Syrphids (*Diptera, Syrphidae*) and coccinellids (*Coleoptera, Coccinellidae*) occurring in *Myzus cerasi* (F.) (*Hemiptera*) colonies on *Prunus avium* L.

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ABSTRACT

During the sampling period, 243 syrphid larvae belonging to seven species were collected from *M. cerasi* colonies on *P. avium*. *Episyrphus balteatus* Deg. and *Epistrophe eligans* (Harr.) were the most numerous species amongst the materials gathered, followed by *Syrphus ribesii* (L.) and *S. vitripennis* Meig. All of these species play an essential role in reducing *M. cerasi* populations. Amongst the *Coccinellidae* occurring in black cherry aphid colonies, *Adalia bipunctata* L. was the dominant species, while the subdominant was *Coccinella septempunctata* L. and *Propylaea quatuordecimpunctata* (L.).

Key words: black cherry aphids, cherry trees, hoverflies, ladybirds

INTRODUCTION

The black cherry aphid *Myzus cerasi* F. is one of the most important pests for both sweet and sour cherry plants. Aphids feed on the lower sides of the upper leaves of young trees; the leaves become severely curled, falling behind in their growth, and then remain black and dry. The yield may be reduced by as much as 30% (Vereščagina 1966, Karczewska 1970).

M. cerasi colonies are controlled by many predators, the most important and best known of which are *Coccinellidae*, and *Syrphidae* (Wnuk 1972, Malinowska 1979, Rakauskas 1984, Cichocka 1996, Francardi and Roversi 1997, 1998, Wojciechowicz-Żytka 2007).

The aim of this research was to determine the population dynamics and species composition of predatory insects (*Syrphidae*, *Coccinellidae*) associated with *Myzus cerasi* (F.) on *Prunus avium* L.

MATERIAL AND METHODS

The experiment was carried out in the years 2000 and 2005 on *Prunus avium* L. (medium early 'Vega' cultivar), in cherry orchards located on a southern slope, surrounded by apple and plum trees in Branice. This experiment was a continuation of previous research made in several locations in the Krakow area on other cherry cultivars (Wojciechowicz-Żytka 2007).

Ten tips (young growths) were selected at random from every 10 trees from each orchard. Predatory syrphids and coccinellids on these tips were counted from April to July at weekly intervals. From the other (not selected) tips, syrphid larvae were collected from aphid colonies and reared separately in Petri dishes, fed daily with aphids until their emergence. *Syrphidae* adults were classified as different species based on the Bańkowska (1963), van Veen (2004) and Rotheray (1993) keys, and *Coccinellidae* based on the Bielawski (1959) key.

The species domination of *Syrphidae* was determined based on Dickler (1968):

- >10% eudominants
- 5.1-10% dominants
- 2.1-5% subdominants
- 1.1-2% recedents
- <1% subrecedents.

The constancy index of syrphid species was also defined, using the formula (Szujewski 1980):

$$C = \frac{q}{Q} 100\%$$

where: C = constancy index, q = number of samples in which the species occurred,

Q = number of analysed samples.

The species domination of *Coccinellidae* was not determined due to the small amount of ladybirds collected.

RESULTS AND DISCUSSION

Occurrence of *Syrphidae*

During the sampling period, 267 syrphid larvae belonging to seven species were collected. A larger

amount of *Syrphidae* was collected in the year 2000 (Tab. 1).

Episyrphus balteatus Deg. and *Epistrophe eligans* (Harr.) were the most numerous species amongst the materials gathered, followed by *Syrphus ribesii* (L.) and *S. vitripennis* Meig. (Fig. 1). The remaining species occurred in smaller numbers. Some species appeared only occasionally, eg. *Sphaerophoria scripta* (L.) in 2000, or *Platycheirus scutatus* (Meig.) in 2005. Based on the Petryszak (1982) dominance class, *E. balteatus*, *E. eligans*, *S. ribesii* and *S. vitripennis* were classified as eudominants, while *E. corollae* as subdominant or dominant, depending on the year of observation. According to Francardi and Roversi (1997, 1998) and Rakauskas (1984), each of these species plays an essential role in reducing *M. cerasi* populations.

