

DYNAMICS OF NUMBER OF *Metopolophium dirhodum* (Walk.) (*Hemiptera, Aphididae*) OCCURRING ON SHRUBS OF ROSES IN LUBLIN

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Abstract. The purpose of the studies was to observe the dynamics of number of *Metopolophium dirhodum* (Walk.) on rugosa rose, multiflowered rose, park rose cv. 'Grandhotel' and different varieties of border roses. Observations were conducted in four different sites in the green area of Lublin in the years 2001–2003. *M. dirhodum* was observed on all the analyzed roses. Annually this aphid colonized only the shrubs of rugosa rose and park rose 'Grandhotel' in all the sites. This is a host-alternating species, with the migration to the summer host of obligatory character (the colonies were observed in spring and autumn). The weather conditions had a significant effect on the date of the spring appearance and the autumn disappearance of aphids. The most numerous aphids were observed in the street site, while in the park one the population of this aphid was the lowest. *Rosa rugosa* was exceptionally willingly colonized by *M. dirhodum*. Those aphids occurred there in much higher numbers as compared with the other roses.

Key words: *Metopolophium dirhodum* (Walk.), roses, number's dynamic of aphids, weather, city green areas

INTRODUCTION

Metopolophium dirhodum (Walk.) is a cosmopolitan species with a wide range of occurrence [Blackman and Eastop 2000]. In Poland it is common throughout the country [Szelegiewicz 1968]. It is a host-alternating aphid, whose primary hosts are roses (*Rosa* L.), both wild and cultivated ones. On the other hand, the secondary hosts include a lot of grass species, mainly cereals [Wojdyła et al. 2002]. Principally, it is a holocyclic species although it was observed in West Europe that it developed on cereals in an anholocyclic manner [Blackman and Eastop 2000, Howard and Dixon 1995]. In Poland the anholocyclic development of these aphids was observed in glasshouses on roses [Cichocka and Jaśkiewicz 2003]. This is a species whose population colonizing roses,

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especially under covers, has considerably increased during the last 36 years [Cichocka and Jaśkiewicz 2003].

The purpose of the studies was to observe the number's dynamic of *M. dirhodum* on rugosa rose, multiflowered rose and park rose cv. 'Grandhotel' as well as on different varieties of border roses growing in four different sites in the green area of Lublin.

MATERIAL AND METHODS

Observations on the dynamics of number of aphids were conducted in the years 2001–2003. Four sites were chosen for the studies: road (A), street (B), housing estate (C) and park (D) ones. The monitoring included rose shrubs belonging to the following groups: border roses (various cultivars), wild ones (rugosa rose – *Rosa rugosa* Thunb., multiflowered rose – *Rosa multiflora* Thunb.), park roses (cv. 'Grandhotel'). The population dynamics of aphids was described using the commonly accepted methods [Jaśkiewicz 1997, Jaśkiewicz and Gantner 2000]. Roses were marked on the basis of studies by Seneta and Dolatowski [2003] and Jerzy et al. [1992].

RESULTS

The dynamics of number of *M. dirhodum* is presented in figures 1–4, whereas the total number of aphids in the years 2001–2003 is shown in table 1.

In 2001, after a relatively mild winter, the first larvae of family founders were observed on rugosa rose in the street site during the first 10 days of April, and on the other sites since the second 10-days' period of that month. The aphid population was small and it stayed at a similar level till the middle of May. *Metopolophium dirhodum* appeared again on the analyzed shrubs in the second 10-days' period of September. The aphid population grew dynamically in the course of the following 10-days' period. In the street site their maximum was found during the first 10-days' period of October, while in the second 10-days' period of that month it was observed in the other sites. Aphids remained on plants till the third 10-days' period of November.

