

## THE POPULATION DYNAMICS OF APHIDS *Cinara juniperi* De Geer ON THE SHRUBS OF *Juniperus communis* L. IN URBAN CONDITIONS OF LUBLIN

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**Abstract.** Studies on the population dynamics of aphids *Cinara juniperi* De Geer on the shrubs of *Juniperus communis* L. in the urban conditions of Lublin were conducted in the years 2002–2004 in two types of sites: a street one and a park one. The first individuals of this species were most frequently observed at the turn of April and May, while the maximum population was found in the first half of May. The course of the weather conditions affected the population dynamics of aphids. Those insects were observed in much bigger numbers on the shrubs growing in the street site. The preying of *C. juniperi* caused browning and drying out of the needles and inhibition of the stem growth, which had an influence on lower decorative character of the examined plants.

**Key words:** aphids, *Cinara juniperi* De Geer, *Juniperus communis* L., population dynamics, urban conditions

### INTRODUCTION

All aphids of genus *Cinara* prey on coniferous plants from the families of pines (*Pinaceae*) and cypresses (*Cupressaceae*). They colonize the roots, boughs, stems, branches or needles, without changing the host plant during the season [Blackman and Eastop 1994]. This is a very numerous genus of aphids, including about 200 species, 30 of which occur in Europe, and 26 of them have been found in Poland [Szelegiewicz 1978].

The occurrence of two aphid species from *Cinara* genus on the shrubs of common juniper was established; however, only one of them, *Cinara juniperi* De Geer, appears commonly, causing a considerable decrease of the decorative values of those plants.

The purpose of the present studies was to examine the population dynamics of aphids *Cinara juniperi* De Geer on the shrubs of *Juniperus communis* L. in the urban conditions against the background of weather conditions.

## MATERIAL AND METHODS

The studies were conducted in the years 2002–2004 in the green area of Lublin. *Juniperus communis* L. shrubs growing in two different types of sites with different degrees of air pollution were chosen for observations. The street site (A) was situated in the area of the Czechów district near a street belt of very heavy traffic. The park site (B), on the other hand, was the UMCS Botanical Garden, where a rich collection of about 6,000 plant species is gathered. The plants chosen for studies grow in an alpinarium.

3 shrubs of common juniper were selected for studies in each of the sites. 5 shoots of similar length were randomly chosen on each plant, and aphids were counted on them every 10 days. The observations of plants began in early spring, and finished in late autumn.

Blackman and Eastop's [1994] and Szelegiewicz's [1968] keys were used in order to mark the aphids for the species. The meteorological data was obtained from Department of Agrometeorology of Agricultural University in Lublin.

## RESULTS

The population dynamics of aphids *Cinara juniperi* De Geer on the shrubs of *Juniperus communis* L. in particular sites is presented in Figure 1, while the information concerning the weather conditions in the years of studies is included in Table 1.

### Street site (A)

In site A the first specimens of *C. juniperi* (photo 1) were observed in 2002 at the earliest, in the second decade of April. A mild winter, which contributed to the early beginning of the vegetation period, probably had an influence on the early appearance of aphids (tab. 1). In the first half of May high temperatures with little rainfall were observed and they caused a dynamic growth of the aphid population's number in that period. Their maximum, of 103.7 aphids/shrub, was observed in the first decade of May (fig. 1). Beginning with the middle of May, the aphid number systematically decreased until it completely disappeared in the third decade of June. This situation was probably caused by heavy rains at the beginning of June. Between July and the end of the vegetation period the studied shrubs of common juniper were free from aphids of this species.

In 2003 aphids of that species occurred in site A very irregularly and in small numbers. Only singular specimens were observed during four observations, in first and second decade of August and first and second decade of October.

In 2004, after a delayed period of vegetation, the first aphids *C. juniperi* were observed in site A in the second decade of May. That was at the same time the peak num-



Photo 1. Apterous *Cinara juniperi* De Geer on *Juniperus communis* L.

Fot. 1. Bezskrzydła mszyca *Cinara juniperi* De Geer na *Juniperus communis* L.



