

Aphids and their predators occurring on some shrubs in the Botanic Garden of the Jagiellonian University in Kraków

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ABSTRACT

The aim of observations carried out in the years 2008-2009 in the Botanic Garden in Kraków was to determine the population dynamics of *Aphis fabae* Scopli, 1763 on *Viburnum opulus* L., *Cryptomyzus ribis* (Linnaeus, 1758) on *Ribes sanguineum* Pur-sch, *Rhopalosiphum padi* (Linnaeus, 1758) on *Padus avium* Mill. and *Liosomaphis berberidis* (Kaltenbach, 1843) on *Berberis thunbergii* 'Atropurpurea' as well as the species composition of predatory insects (Syrphidae, Coccinellidae) occurring in their colonies. In both years of observation the largest aphid colonies were registered on *P. avium* and *B. thunbergii* whereas the smallest on *R. sanguineum*. In the year 2008 – 11 species and in the year 2009 – 8 species of Syrphidae were recorded. In both research years *Episyrphus balteatus* (De Geer, 1776), and *Epistrophe eligans* (Harris, 1780) dominated, constituting over 50% of all collected syrphids. The presence of 5 species of Coccinellidae in 2008 and 6 species in 2009 was registered. *Adalia bipunctata* (Linnaeus, 1758) and *Coccinella septempunctata* Linnaeus, 1758 turned out to be the most numerous species as they constituted 72% of all coccinellids in 2008 and 62% of the same in 2009. The largest number of specimens and species of Syrphidae and Coccinellidae was registered in *R. padi* colonies on a bird-cherry and in *L. berberidis* colonies on a barberry.

KEY WORDS: aphids, syrphids, coccinellids, botanic garden

INTRODUCTION

Ornamental shrubs are a valuable element of urban green plantings due to their decorative shape, leaves and colorful, fragrant flowers. Their decorative values are largely limited by the insects feeding on them, especially aphids, which increase in number in urban areas, as has been reported by many authors (CICHOCKA & GOSZCZYŃSKI, 1991; 2008; JAŚKIEWICZ, 1995; 1996; 2004; BUDZIŃSKA & GOSZCZYŃSKI, 2010).

Aphid colonies inhabit leaves on the top parts of shoots, stalks and flowers, and their feeding results in hampering the shoot growth. The attacked leaves are twisted and deformed, covered with red galls and spots, flowers are deformed and whole shrubs are covered with honeydew on which sooty mould develops, limiting the assimilation area (WNUK & GOSPODAREK, 1999; JAŚKIEWICZ 2000; JAŚKIEWICZ *et al.*, 2001; WOJCIECHOWICZ-ŻYTKO, 2004; BOROWIAK-SOBKOWIAK & WILKANIEC, 2010).

The population of aphids is limited by numerous groups of predatory insects, among which Syrphidae and Coccinellidae play a major role (JAŚKIEWICZ *et al.*, 2001; WNUK, 2000; 2004; 2005; WOJCIECHOWICZ-ŻYTKO, 2009).

The aim of this work was to determine the role of the predatory Syrphidae and Coccinellidae in reducing the population of aphids feeding on ornamental shrubs in the Botanic Garden of the Jagiellonian University in Kraków.

MATERIAL AND METHODS

The research was carried out in the years 2008-2009 on the following shrubs: *Viburnum opulus* L. *Ribes sanguineum* Pursch, *Padus avium* Mill. *Berberis thunbergii* 'Atropurpurea', (three shrubs of these species) in the Botanic Garden of the Jagiellonian University. Ten shoots with aphid colonies were selected on each shrub on which, at weekly intervals from April until June, aphids and predatory larvae of syrphids as well as adults and larvae of coccinellids were counted. The larvae of Syrphidae were collected from the remaining shoots and reared in Petri dishes until they pupated.

Adult specimens of Syrphidae were identified in terms of species on the basis of keys developed by BAŃKOWSKA (1963) and VAN VEEN (2004) whereas Coccinellidae were identified on the basis of BIELAWSKI'S (1959) key.

The naming of Syrphidae species was based on SOSZYŃSKI (1991).

