

Aphid males in urban green space

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Introduction

The research on aphid fauna, which has been carried out for a dozen or so years in the green space of the Poznań city has proved great diversity and stability of aphid presence (RUSZKOWSKA & WILKANIEC, 2002; SZTUKOWSKA & WILKANIEC, 2006; WILKANIEC, 1999; 2001; 2004). The presence of males in aphid populations with the consideration of the time of their appearance in growth season is an interesting phenomenon.

Material and methods

The research was carried out in the city of Poznań in 2005-2006 in two sites: green spaces around the buildings of the Agricultural University in Dąbrowskiego Street (3-ha plantation of numerous trees species and ornamental shrubs) and the Botanical Garden of the Adam Mickiewicz University (22 ha, 8000 botanical taxons). The aphids were captured into Moericke traps each year throughout the entire growth season from May until the end of October. Aphid samples were collected with decade-long intervals. Five and ten traps were placed respectively in the first site of the green spaces in Dąbrowskiego Street (GS) and in the Botanical Garden (BG).

Results

Throughout the two years of research, which was carried out in 2005-2006 the presence of 44 species or groups of aphid species represented by 17 000 specimens

were registered in selected green areas of the city of Poznań. Twenty species were common in both sites. In the autumn in the GS site 27 species were registered and in the BG there were 34 aphid taxons (Tab. 1. and 2.). *Rhopalosiphum padi* (L.) was the most numerous in GS, where it constituted almost 92%, and in BG 52% of all the collected males. In the Botanical Garden another species *Hyperomyzus picridis* (Börn.) was also numerous next to *R. padi*, amounting to 34.8% of all the males in this site. *Drepanosiphum platanoidis* (Schrk.) and *Capitophorus elaeagni* (del Gu) also appeared in high numbers in both sites, whereas *Euceraphis betulae* was frequent in GS (several hundreds of specimens/ 2 seasons) (Tab. 1. and 2.). *Hyperomyzus lactucae* (L.), *Phorodon humuli* (Schrk.), *Aphis fabae* Scop. and *Myzus persicae* Sulz. were also represented by several dozens of males. All the remaining species were present in smaller numbers in groupings.

In the autumn first males appeared in the first decade of September. Gradually their share in subsequently collected samples increased amounting from 40 to 77.6% of all the collected aphids in the third decade of October (Fig. 1.). Species diversity was formed in a similar way, amounting to its highest number towards the end of season (26 species was the maximum amounted to in the third decade of October in a sample from BG) (Fig. 2).

The number of samples in a season was connected with time and weather conditions. Warm, windless weather with little rainfall favoured mass migration (Fig. 3.).

An unexpected phenomenon was the appearance of aphid males in samples collected in a much earlier period of the season, i.e. in June and July. Totally in both sites in both seasons 55 males of one species (*Brachycaudus divaricatae* Shaposhnikov 1965) were collected (Tab. 3.). First males of this species were observed to appear in the traps in the second decade of June, and the last ones a month later.

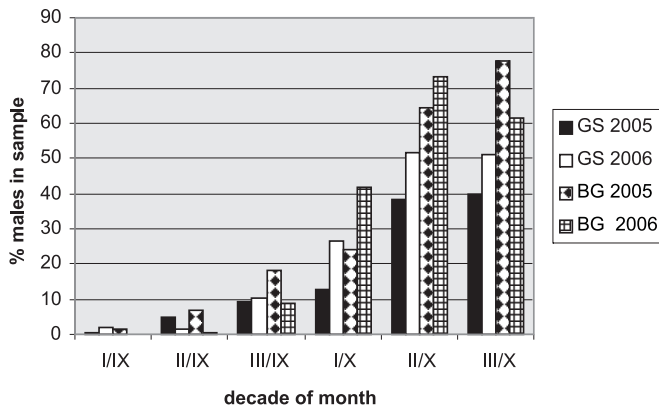


Fig. 1. Percentage share of males in Moericke trays in green spaces (GS) and in Botanical Garden (BG) in Poznań, in 2005-2006