Photo 2. Winged specimen of *Cinara juniperi* De Geer on *Juniperus communis* L.

Fot. 2. Uskrzydłony osobnik *Cinara juniperi* De Geer na *Juniperus communis* L.

Table 1. The characteristic of the weather conditions in the years 2002–2004  
 Tabela 1. Charakterystyka przebiegu warunków pogodowych w latach 2002–2004

Month/ Miesiąc	Temperature Temperatura powietrza °C		Rainfalls – Opady mm		Humidity Wilgotność względna %		The day of the month with temperature over 30°C		The day of the month with stormy rainfalls Dzień miesiąca z opadami burzowymi					
	monthly mean średnie miesięczne	many years mean from 1951–2000 średnie wieloletnie z lat 1951–2000	monthly mean sumy miesięczne	many years rainfalls sum from 1951–2000 wieloletnie sumy miesięczne z lat 1951–2000	monthly mean średnie miesięczne	monthly mean średnie miesięczne	Dzień miesiąca z temperaturą powyżej 30°C	Dzień miesiąca z opadami burzowymi	2002	2003	2004			
January Styczeń	-1.6	-3.4	-3.1	-3.6	35.6	23.2	32.7	21.7	87	91	92	-	-	-
February Luty	3.5	-6.2	-1.1	-2.8	45.2	25.0	52.5	24.8	76	88	83	-	-	-
March Marzec	4.7	1.6	2.7	1.0	33.2	6.6	33.9	25.8	69	74	77	-	-	-
April Kwiecień	8.6	6.5	7.9	7.5	18.3	10.7	38.1	40.6	65	65	64	-	-	21
May Maj	17.3	16.3	11.9	13.0	28.6	71.4	38.0	58.3	62	69	70	-	-	17, 10, 11, 9
June Czerwiec	17.8	17.4	15.8	16.5	116.8	39.6	49.9	65.8	71	67	72	20, 21, 23	22	- 4, 13, 6, 27, 8
July Lipiec	21.6	19.8	18.0	17.9	126.2	98.1	90.5	78.0	69	76	84	3, 4, 10, 14, 15, 18, 28, 29, 30, 31	12	19, 4, 11, 1, 5, 19, 22, 19, 26
August Sierpień	20.5	18.9	18.3	17.3	18.7	27.0	48.5	69.7	66	63	85	1, 17, 23	11	19, 20
September Wrzesień	12.9	13.5	12.8	12.9	42.5	29.0	14.2	52.1	75	69	86	-	-	8
October Październik	6.8	5.3	10.1	7.9	92.9	50.1	19.1	40.3	86	88	91	-	-	26
November Listopad	4.7	4.9	1.2	2.5	22.9	17.0	58.2	39.1	85	92	94	-	-	-
December Grudzień	-7.1	0.2	1.3	-1.4	11.7	36.3	17.1	31.5	87	85	92	-	-	-