RESULTS AND DISCUSSION

In both years of observations aphids were present in similar intensity. They appeared on all observed shrubs in the first decade of April (Fig. 1).

On a bird-cherry *Rhopalosiphum padi* (Linnaeus, 1758) colonies grew in number very quickly and they reached their maximum towards the end of April and at the beginning of May. At this time they constituted colonies which amounted to 250 (2009) – 270 (2008) specimens/tip. The aphids fed on the upper side of leaves, inflorescences and on the tops of shoots. *R. padi* formed 3 generations on a bird-cherry and afterwards migrated onto the summer hosts (grasses, including most cereal crops). The aphids disappeared during the third decade of May (2008) and at the beginning of June (2009).

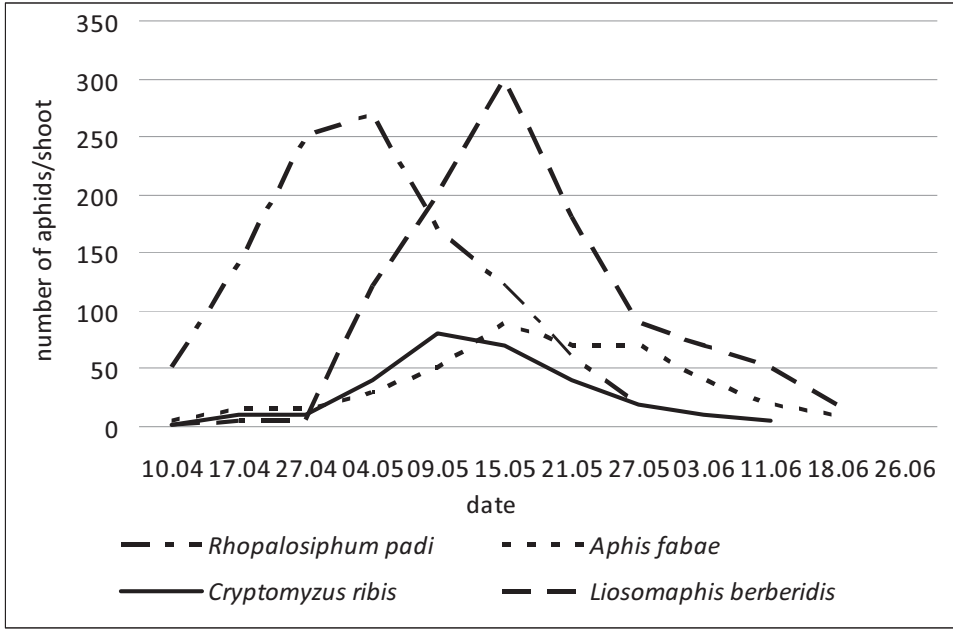
On other shrubs the aphids reached their maximum of appearance later, i.e. in the second decade of May. The most numerous colonies were observed on a barberry 200 (2009) -300 (2008) specimens of *Liosomaphis berberidis* (Kaltenbach, 1843)/tip, whereas the smallest colonies were encountered on a currant bush – 30 (2009) – 80 (2008) specimens of *Cryptomyzus ribis* (Linnaeus, 1758)/tip (Fig. 1). On a currant bush the aphids settled on the underside of leaves. As a result of their feeding very characteristic wine-red colour blisters appeared on the upper surfaces of leaves. *Aphis fabae* Scopoli, 1763 on a barberry and a viburnum fed on tops of shoots and the undersides of leaves, which resulted in hampering the shoot growth; the attacked leaves were twisted and deformed while shrubs were covered with honeydew on which sooty mould developed. It covered the leaves and limited the assimilation area, at the same time decreasing the ornamental value of those plants. After the maximum of appearance the aphids number was decreasing as a result of migrations to summer hosts as well as predators' activity until they finally disappeared in the second/third decade of June (Fig. 1).

On a golden currant bush JAŚKIEWICZ (2000) observed 5 aphid species: *Aphis schneideri* (Börner, 1940), *Aphis grossulariae* Kaltenbach, 1843, *Nasonovia ribisnigri* (Mosley, 1841), *Cryptomyzus ribis* (Linnaeus, 1758) and *Cryptomyzus galeopsidis* (Kaltenbach, 1843). The most common species was *A. schneideri*, whereas the least numerous was *C. ribis*.

