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Tritrophic associations of *Lysiphlebus fabarum* (Marshall) (Hymenoptera, Braconidae, Aphidiinae) in Serbia

Marijana Ilić Milošević¹, Maja Lazarević¹, Olivera Petrović-Obradović², Vladimir Žikić¹*

¹*University of Niš, Faculty of Sciences and Mathematics, Department of Biology and Ecology, Višegradska 33, 18000 Niš, Serbia*

²*Faculty of Agriculture, Nemanjina 6, 11081 Belgrade – Zemun, University of Belgrade, Serbia*

* *Corresponding author: marijanailic83@yahoo.com*

Abstract:

Ilić Milošević, M., Lazarević, M., Petrović-Obradović, O., Žikić, V.: Tritrophic associations of *Lysiphlebus fabarum* (Marshall) (Hymenoptera, Braconidae, Aphidiinae) in Serbia. *Biologica Nyssana*, 5 (2), December 2014: 113-121.

One hundred and eighty-six tritrophic parasitoid-aphid plant associations were established between *Lysiphlebus fabarum* and 64 aphids with 148 different plant species from the territory of Serbia. We identified 18 aphid genera of which the genus *Aphis* was represented by 38 species. The most frequent interactions between the parasitoid and the hosts were the ones of *Aphis fabae*, *A. craccivora* and *A. ruborum* on various plants comprising one third of the total trophic interactions listed here.

Key words: parasitoids, trophic chains, distribution, aphids, host plant

Apstrakt:

Ilić Milošević, M., Lazarević, M., Petrović-Obradović, O., Žikić, V.: Tritrofičke asocijacije vrste *Lysiphlebus fabarum* (Marshall) (Hymenoptera, Braconidae, Aphidiinae) u Srbiji. *Biologica Nyssana*, 5 (2), Decembar 2014: 113-121.

Na teritoriji Srbije je sada ustanovljeno 186 tritrofičkih asocijacija između parazitoida, biljnih vaši i biljaka. Vrsta *Lysiphlebus fabarum* je registrovana na 64 vrste biljnih vaši koje napadaju 148 biljnih vrsta. Utvrđeno je da se biljne vaši grupišu u 18 različitih rodova, od kojih je najzastupljeniji bio rod *Aphis* sa 38 vrsta. Najčešće parazitirane vrste biljnih vaši od strane *L. fabarum* bile su *Aphis fabae*, *A. craccivora* i *A. ruborum* prikupljene sa mnogih biljaka, formirajući oko jednu trećinu svih zabeleženih trofičkih interakcija.

Key words: parazitoidi, trofički lanci, distribucija, biljne vaši, biljke

Introduction

The subfamily Aphidiinae (Hymenoptera: Aphidiidae) represents a small group of solitary endoparasitoid wasps of aphids including many

important species acting as biological control agents (Brewer & Elliott, 2004; Levie et al., 2005). They are very useful in crop fields, as well as in greenhouses and non-arable fields such as meadows and forests reducing the number of pest aphids

(Starý, 1970, 1974; Hagvar & Hofsvang, 1991; Kavallieratos et al., 2004). One genus in subfamily Aphidiinae which has been studied in detail is *Lysiphlebus* Foerster, which comprises about 25 species worldwide, 16 occurring in the European fauna (Yu et al, 2013; van Achterberg, 2013). On the territory of Serbia, ten species were recorded including the two that have already been introduced here: *L. orientalis* Starý & Rakhshani, 2006 and *L. testaceipes* (Cresson, 1880) (Petrović et al., 2013; Žikić et al., 2015). According to the wing venation, this genus could fall into two species groups. The “*fabarum*” group includes the species with a long metacarpal vein while in “*testaceipes*” group the species have a short metacarpal vein (Petrović et al., 2015). *Lysiphlebus fabarum* (Marshall, 1896) is a polyphagous aphid parasitoid that attacks more than a hundred of aphid species in various habitats (Yu et al., 2013). They often exploit small aphids, usually from the genus *Aphis* L., including some serious pests, e.g. the black bean aphid, *A. fabae* Scopoli, the cowpea aphid, *A. craccivora* Koch and the cotton aphid, *A. gossypii* (Glover) (Kavallieratos et al., 2004; Starý, 2006) but also the target aphid genus for *L. fabarum* is *Brachycaudus* van der Goot, e.g. the plum-thistle aphid, *B. cardui* (L.) and the leaf-curling plum aphid, *B. helichrysi* (Kaltenbach). Likewise, the species *L. fabarum* has a tendency to attacks the ant-protected aphid colonies. Its distribution is very wide, including the whole Palaearctic, as well as Australia and Oceania. In Europe, *L. fabarum* is found in the fauna of Andorra, Bulgaria, the Canary Islands, Corsica, Croatia, Czech Republic, France, Germany, Great Britain, Greece, Hungary, Italy, Latvia, Lithuania, Madeira, Montenegro, Poland, Russia, Sicily, Slovakia, Slovenia, Spain, and The Netherlands.

There are few studies regarding tritrophic associations of *L. fabarum*, and its diversity in agroecosystems in Serbia (Tomanović & Brajković, 2001; Kavallieratos et al., 2004; Žikić et al., 2012).

