ACTA SCIENTIARUM POLONORUM *Acta Sci. Pol., Hortorum Cultus 4(2) 2005, 129-137*

ANALYSIS OF THE APHID POPULATION COLONIZING ROSES IN DIFFERENT TYPES OF CITY GREEN AREAS OF LUBLIN

Bożenna Jaśkiewicz
Agricultural University in Lublin

Abstract. Observations on the aphid number were carried out in the years 2001–2003, simultaneously in four different sites. In each of these three shrubs were marked: of park rose 'Grandhotel', rugosa rose, multiflorous rose and five shrubs of border roses of various cultivars. The purpose of these study was to conduct a quantitative analysis of the aphid fauna colonizing roses growing in various types of city green areas. As a result of studies conducted the occurrence of 10 aphid species was found out on the analyzed shrubs. No significant differences were observed in the species composition of aphids colonizing roses growing in various types of city green areas. The studies showed significant differences in the aphid number between the analyzed sites. The road and street sites on the one hand and the road and housing estate ones on the other were most similar regarding the number of aphids.

Key words: aphids, roses, green area, population, anthropopressure

INTRODUCTION

Contemporary cities, and especially urban agglomerations, are specific ecological systems. Very strong anthropopressure causes irreversible deformations in the structure and functioning of urban ecosystems. Changes of the composition of metabolites take place in the plants' tissues under the effect of stress (e.g. drought, air pollution and others) that plants are subjected to. The content of soluble aminoacids and monosaccharides grows, which leads to an increase in the attractiveness of plants as food for arthropods with the stinging-sucking mouth apparatus [Płonka 1990]. In the areas transformed by man the species taking food from the conductive bundles and the parenchyma and the mining leaves develop very dynamically, forming the most numerous group of phytophagous species [Cichocka and Sahajdak 1996, Chudzicka 1979].

Corresponding author – Adres do korespondencji: Bożenna Jaśkiewicz, Department of Entomology, Agricultural University in Lublin, 7 Leszczyńskiego Street, 20-950 Lublin, Poland, e-mail: bozenna.jaskiewicz@ar.lublin.pl

The purpose of the present paper was to conduct a quantitative analysis of the aphid fauna colonizing roses growing in various types of city green areas.

MATERIAL AND METHODS

Observations on the aphid number were carried out during three vegetation periods in the years 2001–2003, simultaneously in four different sites: a road site – situated about 2–5 m from the road with heavy traffic (A), a street site – situated about 15–20 m from the street (B), a housing estate site (C) and a park site (D). In each of these three shrubs were marked: of park rose 'Grandhotel', rugosa rose, multiflorous rose and five shrubs of border roses of various cultivars. Three shoots were randomly selected and marked on border roses, while five shoots (of similar length) were chosen on each of the other shrubs, where both wingless (including the larvae) and winged aphids were counted. Observations began in early spring (in the second decade of March) and finished in late autumn (the second decade of December). The monitoring of plants took place with about 10-days' intervals.

In order to establish the similarity of the analyzed communities, index $P_{A,B}$ was used, which defines absolute mathematical similarity between the compared communities, considering the number of all co-existing species in both analyzed communities [Kasprzak and Niedbała 1981]:

$$P_{A,\,B} = \frac{\sum_{i=1}^{n} \frac{a_i}{b_i}}{n}$$

where: $P_{A,B}$ – similarity of two analyzed communities (A and B),
a_i – relative number of species in community A,
b_i – relative number of species in community B,
n – number of common species.

RESULTS

As a result of studies conducted in the years 2001–2003, the occurrence of 10 aphid species was found out on the analyzed shrubs of roses. The following species were observed in each site: *Macrosiphum rosae* (L.) (photo 1), *Chaetosiphon tetrarhodus* (Walk.) (photo 2), *Metopolophium dirhodum* (Walk.) (photo 3), *Myzaphis rosarum* (Kalt.), *Maculolachnus submacula* (Walk.) (photo 4) and *Longicaudus trirhodus* (Walk.). *Aphis fabae* Scop. was not noticed only in the housing estate site. *Macrosiphum euphorbiae* (Thom.) aphids were observed in the road, street and housing estate sites. *Eucalipterus tiliae* (L.) occurred on roses in the road and street sites. *Aulacorthum* sp. was observed only in the street site (tab. 1).