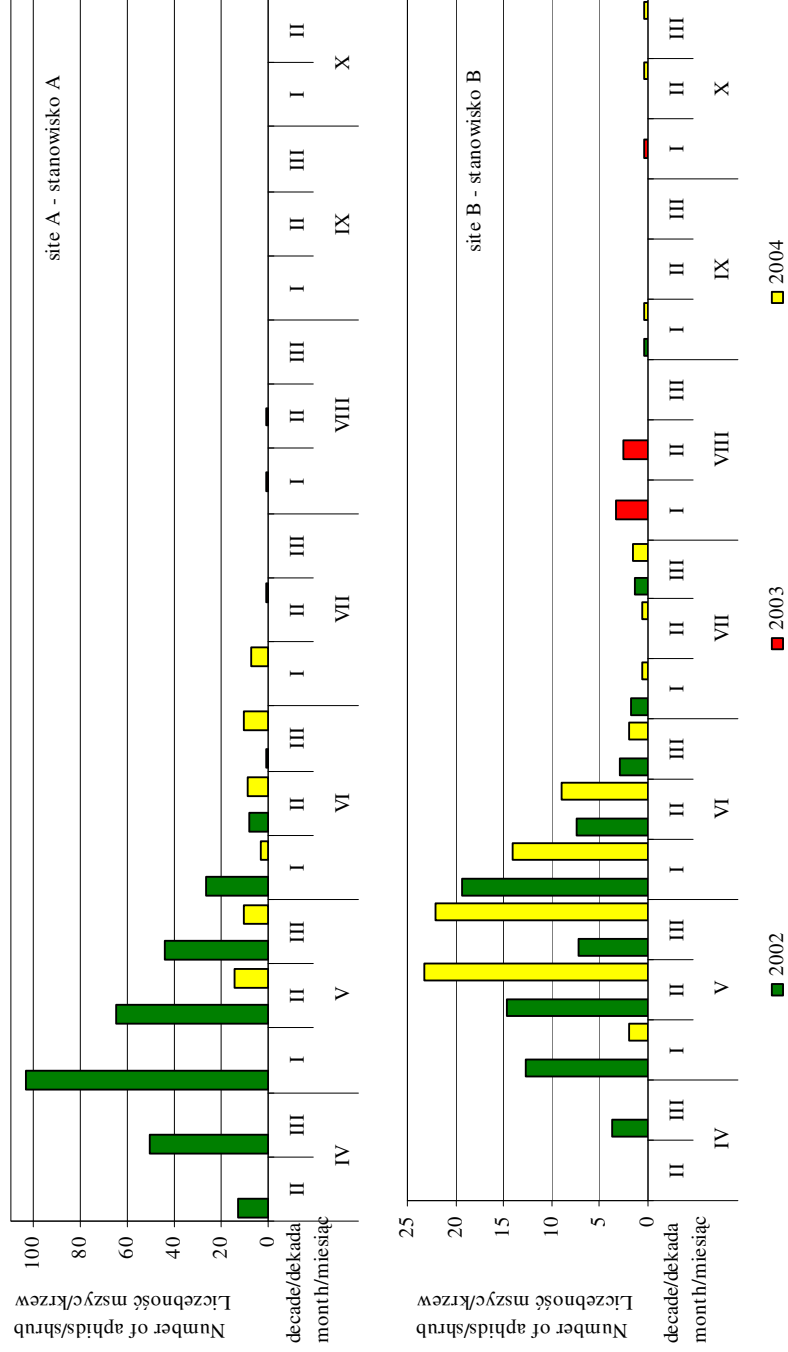


Fig. 1. The population dynamics of aphids *Cinara juniperi* De Geer on the shrubs of *Juniperus communis* L. in 2002–2004  
 Rys. 1. Dynamika populacji mszyc *Cinara juniperi* De Geer na krzewach *Juniperus communis* L. w latach 2002–2004

ber, which was 14.6 aphids/shrub. Between the middle of May and the middle of July aphids colonized the studied shrubs in a very irregular way, their number at that time ranging from 1.0 to 10.6 aphids/shrub. From the third decade of July till the end of the vegetation no presence of aphids was found on the studied plants.

#### **Park site (B)**

In 2002 the first specimens of *C. juniperi* were observed in site B in the third decade of April. In May aphids occurred irregularly, and their number during one observation did not exceed 15 specimens/shrub. In the first decade of June the maximum of 19.3 aphids/shrub was observed (fig. 1). Beginning with the middle of June the aphid number systematically decreased until they disappeared in the third decade of July. Singular specimens were still found on the studied shrubs during one more observation in the first decade of September (photo 1, 2). Between the middle of that month and the end of vegetation the shrubs were free from this species of aphids.

In 2003 the presence of aphids *C. juniperi* was observed in site B only during three observations, in the first half of August and at the beginning of October. The aphid number during one observation did not exceed 4 specimens/shrub.

In 2004 the first individuals of *C. juniperi* were found in the first decade of May. During the successive observation, in the second decade of May, the studies found their maximum of 23.3 aphids/shrub. Between the end of May and the middle of July the number of this species of aphids dropped systematically until its disappearance in the first decade of August. Those aphids were still observed on the studied shrubs three times, in the first decade of September and in the second and third decade of October; however, those were only singular individuals.