The first aphids on the park rose 'Grandhotel' were observed during the first 10 days of April in the street and park sites, while in the other sites they appeared in the third 10-days' period of the month. The aphid population did not exceed 20 specimens per shrub, except the road site, where during the first 10 days of May was recorded 71.3 aphids/shrub. Aphids remained in the housing estate site the longest – till the third 10-days' period of June, whereas their disappearance in the other sites was observed about a month earlier. In autumn aphids appeared in all the analyzed sites at the turn of September and October. Their maximum number was observed in the first, second or third 10-days' period of October, depending on the site. The aphids number on park rose 'Grandhotel', like on the rugosa rose, was much higher in autumn than in spring.

On multiflowered rose the aphids of this species were present only in the third 10-days' period of April in the road site, and in the street site during the first 10 days of May.

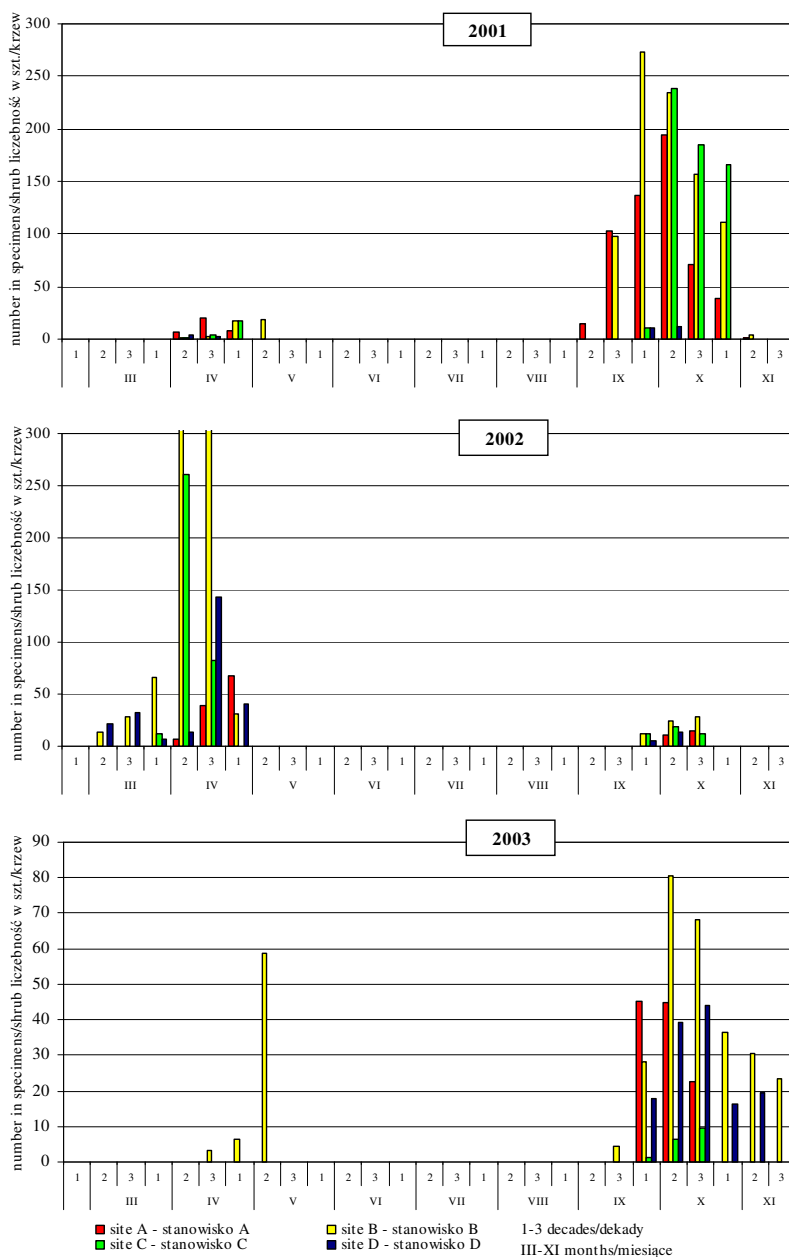


Fig. 1. Dynamics of number of *M. dirhodum* on rugosa rose in the years 2001–2003
 Rys. 1. Dynamika liczebności *M. dirhodum* na róży pomarszczonej w latach 2001–2003