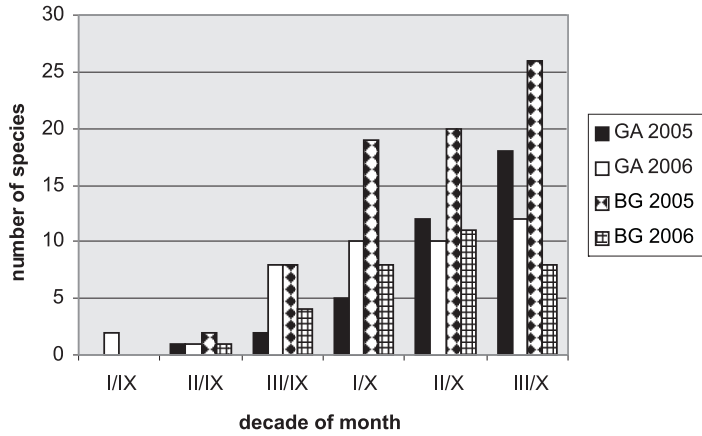


Fig. 2. Male species diversity in green spaces (GS) and in Botanical Garden (BG) in Poznań, in 2005-2006

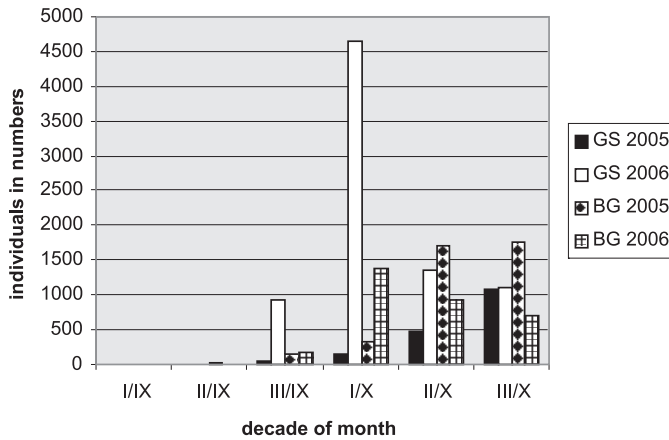


Fig. 3. Male individuals in numbers in green spaces (GS) and in Botanical Garden (BG) in Poznań, in 2005-2006

Table 1. The number of aphid males collected from green spaces around the buildings of the Agricultural University in Dąbrowskiego Street in 2005-2006

Species	Year and monthly decade											Total
	2005					2006						
	September		October			September			October			
	II	III	I	II	III	I	II	III	I	II	III	
<i>Rhopalosiphum padi</i> (L.)	1=	47	148	418	660	1	7	929	4575	1262	962	9010
<i>Tinocallis platani</i> (Kalt.)	2											2
<i>Drepanosiphum platanoidis</i> (Schrk.)		2	6	16	117	1		4		23	14	183
<i>Myzus lythri</i> (Schrk.)			1	1	1							3
<i>Eucallipterus tiliae</i> (L.)			1		1				6	2	1	11
<i>Impatiens asiaticum</i> (Nevsky)			1									1
<i>Myzus cerasi</i> (F.)					2						5	7
<i>Rhopalomyzus loniceræ</i> (Mordv.)				4	2				1	2		9
<i>Phorodon humuli</i> (Schrk.)				1	9				1		3	14
<i>Rhopalosiphum insertum</i> (Walk.)					1							1
<i>Periphyllus testudinaceus</i> (Fern.)					9				1	2	5	17
<i>Metopolophium dirhodum</i> (Walk.)				1	3			1	1			6
<i>Dysaphis crataegi</i> (Kalt.)					4			1				5
<i>Hyperomyzus picridis</i> (Börn.)				3	5			1	30	11	3	53
<i>Hyperomyzus lactucae</i> (L.)				9					11	3	2	25
<i>Capitophorus elaeagni</i> (del Gu.)				5	136				18	50	103	312
<i>Aphis fabae</i> (Scop.)					5				3			8
<i>Myzus persicae</i> (Sulz.)				1	13					2	3	19
<i>Ceruraphis eriophori</i> (Walk.)					1						1	2
<i>Euceraphis betulae</i> (Koch)				5	106							111
<i>Drepanosiphum aceris</i> (Koch)					1							1
<i>Cryptomyzus galeopsidis</i> (Kalt.)				1								1
<i>Macrosiphum rosae</i> (L.)											1	1
<i>Ovatus insitus</i> (Walk.)								1		1		2
<i>Cavariella aegopodii</i> (Scop.)								1				1
<i>Corylobium avellanae</i> (Schrk.)							2					2
<i>Trichosiphonaphis corticis</i> (Aizenb.)								2				2
Species in decade in numbers	1	2	5	12	18	2	1	8	10	10	12	
Species in season in numbers	22					20						27
Specimens in decade in numbers	3	49	157	465	1076	2	9	940	4647	1358	1103	9809
Specimens in season in numbers	1750					8059						

Discussion

The appearance of male aphids in the autumn when first oviparous females are encountered is a normal phenomenon in a moderate climate. The formation of sexuales in aphids depends on the photoperiod and is initiated by an adequate critical value for a given region and species (TAYLOR *et al.*, 1998).

