Electronic Journal of Polish Agricultural Universities is the very first Polish scientific journal published exclusively on the Internet, founded on January 1, 1998 by the following agricultural universities and higher schools of agriculture: University of Technology and Agriculture of Bydgoszcz, Agricultural University of Cracow, Agricultural University of Lublin, Agricultural University of Poznan, Higher School of Agriculture and Teacher Training Siedlce, Agricultural University of Szczecin, and Agricultural University of Wroclaw.

ELECTRONIC JOURNAL OF POLISH AGRICULTURAL UNIVERSITIES

2000
Volume 3
Issue 2
Series HORTICULTURE

JAŚKIEWICZ B. 2000. APHIDS COLONISING THE SHRUBS OF *JUNIPERUS COMMUNIS* L. AND *ROSA CANINA* L. IN URBAN CONDITIONS **Electronic Journal of Polish Agricultural Universities**, Horticulture, Volume 3, Issue 2.
Available Online http://www.ejpau.media.pl

APHIDS COLONISING THE SHRUBS OF *JUNIPERUS COMMUNIS* L. AND *ROSA CANINA* L. IN URBAN CONDITIONS

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ABSTRACT

The subject of studies conducted in the years 1995-1997 was the occurrence of aphids on the shrubs of common juniper and wild rose. The studies were carried out in the city green area in a street site (A) and a park site (B). The presence of four aphid species on wild rose shrubs and one species on common juniper shrubs was established. Aphids appeared in the greatest numbers in 1995, while the lowest number was observed on rose shrubs in 1996 and on juniper shrubs in 1997. It was found out that aphids were more numerous in area A, exceptionally in 1995 the number of *Maculolachnus submacula* Walk. was slightly higher than in area B. The weather in spring and summer affected the increase of the population of all aphid species. After an early and warm spring with rainfalls within the norm the appearance of aphids was more numerous. A delayed vegetative period, high temperatures (over 30°C), dry periods and stormy rainfalls limited the number of aphids.

Independent of the numbers, *Cinara juniperi* De Geer on juniper shrubs, and *Macrosiphum rosae* Walk. on rose shrubs caused the damage, which significantly lowered the ornamental value of those shrubs.

Key words: aphids, *Juniperus comunnis* L., *Rosa canina* L., urban green areas.

INTRODUCTION

Ornamental shrubs, which are an element of urban green areas, perform a number of important functions in man's surroundings. They are not only the "green lungs" of urbanised areas, but they also contribute to the satisfaction of the inhabitants' aesthetic needs. Among these shrubs a significant role is played by roses and juniper.

These plants, introduced into a compositional whole by designers and looked after by experts, are not inferior to the ornamental valours of the flowers of green plants, often even exceeding them. They are characterised by special values, which follow from the richness of forms, sizes, colours and shapes [8]. In the polluted urban conditions, vegetation is especially sensitive to the stressful factors, being less resistant to pathogens and pests. Entomofauna of the urban environment is characterised by dynamic development of insects with a stinging-sucking mouth, to which aphids belong [5, 20]. They constitute a group of most dangerous insects. In urbanised conditions a pest is not only the species causing measurable economic losses, but also lowering the ornamental values of shrubs.

The purpose of the present studies was to examine the species composition, number and dynamics of aphids populations on the shrubs of common juniper and wild rose in street and park sites.

MATERIALS AND METHODS

Observations were conducted in the years 1995-1997 in Lublin, in green areas situated in front of the Rector's Office of the University of Agriculture and its neighbourhood (A), and in a housing district of "Czechów" (B). Area A can be treated as a street site (big traffic), while area B is localised in the middle of the district (no traffic), therefore it is treated as a park site. Shrubs in areas A and B were not submitted to any protective treatments.

The observations were made of the following species of ornamental shrubs in both areas: common juniper – *Juniperus communis* L., and wild rose – *Rosa canina* L.

Five shrubs from each examined species growing near each other were chosen for analysis. The monitoring of plants was performed from early spring to late autumn, in 10-days' intervals. In unfavourable weather conditions (showers of rain) observations were postponed onto the following days.

While designating the aphids, the keys of Šapošnikov [16], Műller [15] and Szelęgiewicz [18] were used. Meteorological data were obtained from the Institute of Agrometeorology of the University of Agriculture in Lublin.