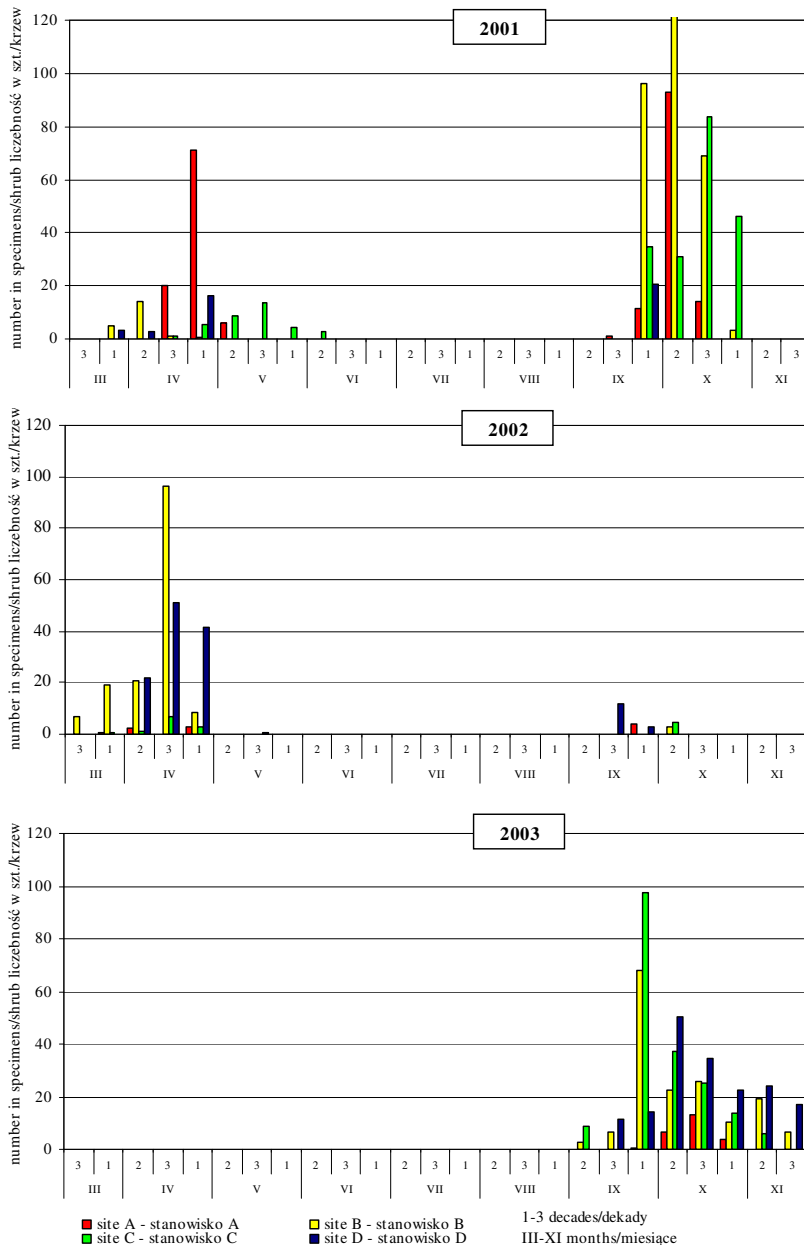


Fig. 2. Dynamics of number of *M. dirhodum* on park rose 'Grandhotel' in the years 2001–2003
 Rys. 2. Dynamika liczebności *M. dirhodum* na róży parkowej 'Grandhotel' w latach 2001–2003