GOSPODAREK (2007), while analyzing the influence of air pollution on the appearance of *A. fabae* on a Sweet Mock Orange observed the occurrence of the first aphid colonies at the beginning of May (during the period of the maximum of appearance the size of colonies amounted to 700-1000 specimens) whereas WOJCIECHOWICZ-ŻYTKO (2009) registered first aphids in mid-April, and observed colonies of 150-300 specimens during the maximum of their occurrence.

JAŚKIEWICZ *et al.* (2001), during the three-year studies on *L. berberidis* found out that weather conditions had a significant impact on the aphids occurrence – first aphids started appearing from the mid-April to mid-May depending on the year of observation. JAŚKIEWICZ (1995) recorded the maximum of aphids infestation beginning towards the end of May until the end of June.

2008



2009

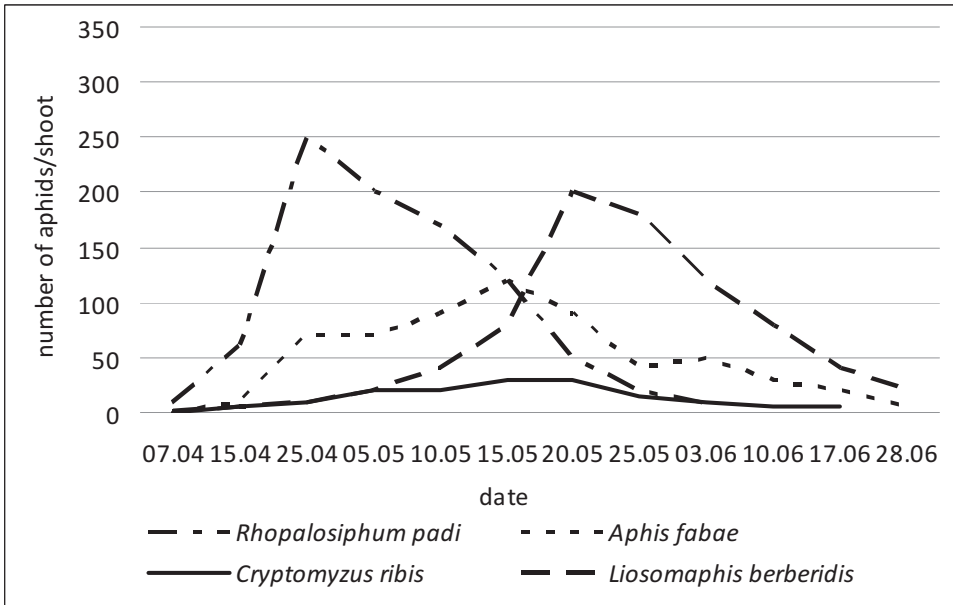


Figure 1. The population dynamics of aphids on the different shrubs

Syrphids appeared several days later than the first aphids. Their maximum of abundance was observed after the maximum of aphids. In 2008 year – 11 species and in 2009 – 8 species of Syrphidae were recorded (Fig. 2). Most species occurred in both years of the research, with the exception of 2009, when no larvae of *Platycheirus scutatus* (Meigen, 1822), *Melanostoma mellinum* (Linnaeus, 1758) and *Epistrophe euchroma* (Kowarz, 1885) were recorded; *Baccha elongata* (Fabricius, 1775) occurred only in 2009. In both research years *Episyrphus balteatus* (De Geer, 1776), and *Epistrophe eligans* (Harris, 1780) dominated, constituting over 50% of all collected syrphids. The largest number of specimens and species of Syrphidae was registered in *R. padi* colonies on a bird-cherry (with a domination of the early spring species *E. eligans*) and in *L. berberidis* colonies on a barberry (Tab. 1).

