

The Population dynamics of *Aphis pomi* De Geer on *Cotoneaster divaricatus* Rehd. et Wils.

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Introduction

Aphis pomi De Geer occurs in many European countries (RIPKA *et al.*, 1998), Asia and North America (BLACKMAN & EASTOP, 2000). It is also very common in Poland, where its presence is forecasted. Until recently it has been considered to be a cosmopolitan species (SZELEGIEWICZ, 1968). *A. pomi* is a relatively xerophilous oligophagous species which feeds on many different trees and shrubs from the *Pomoideae* subfamily. It is most often encountered on plants of the *Malus*, *Cotoneaster*, *Crataegus*, *Cydonia*, *Pyrus*, *Sorbus* and *Mespilus* genus (BLACKMAN & EASTOP, 2000; SZELEGIEWICZ, 1968).

The aim of the three-year research carried out in different types of sites was to control the population dynamics of *Aphis pomi* on *Cotoneaster divaricatus* Rehd. et Wils. as set against weather conditions.

Material and methods

Research concerning the *Aphis pomi* population dynamics on *Cotoneaster divaricatus* shrubs was carried out in 2002-2004 in the urban area of the city of Lublin. Shrubs grown in two different types of sites, i.e. by the road and in the park were selected for the research use. The site located by the road (A) which typically had high traffic congestion was located in the south-eastern part of the Lublin city. Site (B) was situated in the Botanical Garden of the Marie Skłodowska-Curie University in Lublin (UMCS).

In each of the studied sites, 3 shrubs of *C. divaricatus* which grew close to each other were selected. Five shoots of similar length were selected at random. Since early spring until late autumn larvae and wingless and winged *A. pomi* specimens were counted in ten-day intervals.

Meteorological data was obtained from the Department of Agrometeorology of the Agricultural University in Lublin.

Results

The dynamics of *Aphis pomi* population settling *Cotoneaster divaricatus* shrubs throughout three years of research is presented in Fig. 1., while data concerning the weather in Tables 1. and 2.

In 2002 after a mild winter which contributed to early onset of plant vegetation, first specimens of *A. pomi* in site A appeared in the first decade of May. The first two weeks of May had a relatively high temperature and small amount of rainfall. Such conditions favoured a dynamic development of *A. pomi* population leading to a maximum growth in their number in the second decade of May, which amounted to 145.9 aphids/ shrub. During subsequent observations there was a decrease in the number of aphids, in the first decade of June only 20.3 aphids/ shrub were recorded. Probably the abundant rainfall, which took place in the beginning of June, was the reason for such a situation (Tab. 2.). *A. pomi* aphids infested the studied shrubs until mid-October with varying intensity, but their number during one observation was not more than 22 aphids/ shrub.

Table 1. Course of weather condition in 2002-2004

Month	Air temperature [C]				Rainfall [mm]				Humidity relative [%]		
	Means from months			Means from many years': 1951-2000	Monthly in total			Many years' montly in total, means: 1951-2000	Monthly means		
	2002	2003	2004		2002	2003	2004		2002	2003	2004
January	-1.6	-3.4	-3.1	-3.6	35.6	23.2	32.7	21.7	87	91	92
February	3.5	-6.2	-1.1	-2.8	45.2	25.0	52.5	24.8	76	88	83
March	4.7	1.6	2.7	1.0	33.2	6.6	33.9	25.8	69	74	77
April	8.6	6.5	7.9	7.5	18.3	10.7	38.1	40.6	65	65	64
May	1.3	16.3	11.9	1.0	28.6	71.4	38.0	58.3	62	69	70
June	1.8	17.4	15.8	16.5	116.8	39.6	49.9	65.8	71	67	72
July	2.6	19.8	18.0	17.9	126.2	98.1	90.5	78.0	69	76	84
August	2.5	18.9	18.3	17.3	18.7	27.0	48.5	69.7	66	63	85
September	1.9	13.5	12.8	12.9	42.5	29.0	14.2	52.1	75	69	86
October	6.8	5.3	10.1	7.9	92.9	50.1	19.1	40.3	86	88	91
November	4.7	4.9	1.2	2.5	22.9	17.0	58.2	39.1	85	92	94
December	-7.1	0.2	1.3	-1.4	11.7	36.3	17.1	31.5	87	85	92

Table 2. Days with the air temperature above 30°C and thunderstorms rainfall in 2002-2004