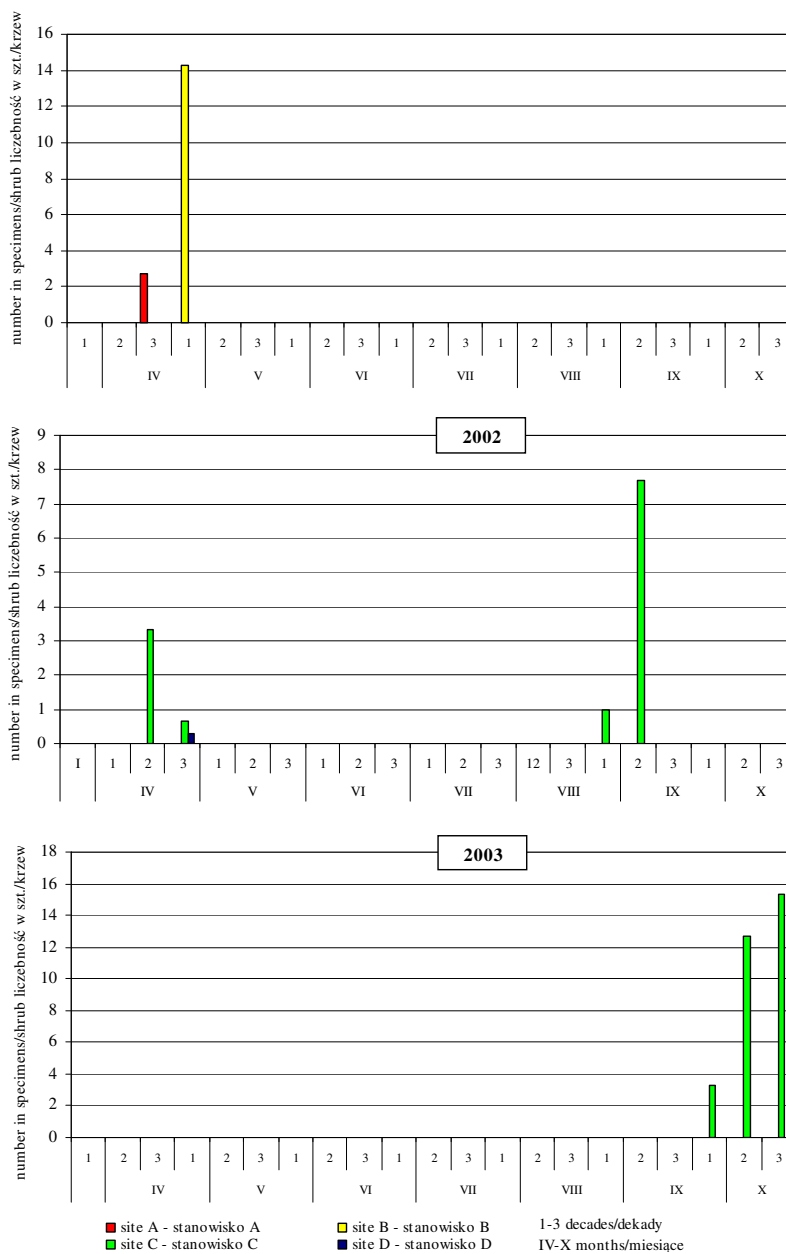


Fig. 3. Dynamics of number of *M. dirhodum* on multiflowered rose in the years 2001–2003
 Rys. 3. Dynamika liczebności *M. dirhodum* na róży wielokwiatowej w latach 2001–2003