Comparing the total number of *C. juniperi* in particular sites during the three years of studies, it can be stated that this species was more than twice as numerous on the shrubs of common juniper in the streets site as compared to the park one.

The presence of aphids *C. juniperi* was observed first of all on the bottom part of young twigs of common juniper, where they preyed individually or in small colonies. They caused, especially in the period of the largest number, browning and drying out of the needles. This brought about inhibition of the stems' growth.

#### **DISCUSSION**

The shrubs of common juniper can be colonized by two species of aphids: *Cinara juniperi* De Geer and *Cinara mordvilkoii* (Pašek) [Szeleńgiewicz 1978]. *C. juniperi* is a species commonly occurring in the area of all Poland [Szeleńgiewicz 1968, Jaśkiewicz 2000a,b, Jaśkiewicz and Bartoszek 2001, Soika and Łabanowski 2001], while the presence of *C. mordvilkoii* was found only in a few sites on the Carpathian highland [Szeleńgiewicz 1978], and their bionomy is not closely recognized [Szeleńgiewicz 1968].

The presence of the first scarce specimens of *C. juniperi* was most frequently observed at the end of April or at the beginning of May, depending on the weather conditions in winter and early spring. This is consistent with the results presented by

Jaśkiewicz [2003]. The maximum number of this species of aphids was usually observed in the first half of May. On the other hand, a few years of earlier studies by Jaśkiewicz i Bartoszek [2001] point out that those aphids reach the maximum much later, at the end of June. Probably, the weather conditions in recent years affected such a situation. These are characterized by warm spring with not too heavy rainfalls, which favour the development of aphids. On the other hand, dry periods at the end of June and in July, with heavy stormy rainfalls, break the population of these insects.

Totally, in the three years of studies those aphids colonized the shrubs in the street site in much greater numbers. This is consistent with earlier results by Jaśkiewicz i Bartoszek [2001].

Injuries caused by *C. juniperi*, manifested by browning and drying out of the needles, considerably lowered the decorative values of the examined plants. Besides, this aphid intensively exudated honey-dew; however, it is rarely visited by ants [Szelegiewicz 1978].

## CONCLUSIONS

1. *Cinara juniperi* De Geer is a one-home, holocyclic species, preying individually or in small colonies on the bottom part of young twigs of common juniper.
2. The first specimens of this species were most frequently observed at the turn of April and May, and the maximum population was reached in the first half of May.
3. The population dynamics of aphids was affected by the course of weather conditions. A warm spring with the rainfalls within the norm favoured the dynamic development of these insects, whereas high temperatures of above 30°C and stormy rainfalls limited the development of this species of aphids.
4. Those aphids were observed in much greater numbers on the shrubs growing in the street site (A) as compared to the park one (B).
5. The preying of *C. juniperi* caused browning and drying out of the needles and inhibited growth of the stems. Those factors negatively affected the decorative value of the studied plants.

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### **DYNAMIKA POPULACJI MSZYC *Cinara juniperi* De Geer NA KRZEWACH *Juniperus communis* L. W WARUNKACH MIEJSKICH LUBLINA**

**Streszczenie.** Badania nad dynamiką populacji mszyc *Cinara juniperi* De Geer na krzewach *Juniperus communis* L. w warunkach miejskich Lublina prowadzono w latach 2002–2004 na dwóch typach stanowisk: przyulicznym i parkowym. Pierwsze osobniki tego gatunku najczęściej notowano na przełomie kwietnia i maja, a maksimum populacji w pierwszej połowie maja. Na dynamikę populacji mszyc miał wpływ przebieg warunków pogodowych. Owady te znacznie liczniej obserwowano na krzewach rosnących na stanowisku przyulicznym. Żerowanie miodownicy jałowcowej powodowało brązowienie i usychanie igieł oraz zahamowanie wzrostu pędów, co miało wpływ na obniżenie dekoracyjności badanych roślin.

**Słowa kluczowe:** mszyce, *Cinara juniperi* De Geer, *Juniperus communis* L., dynamika populacji, warunki miejskie

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