The studies showed considerable differences in the total number of aphids between the analyzed sites (tab. 1). The greatest number of aphids was found in the street site, while the smallest number of aphids was observed in the park site (tab. 1). The value of the similarity coefficient ($P_{A,B}$) shows that the road and street sites on the one hand and

Photo 1. *Macrosiphum rosae* (L.) – pink race
Fot. 1. *Macrosiphum rosae* (L.) – rasa różowa

Photo 2. *Chaetosiphon tetrarhodus* (Walk.) – winged individual
Fot. 2. *Chaetosiphon tetrarhodus* (Walk.) – osobnik uskrzydlony

Photo 3. Wingless individuals of *Metopolophium dirhodum* (Walk.)
Fot. 3. Bezskrzydłe osobniki *Metopolophium dirhodum* (Walk.)

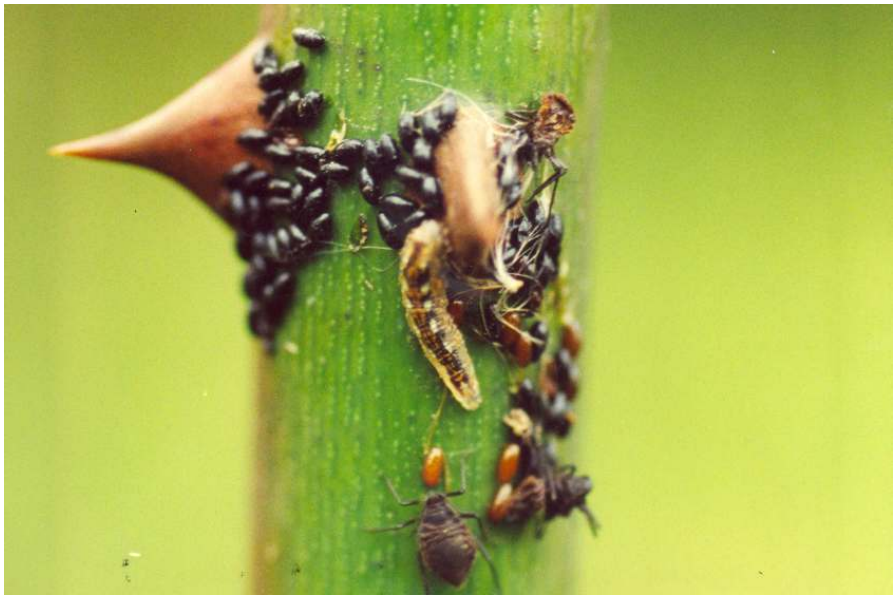

Photo 4. Aphids *Maculolachnus submacula* (Walk.) with their eggs and larvae of *Syrphidae*
Fot. 4. Mszyce *Maculolachnus submacula* (Walk.) i ich jaja oraz larwa *Syrphidae*

Table 1. The total number of aphids (in specimens) in the particular studied sites
Tabela 1. Ogólna liczba mszyc (szt.) na poszczególnych stanowiskach badawczych

Number of aphids in the studied years Liczba mszyc w latach badań	Site – Stanowisko			
	road site przyjezdniowe (A)	street site przyuliczne (B)	housing estate site osiedlowe (C)	park site parkowe (D)
2001	47622	43516	23753	6206
2002	26636	71825	15300	6789
2003	18583	17888	10631	8280
Totally – Łącznie	92 841	133 229	49 143	21 275
Number of the particular aphid species – Liczebność poszczególnych gatunków mszyc				
Chaetosiphon tetrarhodus (Walk.)	39 758	106 681	26 694	5 468
Macrosiphum rosae (L.)	40 931	14 455	17 269	12 497
Metopolophium dirhodum (Walk.)	3 493	9 942	4 804	2 406
Myzaphis rosarum (Kalt.)	6 618	179	508	215
Maculolachnus submacula (Walk.)	1 142	1 232	111	21
Longicaudus trirhodus (Walk.)	232	261	145	409
Aphis fabae Scop.	535	181	0	259
Macrosiphum euphorbiae (Thom.)	78	37	153	0
Eucalipterus tiliae (L.)	54	197	0	0
Aulacorthum sp.	0	64	0	0

Table 2. The number of common aphid species and value of similarity coefficient for studied sites
Tabela 2. Liczba wspólnych gatunków mszyc i wartości współczynnika podobieństwa dla badanych stanowisk

The number of common species Liczba gatunków wspólnych	Site Stanowisko	Street site Przyuliczne (B)	Road site Przyjezdniowe (A)	Housing estate site Osiedlowe (C)	Park site Parkowe (D)	
	street site przyuliczne (B)		0,08	0,05	0,02	
	road site przyjezdniowe (A)	9		0,08	0,03	$P_{A,B}$
	housing estate site osiedlowe (C)	7	9		0,07	
	park site parkowe (D)	7	7	6		

the road and housing estate ones on the other were the most similar considering the aphid number. The greatest disproportion in the aphid number was noted between the street and park sites on the one hand and the road and park ones on the other (tab. 2).