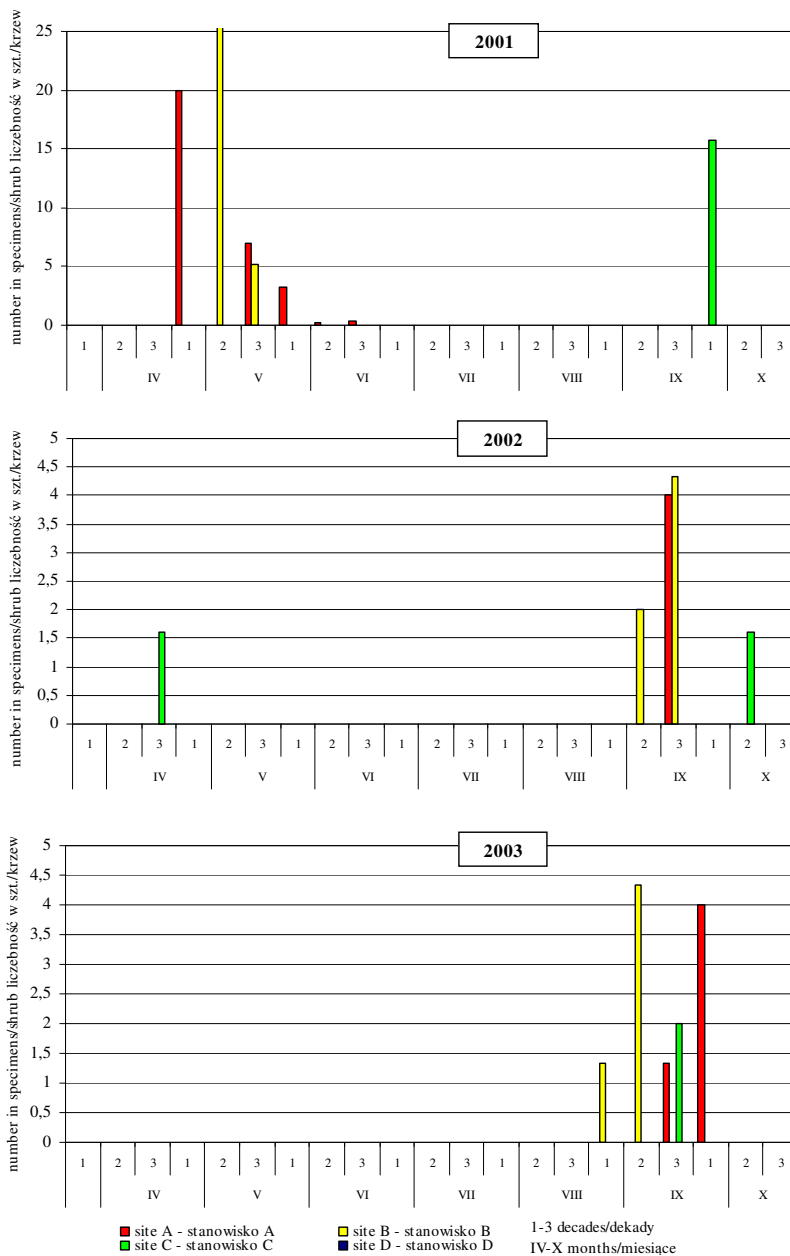


Fig. 4. Dynamics of number of *M. dirhodum* on border roses in the years 2001–2003
 Rys. 4. Dynamika liczebności *M. dirhodum* na różach rabatowych w latach 2001–2003

On the shrubs of border roses *M. dirhodum* was observed in the street site only in the second and third 10-days' periods of May. In the road site those aphids appeared during the first 10 days of May, at the same time reaching the maximum number, which next decreased until the disappearance of aphids during the first 10 days of July. In autumn singular specimens were observed only in the housing estate site during the first 10 days of October.

In 2002, after an exceptionally mild winter and warm early spring, *M. dirhodum* appeared on rugosa rose in the street and park sites already in the second 10-days' period of March. Warm April favoured the development of aphids. The highest number of those insects in the street site was found in the second 10-days' period of April, and in the park site – in the third. In the street site a considerable number of this species (more than 500 aphids/shrub) remained in the first and second 10-days' periods of April. In the road site aphids occurred relatively sparsely, and they reached the maximum number during the first 10 days of May. In autumn only scarce individuals were observed in all the sites. They remained on the shrubs from the beginning till the end of October.