Temperature is a factor that modifies to some extent this phenomenon. So far this phenomenon of occurrence has been referred to as the so-called 'unseasonal' males (TAYLOR *et al.*, 1998). It concerns geographical regions which have relatively mild winters, e.g. in Europe this takes place in Great Britain, where the oceanic climate has an enormous influence on this. The occurrence of about 30 aphid species, the males of which appear in spring or early summer was confirmed there. This phenomenon is explained by the presence of androcyclic clones in aphid populations which, as opposed to holocyclic clones, do not possess a clock mechanism which would prevent them from a reaction to a short day in the spring. According to TAYLOR *et al.* (1998) species which are characterised by scarce presence of 'unseasonal' males in relation to normal ones typically have a small share of androcyclic clones in relation to the holocyclic ones which are present in a population. The fact that the number of early males in Great Britain is larger following a mild winter proves this hypothesis.

Table 2. The number of aphid males collected from the Botanical Garden of the Adam Mickiewicz University in 2005-2006

Species	Year and monthly decade										Total
	2005					2006					
	September		October			September		October			
	II	III	I	II	III	II	III	I	II	III	
<i>Rhopalosiphum padi</i> (L.)	27	123	281	296	404	1	163	1324	520	611	3750
<i>Drepanosiphum platanoidis</i> (Schrk.)	4	4	11	15	64			3	345		446
<i>Hyperomyzus picridis</i> (Börn.)		4	14	1302	1086	1	43	59			2509
<i>Rhopalomyzus lonicerae</i> (Mordv.)		3	9	12	7	1					32
<i>Drepanosiphum aceris</i> (Koch)		1	1		1						3
<i>Periphyllus hirticornis</i> (Walk.)		1									1
<i>Calaphis betulicola</i> (Kalt.)		1		1	1			2			5
<i>Euceraaphis betulae</i> (Koch)		2	1	16	12						31
<i>Aphis fabae</i> (Scop.)			1	7	21			2	3		34
<i>Phorodon humuli</i> (Schrk.)			3	17	18	1	1	3	5		48
<i>Aphis</i> spp.			2		5			1	2	5	15
<i>Myzus cerasi</i> (F.)			1	10	4						15
<i>Cryptomyzus galeopsidis</i> (Kalt.)			2		1						3
<i>Dysaphis plantaginea</i> (Pass.)			1	2	4						7
<i>Dysaphis crataegi</i> (Kalt.)			1					1			2
<i>Hyperomyzus lactucae</i> (L.)			2	9	18			3	1		33
<i>Myzus persicae</i> (Sulz.)			3	7	13			1			24
<i>Myzus lythri</i> (Schrk.)			2	1	13					1	17
<i>Capitophorus elaeagni</i> (del Gu.)			1	6	74			8	1	79	169
<i>Capitophorus similis</i> (V.D.Goot)			1								1
<i>Periphyllus testudinaceus</i> (Fern.)			1	7	5			1			14
<i>Hyperomyzus lampsanæ</i> (Börn.)				2							2

<i>Metopolophium dirhodum</i> (Walk.)				5	10						15
<i>Rhopalosiphum insertum</i> (Walk.)				2							2
<i>Callipterinella calliptera</i> (Htg.)				1					2		3
<i>Rhopalosiphum nymphaeae</i> (L.)				1							1
<i>Ceruraphis eriophori</i> (Walk.)					3						3
<i>Nasonovia ribisnigri</i> (Mosl.)					1						1
<i>Brachycaudus helichrysi</i> (Kalt.)					2						2
<i>Cryptomyzus ribis</i> (L.)					1						1
<i>Liosomaphis berberidis</i> (Kalt.)					1						1
<i>Myzus ligustri</i> (Mosl.)					1						1
<i>Calaphis flava</i> (Mordv.)					1						1
<i>Trichosiphonaphis corticis</i> (Aizenb.)							1				1
Species in decade in numbers	2	8	19	20	26	1	4	8	11	8	
Species in season in numbers	33					16					34
Specimens in decade in numbers	31	139	338	1719	1771	1	166	1383	938	707	7193
Specimens in season in numbers	3998					3195					

Table 3. Unseasonal males of *Brachycaudus divaricatae* caught in Poznań green spaces, in 2005-2006

Site	Year and decade of month							Total	
	2005				2006				
	June		July		June		July		
	II	III	I	II	II	III	I		
Green spaces in Dąbrowskiego Street		2	3			16	2	1	24
Botanical Garden	2	7		2		15	5		31
In season totally	16				39			55	

In Poland, the only reference to the presence of early males is provided by Wilkaniec (2003), whose research from 2000 was carried out in non-arable grounds in the agricultural landscape of Wielkopolska. The presence of 'unseasonal' males of *R. padi* was then confirmed. This may well prove the existence of anholocyclic clones of this taxon in western Poland.