The number of aphids in the years of studies changed in particular sites and its proportion in the total number of aphids oscillated (tab. 1). In the years 2001 and 2003 the percentage contribution of aphids in the road and street sites was similar and it constituted, respectively, 75% and 66%, while in 2002 in the street site it was as much as 59% of the total number of aphids (fig. 1). In each studied year the aphid number in the park site was always the smallest (tab. 1). In 2001 and 2002 it constituted 5% and 6% of the total number of aphids, respectively, while in 2003 it reached the value of 15% and was comparable to the number of those insects in the housing estate (fig. 1).

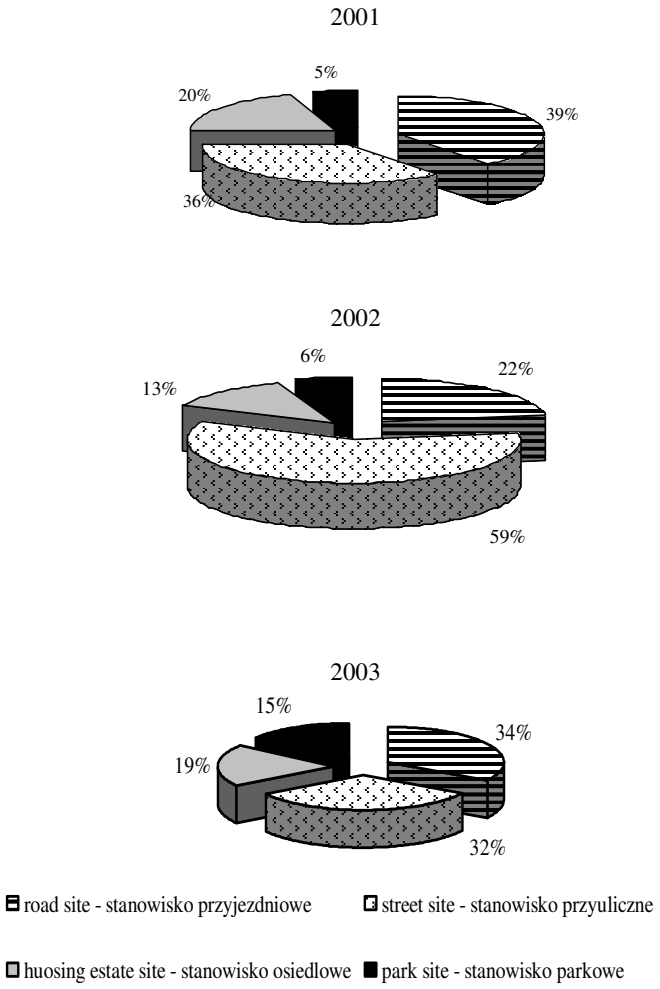

Fig. 1. The structure of aphids number in the particular sites in 2001–2003
Rys. 1. Struktura liczebności mszyc na poszczególnych stanowiskach w latach 2001–2003

DISCUSSION

Observations performed by numerous authors made it possible to state that the city creates specific conditions for the development of entomofauna [Cichocka and Goszczyński 1991, Cichocka et al. 1998, Chudzicka et al. 1998, Jaśkiewicz 1999, Jaśkiewicz et al. 2001, Wilkaniec 1994, 2001]. In the areas transformed by man aphids,