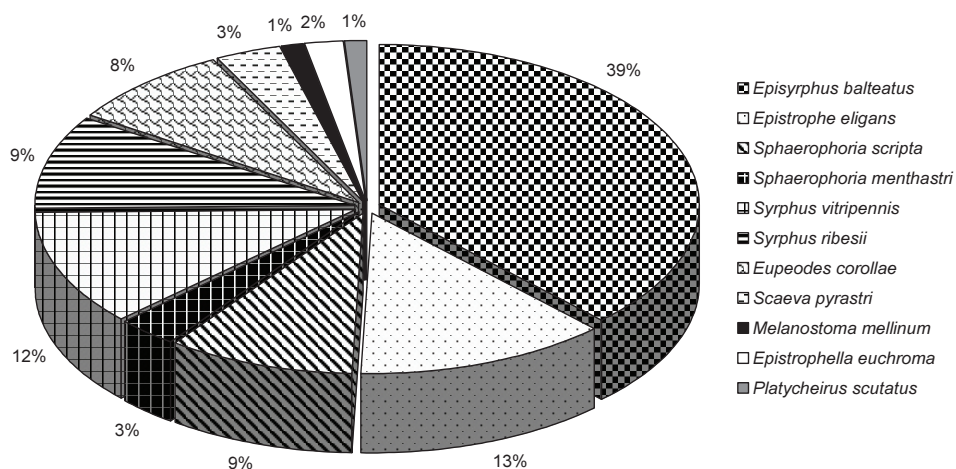
Information on the role of syrphid larvae in reducing population of aphids on various ornamental shrubs can be found in publications by ZIARKIEWICZ & KOZŁOWSKA (1973), CICHOCKA & GOSZCZYŃSKI (1991), JAŚKIEWICZ (1996), WNUK (2004), WOJCIECHOWICZ-ŻYTKO (2004, 2009).

WNUK & GOSPODAREK (1999), WNUK (2000) observed the presence of 10 syrphid species in *A. fabae* colonies on various host plants. The dominant were larvae of the early spring species – *E. eligans*. GOSPODAREK (2007), while investigating the effect of the urban environment with various degrees of pollution on the occurrence of the Syrphidae in *A. fabae* colonies on syringe bushes reported no diversification in syrphid species composition in connection with the pollution. The most frequently encountered species were: *E. eligans*, *E. balteatus*, *Syrphus ribesii* (Linnaeus, 1758), *Syrphus vitripennis* Meigen, 1822.

The importance of aphids developing in early spring on trees and shrubs as a valuable source of food for the first syrphid larvae was pointed out by WNUK (2005), WOJCIECHOWICZ-ŻYTKO (2009).

During the observations of aphid colonies on ornamental shrubs, apart from the syrphid larvae there was also noted the presence of adults and larvae of the Coccinellidae. Coccinellids appeared in aphid colonies in early spring during the appearance of first aphid colonies (Fig. 3). They reached a maximum of appearance during the peak of the aphid number. The presence of 5 species in 2008 and 6 species in 2009 was registered. *Adalia bipunctata* (Linnaeus, 1758) and *Coccinella septempunctata* Linnaeus, 1758 turned out to be the most numerous species as they amounted to 62% of all coccinellids in 2009 and 72% of the same in 2008.