RESULTS

During the studies five aphid species (family *Aphididae*) were found on the examined shrubs. Two species belonged to the sub-family of *Lachninae*, and those were *Cinara juniperi* De Geer and *Maculolachnus submacula* Walk., while the sub-family of *Aphidinae* included three

species, namely *Macrosiphum rosae* L., *Chaetosiphon tetrarhodus* Walk., and *Metopolophium dirhodum* Walk. The paper adopts the newest aphidological designation according to Szelęgiewicz and Cichocka [19]. The information on the numbers, dates of occurrence of the first aphids, the maximum population and disappearance of colonies on the studied shrubs is included in table 1. The course of the weather in the studied years is presented in table 2.

Fot. 1. The colony of *Maculolachnus submacula* Walk. on *Rosa canina* L.

Fot. 2. The colony of *Macrosiphum rosae* L. on *Rosa canina* L.

Fot. 3. *Cinara juniperi* De Geer on *Juniperus communis* L.

Table 1. Species composition, dates of occurrence and number of aphids/shrub in areas A (Rector`s Office) and B (Czechów housing estate) in the years 1995-1997

Aphis species on shrubs	Area of studies	Appearence of the first colonies		Maximum numbers		Disappearence of aphids		The number of aphids/shrub			Totally
		from	to	from	to	from	to	1995	1996	1997	
Cinara juniperi on	A	Id V	IIId V	IId VI	Id VII	IId VIII	IId IX	85.8	50.2	39.4	175.4
Juniperus communis	B	IId V	IIId V	IId VI	IIId VI	IId VIII	IIId VIII	55.8	43.0	37.6	136.4
Totally on *Juniperus communis*								141.6	93.2	77.0	311.8
Macrosiphum rosae on	A	IId V	IIId V	IId VI	IIId VI	IIId IX	IIId X	921.2	309.2	821.2	2051.6
Rosa canina	B	IId V	IIId V	IIId VI		Id X	IIId X	698.4	254.4	582.6	1535.4
Maculolachnus submacula on	A	Id V	IIId V	IId VI	Id VII	IId X	IId XI	492.8	301.6	345.2	1139.6
Rosa canina	B	Id V	IIId V	IIId VI	Id VII	IId X	IIId XI	500.2	202.4	311.2	1013.8
Chaetosiphon tetrarhodus on	A	IId V	IIId V	IIId VI	Id VII	IIId IX	Id X	249.2	311.2	190.2	750.6
Rosa canina	B	IIId V		IId VI	IIId VI	IIId IX		198.4	301.4	161.6	661.4
Metopolophium dirhodum on	A	IId V	IIId V	Id VI	IId VI	IIId VI		32.6	0	29.6	62.2

Rosa canina	B	Id V	IId V	Id VI	IId VI	IId VI	IIId VI	30.2	18.4	26.8	75.4
Totally on *Rosa canina*								3123.0	1698.6	2468.4	7290.0

Table 2. Temperature and rainfalls in 1995-1997 vegetation seasons

Month	Temperature (°C)							Rainfall (mm)						
	mean for years	monthly mean			deviation from multi-year (mean)			mean for years	monthly rainfall			standard percentage		
	1951-1995	1995	1996	1997	1995	1996	1997	1951-1995	1995	1996	1997	1995	1996	1997
III	1.1	2.3	-3.0	1.8	+1.2	-1.9	+0.7	25.4	43.7	24.6	16.2	172.0	96.8	63.8
IV	7.4	7.4	7.3	3.9	0.0	-0.1	-3.5	39.1	40.0	15.4	40.8	102.3	39.4	104.3
V	13.0	12.2	15.5	13.9	-0.8	+2.5	+0.9	57.2	32.8	115.5	83.1	57.3	201.9	145.3
VI	16.4	17.1	16.5	16.8	+0.7	+0.1	+0.4	65.9	70.3	28.0	36.2	106.7	42.5	54.9
VII	17.9	19.8	16.4	17.6	+1.9	-1.5	-0.3	73.6	25.5	80.2	183.8	34.6	109.0	249.7
VIII	17.2	18.1	17.7	18.2	+0.9	+0.5	+1.0	71.1	62.1	90.3	33.8	87.3	127.0	47.5
IX	12.9	12.9	9.6	12.5	0.0	-3.3	-0.4	51.4	113.2	83.3	47.4	220.2	162.1	92.2
X	7.9	9.6	8.4	5.5	+1.7	+0.5	-2.4	40.5	11.0	57.0	35.0	27.2	140.7	86.4
XI	2.5	-0.9	5.5	2.3	-1.6	+3.0	-0.2	38.7	24.1	62.1	34.8	62.3	160.5	89.9

The observations carried out in areas A and B did not find out any aphid species on the examined shrubs.