Table 1. Total number of aphids *Metopolophium dirhodum* (Walk.) in the years 2001–2003Tabela 1. Łączna liczba mszyc *Metopolophium dirhodum* (Walk.) w latach 2001–2003

Year – Rok		2001	2002	2003	Total Razem
Roses Róże	rugosa – pomarszczona	6790	6289	1818	14897
	Park 'Grandhotel' – parkowa 'Grandhotel'	2448	627	1664	5039
	border – rabatowe	439	47	39	525
	multiflowered – wielokwiatowa	51	39	94	184
Site Stanowisko	road – przyjezdniowe	2602	463	428	3493
	street – przyuliczne	3956	4366	1620	9942
	housing estate – osiedlowe	2925	1255	624	4804
	park – parkowe	245	1218	943	2406

The first larvae of *M. dirhodum* appeared on the park rose 'Grandhotel' in the street site in the third 10-days' period of March, while in the other sites they occurred during the first 10 days of April. The maximum number of aphids in the street and park sites were found in the third 10-days' period of April, while in the road and housing estate sites only single specimens of this species were observed. The disappearance of aphids in all the sites were observed in the second 10-days' period of May. Again, aphids appeared in small numbers in particular sites in the third 10-days' period of September and in the first and second 10-days' period of October.

On multiflowered rose aphids were observed during the first 10 days of May in the park site. In the housing estate those insects were observed in the third 10-days' period of April and the first 10 days of May, while in autumn they occurred in the first and second 10-days' period of September. No presence of this species was noted in the road and street sites.

On border roses *M. dirhodum* was observed in spring only in the housing estate site in the third 10-days' period of April. In autumn aphids were observed in the street site

in the second and third 10-days' periods of September. In the road site they were present in the third 10-days' period of September, while in the housing estate site – in the second 10-days' period of October. The aphid number was low and it did not exceed 5 specimens per shrub. The autumn disappearance of *M. dirhodum* in that season took place relatively early because already since the beginning of November no aphids were found on the studied rose shrubs in any of those sites.

In 2003 a long and frosty winter, and especially cold April, caused that in spring the aphids were observed only on rugosa rose in the street site. The first specimens appeared in the third 10-days' period of April. The maximum number of aphids was found in the second 10-days' period of May. Those were mostly nymphs and winged females, which flew away from the primary host. Again *M. dirhodum* were observed on rugosa rose in the street site since the third 10-days' period of September. Since the first 10 days of October aphids were also observed in the other sites. Their highest number was observed in the first, second or third 10-days' periods of October, depending on the site. The disappearance of aphids was observed in particular sites since November. This species remained the longest (till the first 10 days of December) in the street site. On the other roses *M. dirhodum* was observed only in autumn.

On the park rose 'Grandhotel' those aphids appeared in the street and housing estate sites in the second 10-days' period of September. The maximum number of aphids, depending on the site, was observed in the first, second or third 10-days' periods of October. A relatively warm autumn, especially November, caused that aphids were observed on the shrubs till the end of November (in the street and park sites).

On multiflowered rose aphids were found only in the housing estate site since the first till the second 10-days' periods of October.

On the shrubs of border roses singular specimens of this species were observed in September and the first 10 days of October in the road, street and housing estate sites.

DISCUSSION

Metopolophium dirhodum were observed on all of the analyzed roses; however, annually and in all sites this species colonized only the shrubs of rugosa rose and park rose 'Grandhotel'. The colonies of those aphids were found on the studied plants in spring and autumn, which is in agreement with other authors' observations [Cichocka and Goszczyński 1975, Jaśkiewicz 1997]. In spring those aphids develop on roses till the third generation, and already in the second generation the majority is made up of winged females migrating onto the secondary hosts. The females return to the roses since September and there the sexual generation develops. In October the females start laying the wintering eggs [Cichocka and Goszczyński 1975, Wojdyła et al. 2002]. In the author's own studies aphids were most frequently observed on shrubs till the middle of May, and the winged individuals leaving the winter hosts occurred in big numbers already since the beginning of that month. The autumn return of aphids to the roses were usually observed since the third 10-days' period of September.