Year	Temperature above 30°C		Thunderstorms rainfall	
	month	day	month	day
2002	April		April	21
	May		May	17, 24, 26
	June	20, 21, 23	June	4, 13
	July	3, 4, 10, 14, 15, 18, 28, 29, 30, 31	July	4, 11, 19
	August	1, 17, 23	August	1
	September		September	8
	October		October	26
2003	May		May	
	June	22	June	10, 11
	July	12	July	6, 27, 30
	August	11	August	1, 5, 19, 22, 26
2004	May		May	9
	June	19, 21, 22	June	8
	July	19, 20	July	19
	August		August	9

In the B site first infrequent aphids appeared in the second decade of May. In June and in the first two weeks of July they occurred on the studied shrubs irregularly. Since the end of July the number of *A. pomi* systematically grew, and in the third decade of August their maximum number was recorded amounting to 114.0 aphids/ shrub. The month of September had a high number of aphids on the studied shrubs in comparison to the spring and summer months. The colony disappeared in the beginning of November.

In 2003, first and quite numerous colonies of *A. pomi* were registered in site A in the second decade of May. During the next three observations the number of aphids slightly decreased which was probably caused by thunderstorms which took place at this time. The maximum number which amounted to 198.4 aphids/ shrub was registered in the third decade of June. High temperature of above 30°C and heavy thunderstorm which took place in the first two weeks of July inhibited *A. pomi* development. Since the third decade of July until the second decade of October aphids occurred irregularly but in quite large numbers. They disappeared completely in the third decade of October.

In site B, *A. pomi* aphids were registered only during three observations in the end of June and the beginning of July. The highest number which amounted to 27.7 aphids/ shrub was recorded in the first decade of July.

In 2004 despite a delayed growth season numerous aphids appeared in site A as early as the first decade of May. Relatively warm May and June with rainfall below the norm favoured aphid development. The maximum number

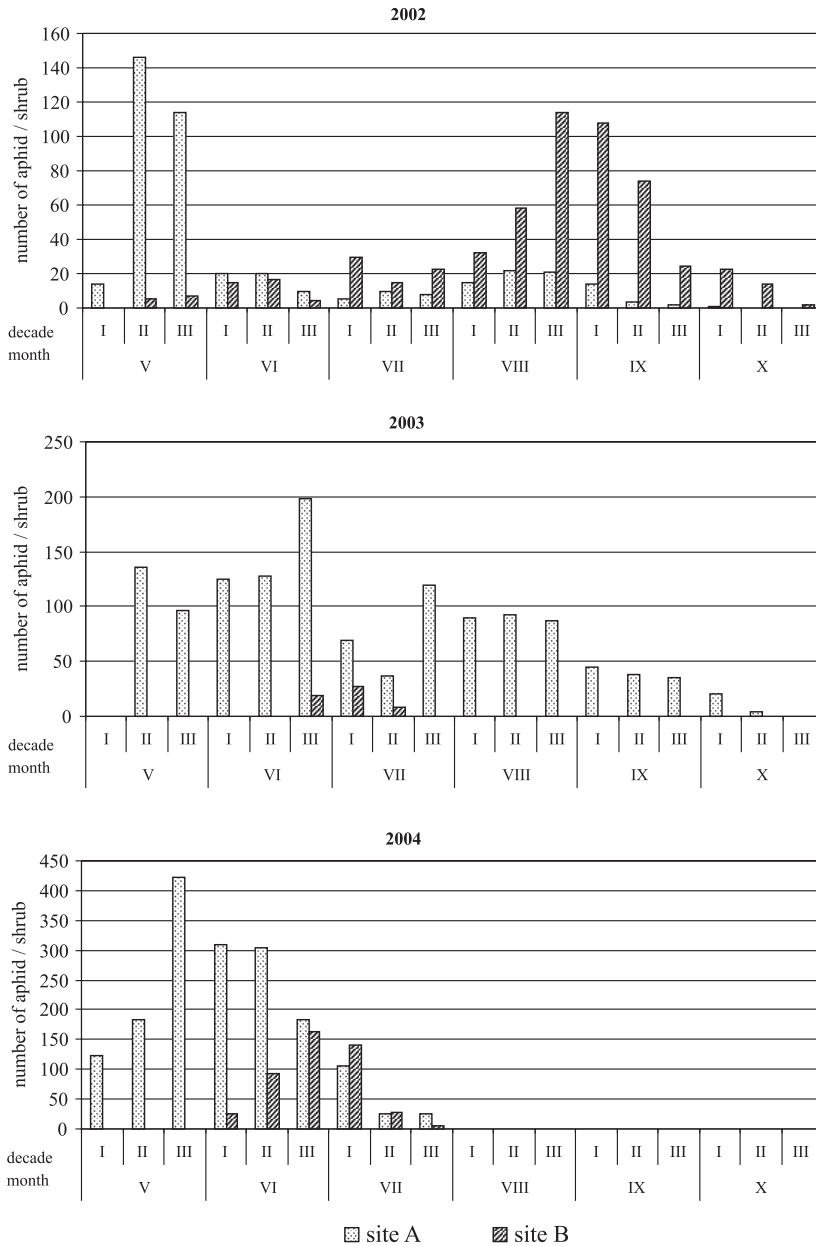


Fig. 1. The Population dynamics of *Aphis pomi* De Geer on *Cotoneaster divaricatus* Rehd. et Wils. on particular sites in 2002-2004