One aphid species was observed on *Juniperus communis* L., namely *Cinara juniperi* De Geer. In the years of the studies those shrubs were only scarcely colonised by aphids as compared to the rose shrubs, which were observed simultaneously.

In 1995 the numbers of aphids were the highest in area A – 85.8 aphids/shrub, and in area B – 55.8 aphids/shrub. The number was almost twice lower in areas A and B in 1997: 39.4 aphids/shrub and 37.6 aphids/shrub, respectively.

In 1995 the first larvae of the mothers appeared in the third 10-days' period of April in both areas, while small colonies in area A were found on the first 10 days, and in area B in the second 10-days' period of May. In June, after considerable warming, the number of aphids grew considerably. The maximum numbers were observed in the second 10-days' period of June – in area A – 19.2 aphids/shrub, and in area B – 12.8 aphids/shrub. Between July and the middle of August the number of aphids was slowly going down. Some of the observed shoots were free from those insects, the reason probably being the heat waves at that time, together with little rain. After a storm, which took place on August 21, the observations found out complete disappearance of colonies in area B and – a week later – also in area A.

In 1996, after a delayed spring (by about 4 weeks) the first singular aphids and small colonies were noticed in both areas in the third 10-days' period of May. Subsequent observations showed an increase of the number of aphids. The maximum was established after a month, in

the third 10-days' period of June in area A – 11.2 aphids/shrub, and in area B – 9.4 aphids/shrub. In July the studies found out a drop of the number of aphids, which was due to heavy rains. After the heat waves on the first days of August, only singular individuals were found on most shrubs. The disappearance of colonies in areas A and B was observed at the turn of August and September.

In 1997 the first scarce aphids appeared in both areas in the second 10-days' period of May. Subsequent observations found out only a slight increase of the numbers. On the other hand, only singular individuals were found on two of the examined shrubs in area B. The population maximum was observed in area A – 7.8 aphids/shrub on the first ten days of July, and in area B – 6.2 aphids/shrub in the third 10-days' period of June. Aphids stayed on the shrub in area A till the second 10-days' period of September, while in area B they disappeared two weeks before.

Juniper aphids most frequently fed on one-year-old shoots (less frequently on two-year-old ones), between the needles, and they were found individually or in small colonies. Because the juices were sucked out of the plants, the observations found out inhibition of the growth of shoots, small increments, discoloration, twisting, browning of the needles, and even their drying out. The injuries caused by that aphid definitely lowered the ornamental value of juniper shoots.

Four aphid species were found on the shrubs of *Rosa canina*, and the dominating species in all the studied years in areas A and B was *Macrosiphum rosae*.

In 1995, the first larvae of the mothers were observed in both areas on April 15. However, their development was slow because of low temperature, especially at night. The first green and pink aphids *M. rosae* in colonies appeared in areas A and B in the second 10-days' period of May. The maximum numbers in both areas were observed at the beginning of the third 10-days' period of June – 231.2 aphids/shrub and 191.4 aphids/shrub. After the showers in the third 10-days' period of June, the studies observed a rapid drop of the population; by the second 10-days' period of July some rose shrubs in area A were free from aphids, while in area B scarce insects were left on the bottom part of slightly bent leaves. Additionally, the situation was made worse by drought and temperatures over 30°C (from the middle of July and in August). The disappearance of aphids on most shrubs in areas A and B took place at the turn of September and October.

The dates of appearance of the first aphids *M. submacula* and their maximum numbers were analogous to those found for the dominating species. In area A the maximum number was 154.0 aphids/shrub, and in area B – 162.2 aphids/shrub. The dates of disappearance of aphids were much later. In area A singular individuals were observed till the third 10-days' period of October, and in area B – till the second one.

Aphids *Ch. tetrarhodus* and *M. dirhodum* appeared in areas A and B in the second and third 10-days' periods of May. The maximum for *Ch. tetrarhodus* was noticed in area B – 50.0 aphids/shrub, and in area A – 40.2 aphids/shrub in the second 10-days' period. The maximum for *M. dirhodum* was observed on the first ten days – about 6.0 aphids/shrub. The disappearance of *M. dirhodum* was established on the last days of June, while for *Ch. tetrarhodus* it was at the turn of September and October.