The development of aphids is to a large extent dependent on the course of the weather conditions, which is confirmed by the results obtained by a number of authors

[Hole et al. 1998, Jaśkiewicz 1997]. A mild winter, a warm beginning of spring and an early spring hasten the hatching of larvae of family founders. On the other hand, after a frosty and long winter with a delayed period of vegetation the appearance of aphids is delayed even by a few weeks [Jaśkiewicz and Gantner 2000]. Besides, most (even 97%) of the wintering eggs die during frosty winters when the temperature falls below -30°C [Cichocka and Jaśkiewicz 2003]. This information is confirmed by the author's own studies. Exceptionally favourable weather conditions occurred in 2002; after a mild winter and a warm beginning of spring the fundatrices were observed on roses already in the second 10-days' period of March, and the number of *M. dirhodum* was very high. On the other hand, in 2003, after a frosty winter and much delayed vegetation, only single aphids were observed as late as in May and it was only in one site on rugosa rose. As reported by Cichocka and Jaśkiewicz [2003] as well as Jaśkiewicz and Gantner [2000], a long and warm autumn makes it possible for *oviparae* to lay eggs even till the first days of December. Similar data were obtained in the present studies. In 2003, thanks to the favourable weather, oviparous aphids were observed on the analyzed rose shrubs till the end of November.

Wojdyła et al. [2002] report that this species is especially willing to colonizes the shrubs of *R. rugosa*, sometimes occurring in great numbers on the top parts of the shoots. Similar data were obtained in the author's own studies when even more than 500 aphids/shrubs were observed on rugosa rose. On the other hand, the maximum number of aphids on the park rose did not exceed 140 specimens, on border roses – 35 specimens, and on multiflowered rose – 16 specimens per shrub. The total number of aphids on rugosa rose was three times as high as on the park rose 'Grandhotel', almost thirty times as high as on the border roses, and as much as eighty times as high as the multiflowered rose (tab. 1). Cichocka and Jaśkiewicz [2003] speak about a considerable increase of *M. dirhodum* population in the course of the years 1967-2003. Comparing the data obtained by Jaśkiewicz [1997], who found 9.4 aphids/shrub/year on average on rugosa rose in the years 1973-1993, with the author's own studies (mean 413.8 aphids/shrub/year), an almost 40-fold increase of the number of this species was observed, which is in agreement with the above statement.

Studies conducted from the 1970's found out that the numbers of arthropods, including the aphids, with a stinging-sucking mouth apparatus, increases in the areas intensively transformed by man [Banaszak 1998, Jaśkiewicz and Gantner 2000]. In the author's own studies aphids were found in the greatest numbers in the street site, whereas in the park site there were the fewest of them.

Metopolophium dirhodum – due to a short period of occurrence on roses – can cause only slight discoloration in the places of prey. It is only in the years of abundant appearance that it can harm the top shoots of roses. The main harmfulness of this species is connected with its preying on cereals and passing the viruses onto the plants from the family *Graminae* [Cichocka and Goszczyński 1975, Cichocka and Jaśkiewicz 2003, Howard and Dixon 1995]. In the author's own studies aphids of this species appeared on roses in very early spring. At first they preyed on the bursting leaf buds and next they moved onto the young shoots and the bottom site of the leaf blade. In autumn, on the other hand, they colonized the bottom side of the yellowing leaf blades and the rose shoots. No clear injuries caused by this species were observed on the analyzed shrubs.

CONCLUSIONS

1. *Metopolophium dirhodum* was observed on all the analyzed roses. Annually this aphid colonized only the shrubs of rugosa rose and park rose 'Grandhotel' in all the sites.

2. This is a host-alternating species, with the migration to the summer host of obligatory character (the colonies were observed in spring and autumn).

3. The weather conditions had a significant effect on the date of the spring appearance and the autumn disappearance of aphids.

4. The most numerous aphids were observed in the street site, while in the park one the population of this aphid was the lowest.

5. *Rosa rugosa* was exceptionally willingly colonized by *M. dirhodum*. Those aphids occurred there in much higher numbers as compared with the other roses.