2008



2009

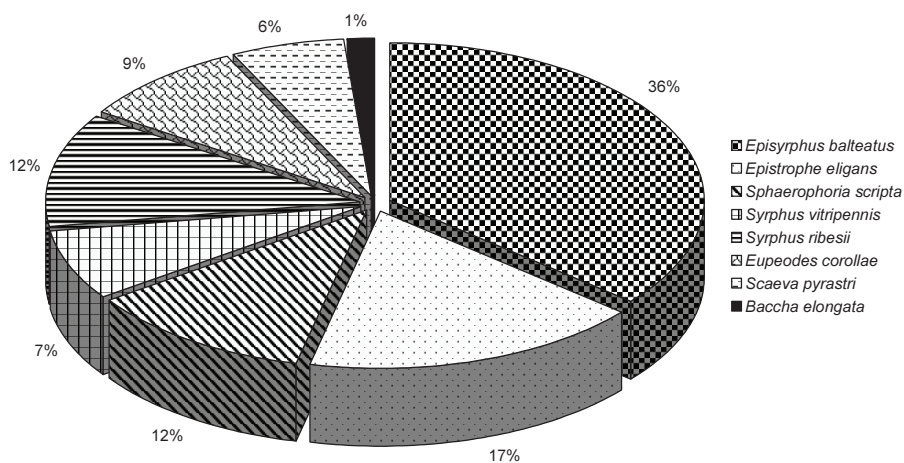
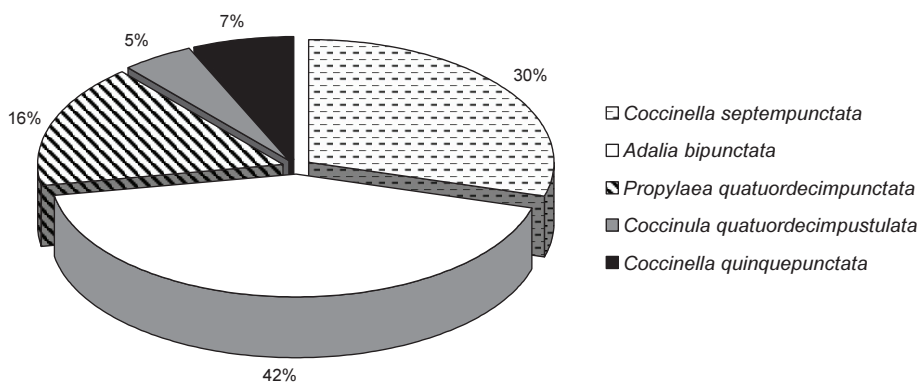


Figure 2. Species composition of predatory syrphids occurring in aphid colonies on different shrubs

2008



2009

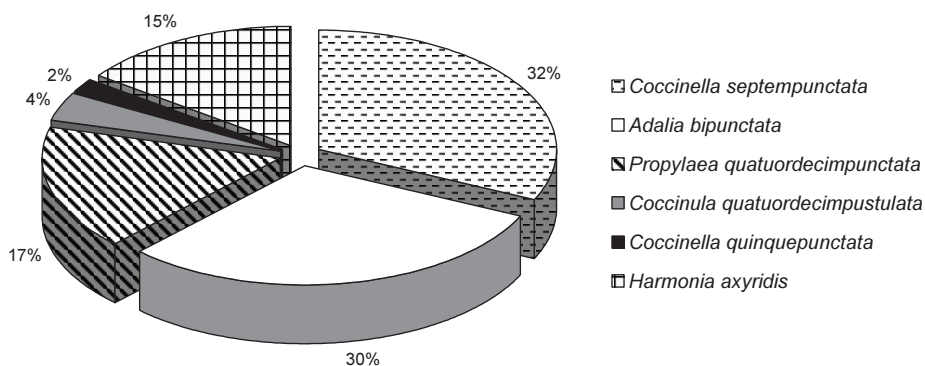


Figure 3. Species composition of Coccinellidae occurring in aphid colonies on different shrubs

As in the case of the Syrphidae the largest number of the Coccinellidae was noted in *R. padi* colonies on a bird-cherry and in *L. berberidis* colonies on a barberry (Tab. 1).

The Coccinellidae overwinter in the adult stage in natural hiding places and thus they are considered to be the most effective predators of aphids on trees and shrubs in early spring (OLSAK 1978; OLSZAK & NIEMCZYK 1986). According to JAŚKIEWICZ (2000), JAŚKIEWICZ *et al.* (2001) and WOJCIECHOWICZ-ŻYTKO (2004) coccinellids were the most often encountered predators in *L. berberidis* colonies on a barberry and *C. ribis* on a currant bush. *C. septempunctata*, *A. bipunctata* and *C. quinquepunctata* were the most numerous species. Similar dominance

of species in *A. fabae* colonies on a spindle tree was reported by BARCZAK *et al.* (1996).