The syrphid species identified during the experiment were similar to those found by Wojciechowicz-Żytka (2007) in previous years in *M. cerasi* colonies on *P. avium*. Wnuk (1972) observed the occurrence of 12 species of *Syrphidae* in black cherry aphid colonies, while Malinowska (1979) found 15 species on sweet cherry and 12 on

Table 1. Species composition, dominance structure and constancy of syrphids occurring in *Myzus cerasi* colonies on sweet cherry

	2000		2005		Total number	Dominance class	Constancy index
	Number	Dominance class	Number	Dominance class			
<i>Episyrphus balteatus</i> (Deg.)	68	Ed	25	Ed	93	Ed	100.0
<i>Epistrophe eligans</i> (Harr.)	32	Ed	31	Ed	63	Ed	90.9
<i>Syrphus ribesii</i> (L.)	17	Ed	14	Ed	31	Ed	63.6
<i>Syrphus vitripennis</i> Meig.	16	Ed	13	Ed	29	Ed	45.5
<i>Eupeodes corollae</i> (Fabr.)	7	Sd	8	D	15	D	27.3
<i>Platycheirus scutatus</i> (Meig.)	-	-	10	D	10	Sd	18.2
<i>Sphaerophoria scripta</i> (L.)	2	Re	-	-	2	Sr	9.0
Dead non-identified larvae	15	-	9	-	24	-	-
Total	157		110		267		

Ed – eudominants, D – dominants, Sd – subdominants, Re – recedents, Sr – subrecedents

Figure 1. Species composition of aphidophagous *Syrphidae* collected from *M. cerasi* colonies in the years 2000 and 2005

Figure 2. Population dynamics of *Syrphidae*

sour cherry, whereas Wojciechowicz-Żytko (2007) found 19 on *P. avium* and eight on *P. cerasus*.

E. balteatus and *E. eligans* were the species that occurred in particularly large numbers during the study. The constancy of those species was 100 and 90.9%, respectively (absolutely constant species) (Szujecki 1980). *S. ribesii* and *S. vitripennis* were also numerous, with a constancy of 63.6 and 45.5%, respectively (Tab. 1). These data demonstrate the large role of these species in regulating the population of *M. cerasi*. *Eupeodes corollae*, *Platycheirus scutatus*, and *Sphaerophoria scripta* were classified as accessory and incidental species.

The periods of the occurrence of larvae of the main syrphid species are shown in Figure 5.

The first syrphid individuals appeared in *M. cerasi* colonies in the second ten days of May (Fig. 2). Most of them constitute an early spring species—*E. eligans* (Fig. 5). This was between 14 and 20 days after the first aphids were noted. Afterwards, the syrphids appeared more numerous and their numbers had increased, reaching their maximum in

late May/early June. Later, the population showed a declining tendency, completely disappearing at the end of June (Fig. 2).

According to Francardi and de Silva (1997), working on *M. cerasi* and its antagonists in central Italy, the amount of hoverflies reached the highest level in the second half of May.

Occurrence of *Coccinellidae*

In the years 2000 and 2005, 67 coccinellid larvae and adults belonging to five species were noted. Among the *Coccinellidae* occurring in *M. cerasi* colonies on *P. avium* *Adalia bipunctata* L. was the most numerous species (49.3%), followed by *Coccinella septempunctata* L. in 2000 and *Propylaea quatuordecimpunctata* in 2005 (Tab. 2, Fig. 3). Other researchers (Rakauskas 1984, Francardi and de Silva 1997) had similar results.

