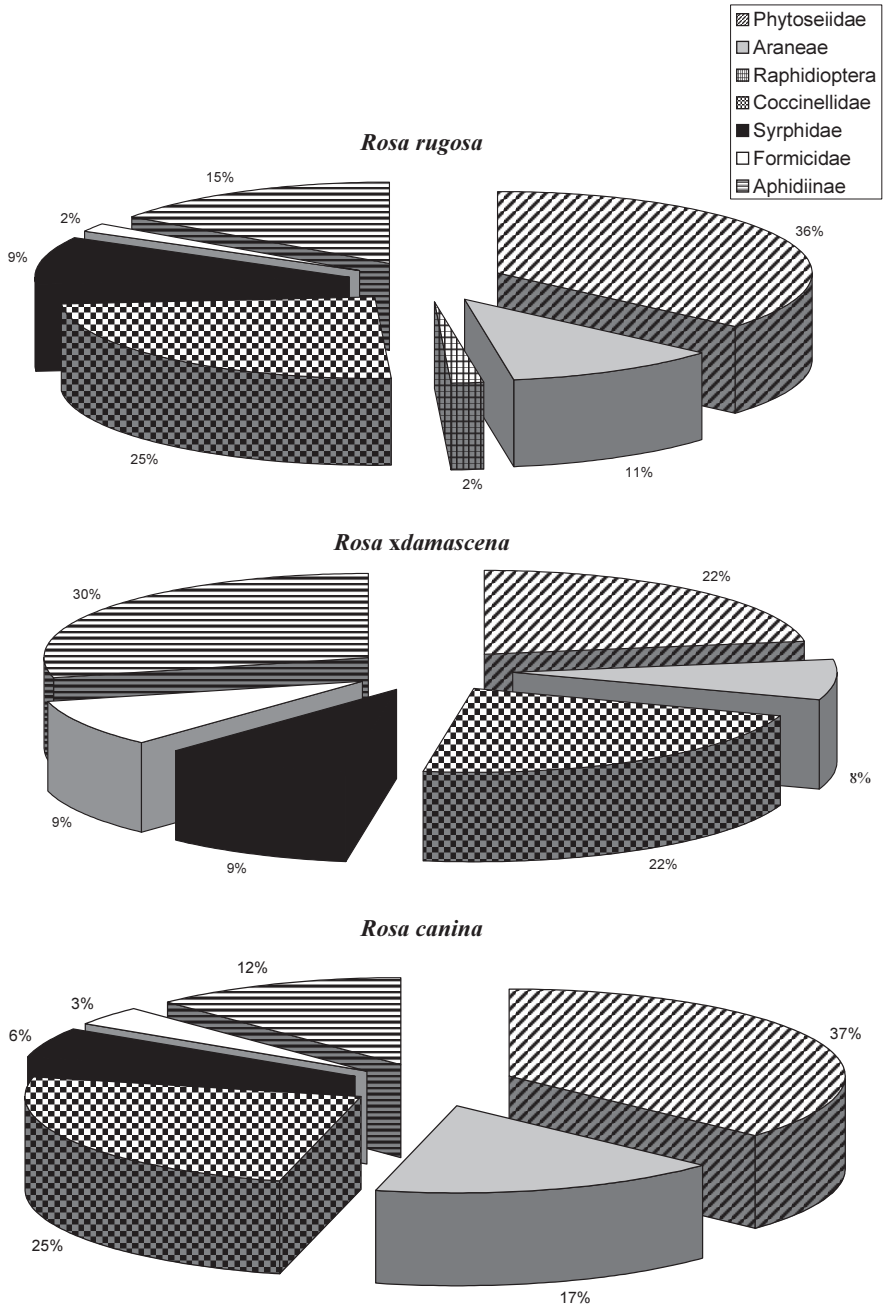

Figure 5. Percentage shares of particular taxa of predatory and parasitic arthropods on particular rose bush species

Arthropods feeding on mixed nutrients

Only individual specimens of arthropods feeding on mixed nutrients were observed on the studied roses. The Psocoptera have been included in this group because of insufficient state of knowledge about their trophic preferences. Only larvae and nymphs of these insects were found. Furthermore, also the Acari from the family Tydeidae have been included in this group: they feed on various kinds of nutrients since they can be herbivorous, predatory or saprophagous (Boczek 1999, Boczek & Błaszczyk 2005). The Tydeidae were usually observed on the undersides of leaves, where they accompanied spider mites. They were encountered only on *Rosa rugosa* and *Rosa canina*. Similarly, on a small-leaved lime, among insects feeding on mixed nutrients Mackoś (2010) identified only the acarian species *Czenspinskia lordi* Nesbitt 1946 and representatives of the Psocoptera.

CONCLUSIONS

Herbivorous arthropods were the most abundant on the studied rose plant species. They made up as much as 98.48% of the total number of collected specimens. In this group spider mites were the most numerous, with 3 species identified, followed by aphids, of which 5 species were identified. In spite of the fact that they were not very numerous, *Edwardsiana rosae* and *Allantus* sp. caused visible damage to the studied plants. Predatory and parasitic plants made up just 0.67% of the total number of collected specimens, so they were not very abundant. However, a considerable variety was observed within the group. Among the identified taxa dominated the Phytoseiidae, the Coccinellidae and the Aphidiinae.

Herbivorous arthropods showed the most preference for *Rosa rugosa* as their host plant, while *Rosa* x*damascena* was their last preference. On all studied rose plats *Macrosiphum rosae* was the most abundant species, which developed its largest populations on the native rose plant species – *Rosa canina*.

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Stawonogi występujące na krzewach róż w Ogrodzie Botanicznym UMCS (Maria Curie-Skłodowska University) w Lublinie (południowo-wschodnia Polska)

STRESZCZENIE

Praca przedstawia wyniki obserwacji nad występowaniem stawonogów na trzech gatunkach róż: *Rosa rugosa*, *Rosa* x*damascena* i *Rosa canina*. Przeprowadzone badania wskazują, że najliczniejszą grupą były stawonogi roślinożerne, głównie o aparatach gębo-

wych kłująco-ssących. Do najliczniejszych roślinożerców należały pluskwiaki z rodziny Aphididae oraz roztocze z rodziny Tetranychidae. Wśród stawonogów drapieżnych i pasożytniczych dominowały roztocze z rodziny Phytoseiidae oraz chrząszcze z rodziny Coccinellidae. Stawonogi odżywiające się pokarmem mieszanym były nieliczne i stwierdzono w tej grupie jedynie Psocoptera i roztocze z rodziny Tydeidae.