scale insects and mites develop very dynamically and they constitute the most numerous group of the phytophagous [Cichocka and Sahajdak 1996, Chudzicka 1979]. A lot of papers showed much more numerous colonization of plants by aphids and other stinging-sucking arthropods in the areas subjected to strong anthropopressure, for example in the sites near busy street or big industrial factories as compared to the areas much less submitted to degradation [Cichocka and Sahajdak 1996, Cichocka et al. 1998, Czechowska et al. 1979, Jaśkiewicz et al. 2001, Jaworska and Gospodarek 2001, Klimaszewski et al. 1980, Lubiarz and Cichocka 2003, Milevoj and Kravanja 1999, Minoranskij and Wojciechowski 1988, Pisarski 1979, Sahajdak et al. 1995, Wilkaniec 1996]. Similar data were achieved in the author's own studies. The aphid number in the street site in the studied years constituted 32–59% of the total aphid number from all sites, while in the park site it was only 5–15%. The papers by Chudzicka [1979], Czechowska et al. [1979] and Rychlik [1979] showed relationships existing between the type of green area and the number of aphids. The stronger anthropopressure was made on the site, the larger number of these insects was observed. On the other hand, Pisarski [1979] states that together with increased intensity of urbanization pressure the number of particular species of animals grows at first and then decreases in the areas subjected to very strong anthropopressure. This is confirmed by the author's own studies, where significant differences were proved in the aphid number in the analyzed sites. The greatest number was found out in the street, and not the road site, while the smallest in the park one.

CONCLUSIONS

1. No significant differences were observed in the species composition of aphids colonizing roses growing in various types of city green areas.
2. The studies showed significant differences in the aphid number between the analyzed sites: the largest was found in the street site, while the smallest in the park one.
3. The road and street sites on the one hand and the road and housing estate ones on the other were most similar regarding the number of aphids.

REFERENCES

Chudzicka E., 1979. Wpływ struktury zieleni miejskiej na skład gatunkowy i liczebność fitofagów koron (na przykładzie *Tilia* sp.). Mat. konf. „Warunki rozwoju drzew i ich fauny w Warszawie". Wyd. PAN, 74–83.

Chudzicka E., Skibińska E., Winiarska G., 1998. Zasiedlanie środowiska miejskiego przez owady (na przykładzie Warszawy). [w:] Fauna miast, T. Barczak, P. Indykiewicz (red.). Wyd. ATR, Bydgoszcz, 47–55.

Cichocka E., Goszczyński W., 1991. Mszyce zasiedlające drzewa przyuliczne w Warszawie. [w:] Mszyce – ich bionomia, szkodliwość i wrogowie naturalni, E. Cichocka, W. Goszczyński (red.). PAN, Warszawa, 9–18.

Cichocka E., Goszczyński W., Szybczyński K., 1998. Mszyce i ich naturalni wrogowie na klonach w Warszawie. [w:] Fauna miast, T. Barczak, P. Indykiewicz (red.). Wyd. ATR, Bydgoszcz, 83–88.

Cichocka E., Sahajdak A., 1996. Liczebność i rozwój mszycy jabłoniowej na jabłoniach o różnym stopniu zanieczyszczenia środowiska. Progress in Plant Protection/Postępy w Ochronie Roślin 32 (2), 354–356.

Czechowska W., Pisarska R., Skibińska E., Wegner E., 1979. Wpływ presji urbanizacyjnej na kompleks mszyce-afidofagi. Mat. konf. „Warunki rozwoju drzew i ich fauny w Warszawie". Wyd. PAN, 106–115.

Draber-Mońko A., Garbarczyk H., Skibińska E., Wegner E., 1979. Kształtowanie się zależności między fitofagami i zoofagami koron drzew w urbicenozie Warszawy. Mat. konf. „Warunki rozwoju drzew i ich fauny w Warszawie". Wyd. PAN, 95–105.

Jaśkiewicz B., 1999. Aphids on chosen ornamental shrubs in Lublin. Aphids and Other Homopterous Insects, PAS Olsztyn, 7, 67–73

Jaśkiewicz B., Łagowska B., Gantner M., 2001. Aphids inhabiting certain ornamental shrubs in urban conditions. Annales UMCS, sectio EEE, IX, 99-107.

Jaworska M., Gospodarek J., 2001. Wpływ zanieczyszczenia powietrza i gleby na mszycę trzmielinowo-burakową (*Aphis fabae* Scop.). Progr. Plant Protect./Post. Ochr. Rośl. 41(2), 395–398.

Kasprzak K., Niedbała W., 1981. Wskaźniki biocenotyczne stosowane przy porządkowaniu i analizie danych w badaniach ilościowych. [w:] M. Górny, L. Grüm (red.) Metody stosowane w zoologii gleby. PWN, Warszawa, 397–416.