In 1996 aphids *M. rosae* and *M. submacula* occurred only scarcely and their numbers were comparable in both areas. The first colonies of both species appeared between the first and third 10-days' periods of May. The maximum number was noted a month later – about 100 aphids/shrub in both areas. Worse weather conditions (heat waves and numerous showers of rain) caused that the numbers decreased, especially of *M. rosae,* which was due to the fact that they usually colonise the top shoots and flower buds. Those species were observed with varying intensities in areas A and B till the end of October.

Aphids *Ch. tetrarhodus* appeared in areas A and B in the third 10-days' period of May. Favourable weather in May and June allowed for a considerable increase of the numbers; the maximum was observed in area A – 58.2 aphids/shrub in the third 10-days' period of June, and in area B – 44.8 aphids/shrub on the first 10 days of July. The disappearance of aphids in area A took place on the first 10 days of October, and in area B a week before.

Aphids *M. dirhodum* occurred very scarcely in that season, and they were found only in area B – 18 aphids/shrub.

In 1997, in both areas, A and B, the first colonies, mostly consisting of green (few pink) individuals *M. rosae* were found during the first 10-days of May. They colonised young shoots and flower buds. After the period of increased numbers of aphids in colonies, the studies found out the maximum in area A – 210.2 aphids/shrub in the second 10-days' period, and in area B – 133.2 aphids/shrub in the third 10-days' period of June. The following analyses observed a gradually decreasing number of aphids. The reason could have been the August dry period and a series of stormy rainfalls between August 26 and September 4. In that period aphids occurred rather scarcely, most frequently as singular individuals. After the ground frosts, which took place in the third 10-days' period of October, the colonies disappeared completely.

Aphids *M. submacula* and *Ch. tetrahodus* were observed in areas A and B in the second and third 10-days' periods of May. Changes in their number were analogous in both areas. The maximum was found out at the turn of June and July – in areas A and B there were found about 100 *M. submacula* aphids per shrub, and 50 *Ch. tetrarhodus* aphids per shrub. *M. submacula* colonies disappeared in the second 10-days' period of November, after ground frosts, which took place at the turn of October and November. The disappearance of *Ch.tetrarhodus* colonies was observed at the turn of September and October.

Aphids *M. dirhodum* occurred in small numbers, in area A they were found between the third 10-days' period of May and the third 10-days' period of June, and in area B between the second 10-days' period of May and the seconds 10-days' period of June.

M. rosae aphids formed big, compact colonies on the young shoots on the bottom part of the leaves, and also on the flower buds. The shoots grew very poorly, they were shorter, their top parts got dry. The flower buds that were covered by aphids were deformed and did not develop. Honey-dew covered the leaves and the fungi leaving a dark coat marred the plants. Independent of their numbers, those aphids clearly lowered the ornamental value of roses. *M. submacula* aphids also lowered the aesthetic valours of roses. The aphids feeding on young shoots and bark of the young twigs caused that the shoots got twisted, bent, they stopped growing and the shoot ends died out. In autumn the leaves fell down earlier. Aphids *Ch. tetrarhodus* fed on the shoot ends and the bottom part of the leaves. Those aphids constituted 10-15% of all the aphids feeding on rose shrubs, but they did not cause any clear

damage which would affect the ornamental value. Aphids *M. dirhodum,* which stayed for a short time in small numbers, did not lower the ornamental value of roses.

DISCUSSION

Analysing the three years of studies it was found out that rose shrubs were colonised by four aphid species, namely *Macrosiphum rosae* L., *Maculolachnus submacula* Walk., *Chaetosiphon tetrarhodus* Walk., *and Metopolophium dirhodum* Walk. A few years of studies did not find out the presence of such aphid species enumerated by Szelęgiewicz [17] as Rhodobium porosum (Sand.), *Brachycaudus helichrysi* Kalt., *Longicaudus trirhodus* Walk., or *Myzaphis rosarum* Kalt. Absence of *R. porosum* can be explained by the fact that this is a very rare species in Europe [9], in Poland occurring only in glasshouses [4]. *B. helichrysi* aphids appear very rarely on roses. This species occurs above all on plants from the genus of *Prunus* [3]. Aphids of *L. trirhodus* and *M. rosarum* occurred in small numbers on wild rose in the years 1992-1994 [13], and on rugosa rose in the years 1973-1993 [11], and during the studies they were not found at all.