which amounted to 422.3 aphids/ shrub was registered in the third decade of May. In subsequent observations the number of aphids in colonies systematically decreased until complete disappearance which was recorded in the first decade of September. In site B first aphids were recorded approximately one month later in comparison to site A in the first decade of June. The maximum number which amounted to 164.0 aphids/ shrub was registered in the third decade of this month. In the studied site, aphids settled *C. divaricatus* shrubs for quite a short period of time and since the first decade of August these plants were aphid free.

A. pomi usually fed on the top parts of shoots and leaves of *C. divaricatus* which led to deformation of leaves. The leaves, which were infested by aphids, were curling inwards while the shoots were becoming shorter and shorter. This made the shrubs less attractive in terms of their decorative quality. Another factor which influenced the decrease of plant value was the honeydew which was excreted by aphids in large quantities. On this honeydew saprophytic fungi developed and other impurities additionally marred the plants. Moreover, the honeydew attracted ants which attended aphid colonies in large numbers.

Discussion

On *C. divaricatus* shrubs so far the presence of three aphid species was confirmed: *A. pomi*, *A. fabae* (Scop.) and *Rhopalosiphum insertum*, (Walk.), however, *A. pomi* is always a species which is considered to dominate on this plant (JAŚKIEWICZ 2003; 2004b). This aphid occurred quite numerously in each year of the research in both sites. It was more likely to settle plants on the site located by the road in 2003 and 2004 which is in accordance with conclusions by CICHOCKA & GOSZCZYŃSKI (1991), who claim that these insects with piercing-sucking mouth apparatus are more frequent on sites with a large degree of antropopressure. However, in 2002 aphids were more numerous in the site located in the park which is in accordance with results presented by JAŚKIEWICZ (2004a) from 1999-2001.

A. pomi fed on the studied shrubs since spring until early Autumn and the highest number was most often recorded in May and June depending on the year of research and site. This is in line with research results published previously by JAŚKIEWICZ (2004a).

In the spring aphids settled top parts of the plants leading to the deformation of their leaves and shoots. CICHOCKA (1980) described similar effects of feeding caused by this species on fruit-growing plants and JAŚKIEWICZ (2000, 2004b) on maule's quince (*Chaenomeles japonica* Thunb.) and spreading cotoneaster (*Cotoneaster divaricatus* Rehd. et Wils.).

The aphid population dynamics was influenced by weather conditions. Warm spring with little rainfall favoured their development whereas high temperature and thunderstorms in the summer reduced the aphid colony number (JAŚKIEWICZ, 1997; 2004a).

Conclusions

1. *Aphis pomi* fed on shrubs of *Cotoneaster divaricatus* in all research years in both sites of the research which were located by the road and in the park.
2. More numerous colonies of this species were registered on shrubs growing in the site by the road.
3. The presence of *A. pomi* was registered throughout the entire growth season, and their maximum number was most often recorded to take place in May or June, depending on the research year and type of site.
4. *A. pomi* settled topmost parts of shoots and its feeding caused the deformation of leaves and shoots. The increase of attacked shrubs was inhibited and shoots which easily froze during winter tended to be attacked most severely. The feeding of *A. pomi* on *C. divaricatus* shrubs lowered their decorative value.
5. Weather conditions had a significant impact on aphid population dynamics. A delayed growth season, air temperature above 30°C as well as thunderstorms greatly inhibited the number of aphids.

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Streszczenie

Badania dotyczące dynamiki populacji *Aphis pomi* De Geer na krzewach *Cotoneaster divaricatus* Rehd. et Wils. prowadzono na stanowisku przyulicznym i parkowym w latach 2002-2004. Obecność *A. pomi* obserwowano przez cały okres wegetacji, a maksimum liczebności przypadało najczęściej w maju lub w czerwcu, w zależności od roku i stanowiska. Liczniejsze kolonie tego gatunku obserwowano na krzewach rosnących na stanowisku przyulicznym. *A. pomi* zasiedlała szczytowe części pędów, jej żerowanie powodowało deformację liści i pędów. Opóźniony okres wegetacji, temperatury powietrza powyżej 30°C oraz opady typu burzowego znacznie ograniczały liczebność tych owadów.