Klimaszewski S.M., Wojciechowski W., Czylok A., Gębicki C., Herczek A., Jasińska J., 1980. Zgrupowania wybranych grup pluskwiaków równoskrzydłych (*Homoptera*) i różnoskrzydłych (*Heteroptera*) w lasach rejonu huty „Katowice". Acta Biol., Prace Nauk. Uniw. Śl. 8(348), 22–39.

Lubiarz M., Cichocka E., 2003. Aphids and scale insects on pedunculate oak in two different environments, in Poleski National Park and in the neighbourhood of nitrogen fertilisers' factory (Zakłady Azotowe in Puławy). Aphids and Other Hemipterous Insects, Monograph, PAG, Rogów, 9, 69–91.

Milevoj L., Kravanja N., 1999. Health problems of trees in urban areas. Zbornik predavanj in referatov 4. Slovenskega Posvetovanja o Varstvu Rastlin v Portorozu, 421–428.

Minoranskij V.A., Wojciechowski W., 1988. Wpływ spalin transportu samochodowego na liczebność mszycy *Protaphis artemisiae* Narz., biedronki *Coccinella septempunctata* L. i mrówki *Lasius niger* (L.) w strefie przydrożnej. Acta Biol. Prace Nauk. UŚl. 10(27), 21–27.

Pisarski B., 1979. Presja urbanizacyjna a zespoły fauny. Mat. konf. „Warunki rozwoju drzew i ich fauny w Warszawie". Wyd. PAN, 116–120.

Płonka P., 1990. Wpływ zanieczyszczeń przemysłowych na układ roślina – roślinożerca na przykładzie owadów żerujących na liściach dębów w Puszczy Niepołomickiej. Kosmos 39(4), 365–371.

Rychlik B., 1979. Liczebność i struktura dominacyjna mszyc występujących na liściach dębu szypułkowego (*Quercus robur* L.) w różnych typach zieleni miejskiej. Mat. konf. „Warunki rozwoju drzew i ich fauny w Warszawie". Wyd. PAN, 88–94.

Sahajdak A., Boczek J., Cichocka E., Kropczyńska D., 1995. Liczebność mszyc i roztoczy w środowisku skażonym emisjami przemysłowymi. Mat. XXXV Sesji Nauk. IOR Poznań, cz. II, Postery, 129–132.

Wilkaniec B., 1994. Aphidofauna of selected tree species in the urban area of Poznań. Aphids and other homopterous insects, PAS, Skierniewice, 4, 71–79.

Wilkaniec B., 1996. Występowanie *Eucalipterus tiliae* (L.) (*Homoptera: Phyllaphididae*) na lipie w warunkach miejskich. Rocz. AR Pozn. CCLXXXVIII. Ogrodn. 24, 85–92.

Wilkaniec B., 2001. Afidofauna Ogrodu Dendrologicznego w Poznaniu. [w:] Bioróżnorodność i ekologia populacji zwierzęcych w środowiskach zurbanizowanych, P. Indykiewicz, T. Barczak, G. Kaczorowski (red.), Wyd. Nice, Bydgoszcz, 32–37.

ANALIZA LICZEBNOŚCI MSZYC ZASIEDLAJĄCYCH RÓŻE ROSNĄCE W RÓŻNYCH TYPACH ZIELENI MIEJSKIEJ LUBLINA

Streszczenie. Obserwacje nad liczebnością mszyc prowadzono w latach 2001-2003 jednocześnie w czterech różnych stanowiskach. W każdym z nich wyznaczono po trzy krzewy: róży parkowej 'Grandhotel', róży pomarszczonej, róży wielokwiatowej oraz po pięć krzewów róż rabatowych różnych odmian. Celem badań było przeprowadzenie analizy ilościowej fauny mszyc zasiedlającej róże rosnące w różnych typach zieleni miejskiej. W wyniku przeprowadzonych badań na analizowanych krzewach zaobserwowano występowanie 10 gatunków mszyc. Nie odnotowano istotnych różnic w składzie gatunkowym mszyc zasiedlających róże rosnące w różnych typach zieleni miejskiej. Wykazano istotne różnice w liczebności mszyc pomiędzy analizowanymi stanowiskami. Najbardziej podobne pod względem liczebności były stanowiska: przyjezdniowe i przyuliczne oraz przyjezdniowe i osiedlowe.

Słowa kluczowe: mszyce, róże, zieleń miejska, liczebność, antropopresja

Accepted for print – Zaakceptowano do druku: 3.11.2005