Comparing the numbers of all aphid species in the street site (A) and in the park site (B) the studies found out more numerous populations of those insects in the former one. Exceptionally in 1995, the number of *Maculolachnus submacula* Walk. aphids in that area was slightly lower, while in 1996 aphids of *Metopolophium dirhodum* Walk. did not occur at all (tab. 1). Similar results, but on trees (maple, linden) in urban conditions are provided from the area of Warsaw by Cichocka and Goszczyński [5], and from the area of Poznań by Wilkaniec [20]. The highest numbers of aphids were observed in both areas in 1995, while the lowest were found on juniper shrubs in 1997, and on rose shrubs in 1996.

The dominating species on rose shrubs was *Macrosiphum dirhodum* Walk. Those observations confirmed partial migration of this aphid from roses to *Dipsacaceae*, since it stayed on roses till August or throughout the vegetative period. Similar data are given by Börner and Heinze [2], Cichocka and Goszczyński [4], while according to Lampel [14] this species obligatorily migrates to *Dipsacaceae*. Those aphids occurred in great numbers till the end of June, while in summer the numbers decreased probably due to the weather conditions (dry periods, showers of rain), which destroyed big compact colonies setting young shoots and flower buds. The next appearance in autumn was observed from the third 10-days' period of September to the third 10-days' period of October.

The next frequently appearing species was *Maculolachnus submacula* Walk., whose first colonies were noticed beginning with the first ten days of May. As quoted by Gottschalk [7], in the region of Roztok, the first fundatrix appear a month earlier, probably due to earlier spring in that area. He also states that in November wild rose was free from aphids, which was confirmed by the observations in the Lublin area. Aphids colonised green and woody shoots, moving as far as the root crown, but leaves and flowers were always free from them, which is in accordance with the observations made by Czyżewski [6] and Gottschalk [7].

The other aphid species colonising rose shrubs occurred in small numbers, forming colonies of a few or more individuals on a shrub. *Chaetosiphon tetrarhodus* Walk. aphids did not cause any visible damage, although they appeared in varying numbers throughout the year. Similar data are provided by Achremowicz [1] and Jaśkiewicz [11]. Aphids of Metopolophium dirhodum Walk. occurred in small numbers and for a short period of time (about a month) in spring. No clear damage to the plants was observed.

All the aphid species colonising roses turned out to be sensitive to the decrease of leaf turgor caused by dry periods; then, numerous winged female individuals, which left rose shrubs, appeared in their colonies. After a longer period of drought the shrubs were for some time free from aphids. After heavy stormy rains a considerable part of the population was washed away, which was facilitated by the fact that some feeding aphids stayed on the shoot tops and on flower buds. The studies confirmed the results obtained by other authors [3, 7, 11, 12, 14].

One aphid species was found on common juniper shrubs and that was *Cinara juniperi* De Geer. Szelęgiewicz [17, 18] also speaks about the occurrence of Mordvilka aphid, which, however, appears rarely in Poland, and only in the plateau of the Carpathian mountains. Despite many years of observations, it was not found in Lublin. The presence of *Cinara juniperi* De Geer on shrubs was observed from early spring to the second 10-days' period of September, with varying intensities. It occurred in very small numbers, and the maximum, which informs about the date of the greatest threat for plants, was within the range from a few to several individuals (6.2-19.2 aphids/shrub). The damage caused by *Cinara juniperi* De Geer aphids, although they appeared in small numbers, definitely lowered the ornamental value of juniper shrubs. The data provided by the present studies confirmed earlier studies conducted by Jaśkiewicz [10] on the occurrence of those aphids in the area of parks and housing estates in Lublin.

CONCLUSIONS

1. On common juniper the studies found out the appearance of one species of aphids, namely *Cinara juniperi* De Geer, while on wild rose four species were found: *Macrosiphum rosae* L., *Maculolachnus submacula* Walk., *Chaetosiphom tetrarhodus* Walk., and *Metapolophium dirhodum* Walk.
2. The studies found out more numerous colonisation of shrubs by aphids in the street site (A) as compared to the park one (B).
3. Aphids were most numerous in 1995, because vegetative period started very early.
4. A negative effect on the dynamics of the aphids population was exerted by a delayed vegetative period, drought, high temperatures (over 30^{o}C) and heavy stormy rains. On the other hand, the number of aphids was higher after a mild winter and a warm spring with rainfalls within the norm.
5. The greatest damage lowering the ornamental value of rose shrubs was caused by the dominating species of *Macrosiphum rosae* L., while the ornamental valour of juniper shrubs was lowered by aphids of *Cinara juniperi* De Geer, despite their small numbers.

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