The appearance of early males of *B. divaricatae* is difficult to explain by means of the same mechanism especially since a severe winter before the growth season of 2005. A possibility for *B. divaricatae* to survive in a stage of development other than the stage of an egg seems very unlikely. Another possible explanation of the presence of this species in the region of Wielkopolska is the recent increase of the region of its so far presence in central Europe. In Poland it was observed for the first time in the south of the country in very numerous populations developing on cut hedges of cherry plum (*Pru-*

Prunus cerasifera Ehrh. ssp. *divaricata* C.K. Schneid.) in Lublin in 2002 (CICHOCKA & LUBIARZ, 2003) (RAKAUKAS & CICHOCKA, 2005).

In Wielkopolska its presence was proved for the first time in the above quoted references. At present in the 2007 season, after two years since the first appearance was registered the species was observed in large numbers on *Prunus*. It was recorded in many sites both in urban green spaces as well as away from the city. The species is easily spotted because its feeding causes very peculiar changes on plants such as leaf curling of apical young shoots of cherry plum. Aphids themselves can quite easily be differentiated from other species of the *Brachycaudus*, which may settle this plant, by means of colour. The wingless viviparous are not green but black and shiny on the dorsal part and dark-brown on the ventral side. In the Botanical Garden this species was registered also on *Prunus salicina* Lindl., which originally comes from China.

RAKAUSKAS & TURCINAVIVIENE (2006) in an extensive paper on the bionomy, morphology and geographical distribution of *B. divaricatae* provide much interesting information concerning this species. They point out to, among other things, its quick spreading in recent years towards the north-western direction in relation to the previously occupied zone (Middle East and Eastern Europe). The Lithuanian populations go through a shortened developmental cycle on cherry plum, where sexuales and egg laying take place towards the end of June. In Lithuania no possibility of species development on *Silene alba* (Mill.) as a secondary host for this primarily host alternating species was confirmed. The authors assess that in Poland and Lithuania it can be considered harmful on cherry plums and potentially damaging to other species of the *Prunus* genus. This information is in accordance with results of the observation on cherry plum carried out in the area of the city of Poznań in the season of 2007, where this aphid appeared in a large number. Further research is required to obtain detailed data concerning its development.

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Samce mszyc odławiane w miejskich terenach zieleni

Streszczenie

Badania prowadzono w dwóch stanowiskach w wybranych terenach zieleni Poznania w latach 2005-2006. Mszyce odławiano każdego roku przez cały sezon wegetacyjny od maja do października metodą pułapek Moerickego. Próby mszyc zbierano w odstępach dekadowych.

W obu stanowiskach stwierdzono występowanie samców 44 gatunków lub grup gatunków mszyc, ponad 17 000 osobników. Najliczniej reprezentowane były w odłowach samce *Rhopalosiphum padi* i *Hyperomyzus picridis*. Licznie wystąpiły: *Drepanosiphum platanooidis*, *Capitophorus elaeagni* i *Euceraphis betulae* (kilkaset osobników/2 sezony) oraz *Hyperomyzus lactucae*, *Phorodon humuli*, *Aphis fabae* i *Myzus persicae* (kilkadziesiąt samców/2 sezony). Samce pozostałych gatunków wystąpiły mniej licznie. Jesienią pierwsze samce pojawiały się w pierwszej dekadzie września. Później w sezonie ich udział w kolejnych próbach stopniowo wzrastał, osiągając w trzeciej dekadzie października poziom 40-78% wszystkich mszyc.

Nieoczekiwanym zjawiskiem, które odnotowano było pojawienie się samców znacznie wcześniej w sezonie bo już w czerwcu i lipcu. Były to samce *Brachycaudus divaricatae*, nowego dla Wielkopolski gatunku zasiedlającego ałyczę. Rozpoznanie jego bionomii wymaga kontynuacji badań.