REFERENCES

- Banaszak J., 1998. Z badań nad fauną i ekologią miast. [in:] Barczak T., Indykiewicz P. (eds.) Fauna miast – Urban Fauna. Wyd ATR, Bydgoszcz, 21–44.
- Blackman R.L., Eastop V.F., 2000. Aphids on the World's Crops. An Identification and Information Guide. The Natural History Museum, London.
- Cichocka E., Goszczyński W., 1975. Mszyce (*Homoptera, Aphidoidea*) szkodniki roślin uprawianych pod szkłem. *Fragm. Faun.* XX, 17, 273–305.
- Cichocka E., Jaśkiewicz B., 2003. Aphid inhabiting roses in different cultures in 1967–2003. *Aphids and Other Hemipterous Insects, Monograph, PAG, Rogów*, 9, 17–36.
- Hole U.B., Salunkhe G.N., Reddy P.P., Kumar N.K.K. (eds.), Verghese A., 1998. Effect of meteorological parameters on the population dynamics of aphid on rose. *Advances in IPM for horticultural crops*. [in:] *Proceedings of the First National Symposium on Pest Management in Horticultural Crops: environmental implications and thrusts*, Bangalore, India, 15–17 October 1997, 168–171.
- Howard M.T., Dixon A.F.G., 1995. Factors determining the pest status of *Metopolophium dirhodum* on winter barley in the United Kingdom. *Ann. Appl. Biol.* 127, 1–10.
- Jaśkiewicz B., 1997. Skład gatunkowy i dynamika pojawu mszyc na wybranych krzewach ozdobnych w latach 1973–1993. *Rozpr. Nauk. AR w Lublinie* 183.
- Jaśkiewicz B., Gantner M., 2000. Observation on the dynamics of the population of *Maculolachnus submacula* (Walk.) on dog rose (*Rosa canina* L.) in Lublin. *Folia Hort. Ann.* 12/2, 111–119.
- Jerzy M., Żyła S., Czekalski M., 1992. *Róże*. PWRiL, Warszawa.
- Seneta W., Dolatowski J., 2003. *Dendrologia* PWN, Warszawa.
- Szelegiewicz H., 1968. Mszyce – *Aphidoidea*. *Katalog fauny Polski*. PWN, Warszawa, XXI, 4.
- Wojdyła A., Kamińska M., Łabanowski G., Orlikowski L., 2002. *Ochrona róż*. Plantpress, Kraków.

DYNAMIKA LICZEBNOŚCI *Metopolophium dirhodum* (Walk.) (HEMIPTERA, APHIDIDAE) ZASIEDLAJĄCEJ KRZEWY RÓŻ W LUBLINIE

Streszczenie. Celem przeprowadzonych badań było prześledzenie dynamiki liczebności mszyc *Metopolophium dirhodum* (Walk.) na róży pomarszczonej, wielokwiatowej, parkowej odmiany 'Grandhotel' oraz na różnych odmianach róż rabatowych. Obserwacje prowadzono w latach 2001–2003 w czterech odmiennych stanowiskach na terenie zieleni miejskiej Lublina. *M. dirhodum* obserwowano na wszystkich analizowanych różach. Rokrocznie i we wszystkich stanowiskach mszyca ta zasiedlała jedynie krzewy róży pomarszczonej i róży parkowej 'Grandhotel'. Jest to gatunek różnorodny, u którego migracja na żywiciela letniego ma charakter obligatoryjny (kolonie notowano wiosną oraz jesienią). Na terminy wiosennego pojawu oraz jesienniego zaniku mszyc w istotny sposób wpływał przebieg warunków pogodowych. Najliczniej mszyce te występowały na stanowisku przyulicznym. Wyjątkowo chętnie *M. dirhodum* zasiedlała krzewy *R. rugosa*, na której występowała w wielokrotnie większej liczebności w porównaniu z innymi różami.

Słowa kluczowe: *Metopolophium dirhodum* (Walk.), róże, dynamika liczebności mszyc, pogoda, zieleń miejska

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