The *Coccinellidae* were the first representatives of predacious entomofauna occurring in *M. cerasi* colonies. They presented on *P. avium* early in the season when aphid numbers were low (Fig. 4). They appeared in the beginning of May, a few days

Table 2. Predatory coccinellids occurring in *M. cerasi* colonies on sweet cherry

<i>Coccinellidae</i> species	2000		2005		Total	
	adult	larvae	adult	larvae	Number	%
<i>Adalia bipunctata</i> L.	8	5	14	6	33	49.3
<i>Propylaea quatuordecimpunctata</i> (L.)	2	-	4	1	7	10.4
<i>Coccinella septempunctata</i> L.	6	3	10	5	24	35.8
<i>Coccinula quatuordecimpustulata</i> (L.)	-	-	2	-	2	2.9
<i>Coccinella quinquepunctata</i> L.	-	-	1	-	1	1.5
Total	16	8	31	12	67	100.0

Figure 3. Species composition of *Coccinellidae* occurring in *M. cerasi* colonies **Figure 4.** Population dynamics of *Coccinellidae*

Figure 5. The occurrence of the main syrphid species during the years 2000 and 2005

after the aphids. From this time the population increased up to the third ten days of May, when the largest number of these insects was recorded. In the second ten days of June, a decrease in the coccinellid numbers was noted.

Because of the fact that *Coccinellidae* appear in early spring in aphid colonies and destroy the first fundatrices, they ought to be counted amongst the important groups of predators regulating aphid populations (Olszak 1978, Rakauskas 1984, Wojciechowicz-Żytko 2007). Olszak and Niemczyk (1986) stated that ladybirds are present in the largest numbers in orchards in early spring and in the summer on vegetables. According to Ganter and Jaśkiewicz (2001) and Wojciechowicz-Żytko (2004), ladybirds, especially *Propylaea quatuordecimpunctata* and *Coccinella septempunctata*, play a significant role in controlling the number of hazel aphids in early spring.

CONCLUSIONS

1. Seven syrphid species were noted in *M. cerasi* colonies. The most numerous were *Episyrphus balteatus* and *Epistrophe eligans*.
2. *Coccinellidae* was the first group of predators that appeared in *M. cerasi* colonies in the spring. The dominant species were *Adalia bipunctata* and *Coccinella septempunctata*.
3. *Syrphidae* and *Coccinellidae* play an essential role in regulating *M. cerasi* populations.

REFERENCES

BĄKOWSKA R., 1963. Klucze do oznaczania owadów Polski. Część XXVII. Muchówki-Diptera. Zeszyt 24 *Syrphidae*. PWN, Warszawa, 236.

- BIELAWSKI R., 1959. Biedronki – *Coccinellidae*. Klucze do oznaczania owadów Polski, XIX, 76, Warszawa, 92.
- CICHOCA E., 1996. Effect of natural enemies on aphid populations in young apple orchard. *Aphids and Other Homopterous Insects* 5: 37-45.
- DICKLER E., 1968. Untersuchungen zur Besiedlung von wiesennahen Leguminosenkulturen durch Rüsselkäfer. *Zeit.f. angew. Ent.* 55:129-192.
- FRANCARDI V., DE SILVA J., 1997. On *Myzus cerasi* (F.) and its antagonists within timber plantations of *Prunus avium* L. in central Italy. *Redia* LXXX: 73-85.
- FRANCARDI V., ROVERSI P.F., 1997. Osservazioni sull'entomofauna fitifaga di *Prunus avium* L. in piantagioni da legno dell'Italia centro-settentrionale. *Ann. Ist. Sper. Selv.* XXV e XXVI: 399-412.
- FRANCARDI V., ROVERSI P.F., 1998. Variazioni stagionali in popolazioni di *Myzus cerasi* (F.) (*Homoptera, Aphidoidea*) e di suoi entomofagi In impianti di *Prunus avium* L. da legno. *Annali Istituto Sperimentale per la Selvicoltura* 29: 87-91.
- GANTNER M., JAŚKIEWICZ B., 2001. Species composition of ladybirds (*Coleoptera, Coccinellidae*) on hazelnut plantations. *Folia Hort.* 13/1: 91-100.
- KARCZEWSKA M., 1970. Z badań nad biologią mszycy wiśniowo-przytuliowej – *Myzus cerasi* (F.) (*Homoptera, Aphididae*) na wiśni. *Pol. Pismo Ent.* XL/2: 345-359.
- MALINOWSKA D., 1979. Arthropod communities in terrestrial ecosystem. Polish Academy of Sciences. Institute of Zoology. *Memorabilia Zoologica*: 30.
- OLSAK R., 1978. Drapieżne biedronkowate. In: „Biologiczne metody walki ze szkodnikami roślin”. J. Boczek and J. Lipa (eds), PWN, Warszawa: 253-266.
- OLSAK R., NIEMCZYK E., 1986. The predaceous *Coccinellidae* associated with aphid in apple orchards. *Ekologia Polska* 34(4): 711-721.
- PETRYSZAK B., 1982. Ryjkowce (*Curculionidae, Coleoptera*) Beskidu Sądeckiego. *Rozpr. Nauk. UJ w Krakowie* 68: 204.