Table 1. The occurrence of predatory Syrphidae and Coccinellidae in aphid colonies on the different shrubs in Botanic Garden of Jagiellonian University (2008-2009)

Species	2008				2009				Total
	R.p.	A.f.	C.r.	L.b.	R.p.	A.f.	C.r.	L.b.	
Syrphidae									
<i>Episyrphus balteatus</i> (De Geer, 1776)	9	7	6	14	7	5	5	8	61
<i>Epistrophe eligans</i> (Harris, 1780)	9	1	-	2	11	1	-	-	24
<i>Sphaerophoria scripta</i> (Linnaeus, 1758)	-	2	3	4	3	-	1	4	17
<i>Syrphus vitripennis</i> Meigen, 1822	5	2	-	4	1	1	-	3	16
<i>Syrphus ribesii</i> (Linnaeus, 1758)	4	1	2	2	1	1	2	4	17
<i>Eupeodes corollae</i> (Fabricius, 1794)	2	2	2	2	1	1	1	3	14
<i>Scaeva pyrastris</i> (Linnaeus, 1758)	-	1	-	2	-	1	1	2	7
<i>Sphaerophoria menthastris</i> (Linnaeus, 1758)	-	-	1	2	-	-	-	-	3
<i>Melanostoma mellinum</i> (Linnaeus, 1758)	-	1	-	-	-	-	-	-	1
<i>Epistropheella euchroma</i> (Kowarz, 1885)	2	-	-	-	-	-	-	-	2
<i>Platycheirus scutatus</i> (Meigen, 1822)	-	-	-	1	-	-	-	-	1
<i>Baccha elongata</i> (Fabricius, 1775)	-	-	-	-	-	-	-	1	1
total	31	17	14	33	24	10	10	25	164
Coccinellidae									
<i>Coccinella septempunctata</i> Linnaeus, 1758	5	4	2	7	8	3	1	5	35
<i>Adalia bipunctata</i> (Linnaeus, 1758)	11	3	4	8	8	2	2	4	42
<i>Propylaea quatuordecimpunctata</i> (Linnaeus, 1758)	2	3	1	4	1	-	2	6	19
<i>Coccinula quatuordecimpustulata</i> (Linnaeus, 1758)	-	-	1	2	-	2	-	-	5
<i>Coccinella quinquepunctata</i> Linnaeus, 1758	-	1	-	3	-	-	-	1	5
<i>Harmonia axyridis</i> (Pallas, 1773)	-	-	-	-	-	2	2	4	8
total	18	11	8	24	17	9	7	20	114

R.p. - *Rhopalosiphum padi*, A.f. - *Aphis fabae*, C.r. - *Cryptomyzus ribis*, L.b. - *Liosomaphis berberidis*

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Mszyce i ich drapieżcy występujący na krzewach w Ogrodzie Botanicznym Uniwersytetu Jagiellońskiego w Krakowie

STRESZCZENIE

Obserwacje przeprowadzono w latach 2008 - 2009 w Ogrodzie Botanicznym Uniwersytetu Jagiellońskiego w Krakowie. Celem pracy było ustalenie dynamiki populacji *Aphis fabae* Scopoli, 1763 na *Viburnum opulus* L., *Cryptomyzus ribis* (Linnaeus, 1758) na *Ribes sanguineum* Pursch, *Rhopalosiphum padi* (Linnaeus, 1758) na *Padus avium* Mill. i *Liosomaphis berberidis* (Kaltenbach, 1843) on *Berberis thunbergii* 'Atropurpurea' oraz stwierdzenie składu gatunkowego owadów drapieżnych (*Syrphidae, Coccinellidae*) występujących w koloniach tych mszyc. W obu latach badań największe kolonie mszyc zaobserwowano na *P. avium* oraz na *B. thunbergii*.

W 2008 roku zanotowano występowanie 11 a w 2009 r. 8 gatunków *Syrphidae*, wśród których dominowały *Episyrphus balteatus* (De Geer, 1776) i *Epistrophe eligans* (Harris, 1780) stanowiąc ponad 50% ogółu zebranych bzygowatych. Wśród biedronkowatych (5 gatunków w 2008 roku i 6 gatunków w 2009 roku) dominowały *Adalia bipunctata* (Linnaeus, 1758) i *Coccinella septempunctata* Linnaeus, 1758. Największą liczbę osobników oraz gatunków bzygowatych i biedronkowatych zanotowano w koloniach *R. padi* na czeremsie oraz *L. berberidis* na berberysie.