- RAKAUSKAS R.P., 1984. Biologija i ekologija višnievoj tli v Litovskoj SSR. Trudy Akademii Nauk Litovskoj SSR, serija V, 4(88): 80-87.
- ROTHERAY G., 1993. Colour guide to hoverfly larvae (*Diptera, Syrphidae*) in Britain and Europe. Dipterists Digests No. 9.
- SZUJECKI A., 1980. Ekologia owadów leśnych. PWN, Warszawa.
- VAN VEEN M.P., 2004. Hoverflies of northwest Europe. KNNV Publishing, Utrecht: 254.
- VEREŠČAGINA V.V., 1966. Višnievaja tlja *Myzus cerasi* Fabr. na čerešne i borb'a s nej v Moldavii. Trudy Moldavskovo naučno-issledovatel'skovo Instituta Sadovodstva, Vinogradarstva i Vinodelija 13: 39-52.
- WNUK A., 1972. Badania nad składem gatunkowym drapieżnych bzygowatych (*Syrphidae, Diptera*) występujących w koloniach mszyc na drzewach i krzewach owocowych. Pol. Pismo Ent. 42: 235-247.
- WOJCIECHOWICZ-ŻYTKO E., 2004. Predators occurring in in *Myzocallis coryli* Goetze (*Homoptera, Aphidodea*) colonies on hazel (*Corylus* L.). J. Plant Protection Res. 44(3): 181-188.
- WOJCIECHOWICZ-ŻYTKO E., 2007. Rola bzygowatych (*Diptera, Syrphidae*) i innych drapieżców w regulacji populacji mszycy wiśniowej – *Myzus cerasi* (F.) (*Homoptera, Aphidodea*). Zesz. Nauk. AR w Krakowie, rozprawy, 443, 321: 92.
- BZYGOWATE (*DIPTERA, SYRPHIDAE*) I BIEDRONKOWATE (*COLEOPTERA, COCCINELLIDAE*) WYSTĘPUJĄCE W KOLONIACH *MYZUS CERASI* (F.) (*HEMIPTERA*) NA CZEREŚNI *PRUNUS AVIUM* L.**
- Streszczenie: W latach badań z kolonii mszycy wiśniowej żerującej na czereśni zebrano 243 larwy *Syrphidae* należące do 7 gatunków. Dominowały *Episyrphus balteatus* i *Epistrophe eligans*, mniej licznie występowały gatunki *Syrphus ribesii* i *S. vitripennis*. Gatunki te odgrywają dużą rolę w ograniczaniu populacji *M. cerasi*, można je uznać za typowe dla kolonii tej mszycy. W koloniach *M. cerasi* stwierdzono występowanie 5 gatunków biedronek – dominowały *Adalia bipunctata* L., *Coccinella septempunctata* L. i *Propylaea quatuordecimpunctata* (L.).

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