In this study we present the parasitoid-aphid-plant trophic associations of *L. fabarum* registered on the territory of Serbia. The knowledge about parasitoid-aphid-plant associations appears to be necessary for a better implementation of programs of biological control of aphids as an economically important group of pests. Also, host-plant associations are important for better knowledge of biodiversity of species *L. fabarum*.

Material and methods

We used the data from the collections of *Lysiphlebus fabarum* sampled during the period 1989-2014 from numerous localities throughout Serbia. Our samples represent cut branches infested by aphids, sometimes with visible signs of parasitization. This plant material, with or without mummified aphids, was put in small plastic mesh-covered boxes to enable ventilation, and then placed in a growth cabinet (22.5°C, 65% relative air humidity, 16:8 h, light:dark photoperiod) until the parasitoid emergence. Before leaving the samples in the growth cabinet, some live adult aphids were preserved in 90% ethyl-alcohol for identification. Parasitoid material and plants were deposited at the Faculty of Sciences and Mathematics, Department of Biology and Ecology, University of Niš, Serbia and the Faculty of Biology, University of Belgrade, Serbia. In order to obtain some data relevant literature was used (Žikić et al., 2012). The aphids used in this study were from the collection of Dr Olivera Petrović-Obradović (Faculty of Agriculture, University of Belgrade, Serbia).

The nomenclature of aphids is given according to Remaudière and Remaudière (1997), whereas the nomenclature of plants is based on Flora Europaea (1964, 1968, 1972, 1976, 1980) and Greuter et al. (1984, 1986, 1989).

Results and discussion

The results shown in Appendix 1 refer to the long time period of investigation of *Lysiphlebus fabarum* and all the interactions with aphids infesting analysed plants on the territory of Serbia. Analysing established trophic chains, we found 186 tritrophic parasitoid-aphid-plant associations including 64 hosts on 148 plants. The aphids belong to 18 genera. It is evident that the species belonging to the genus *Aphis*, were most frequently recorded in this investigation, about 38 taxa. The species *A. fabae* and *A. craccivora* made a great number of associations with different plants. We registered 57 trophic chains for *A. fabae* together with two subspecies, *A. fabae cirsiacanthoidis* Scopoli and *A. fabae solanella* Theobald, species *A. fabae* forming 75 interactions with different plant species. As far as the species *Aphis craccivora* is concerned, we counted 30 associations with plants. The third most commonly encountered host species was *A. ruborum*, forming 11 associations.

Conclusion

Based on such a large number of recorded associations of the parasitoid *Lysiphlebus fabarum* and the previous studies regarding this species, *L. fabarum* is a suitable candidate for the biological control programs of various aphid species. Future investigations should be focused on interactions between many aphid species and *L. fabarum*, especially the very close relation between *L. fabarum* and polyphagous aphid, *Aphis fabae* as its host. Through different methods, such as the level of parasitism success, field campaign, and the introduction or detection of bacterial symbionts using suitable molecular markers have already been applied in the pioneering work by Vorburger et al. (2009).

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Appendix 1.

List of registered tritrophic associations

plant	aphid	finding
<i>Althaea officinalis</i> L.	<i>Aphis fabae</i>	Novi Sad, 10.06.1997, ŽT
	<i>Aphis davletshinae</i> Hille Ris Lambers	Surčin, 20.05.1989, OP
	<i>Aphis fabae</i> Glover	Zemun, Galenika, 07.06.2011, AP
<i>Amaranthus retroflexus</i> L.	<i>Aphis fabae</i>	Belgrade, Crveni krst, 05.07.1996, ŽT; Lebane, Konjino, 06.07.2010, SS.
<i>Arctium lappa</i> L.	<i>Aphis fabae</i>	Suva planina Mt., Vetanska reka River, 20.07.1997, ŽT; Sićevačka klisura Gorge, Ostrovica, 23.06.2012, SS; 28.05.2013, MĐ; Tara Mt., Mitrovac, 25.06.2013, VŽ
<i>Atriplex patula</i> L.	<i>Aphis craccivora</i>	Paličko jezero Lake, 06.09.1995, ŽT Zemun, 09.07.1996, OP;
<i>Ballota nigra</i> L.	<i>Aphis balloticola</i> Szelegiewicz	Belgrade, Avala Mt., 01.06.1996, ŽT; Obedska bara Swamp, 07.06.1997, ŽT; Stara Pazova, 10.06.1997, ŽT; Belgrade, Radmilovac, 18.06.1999, ŽT; Niš, Popovac, 25.06.2010, VŽ; Niš, Bujanj, 05.06.2013, MĐ
	<i>Aphis</i> spp.	Zemun, IZBIS, 30.05.2011, AP;
<i>Beta vulgaris</i> L.	<i>Aphis fabae</i>	Zemun, 27.09.1990, ŽT;
<i>Capsella bursa pastoris</i> (L.) Medik.	<i>Aphis fabae</i>	Čemernik, 04.08.2011, SS;
<i>Capsicum annuum</i> L.	<i>Myzus persicae</i>	Kikinda, 23.06.1997, ŽT;
<i>Carduus acanthoides</i> L.	<i>Aphis fabae</i>	Stara planina Mt., Balta Berilovac, 22.07.1997, ŽT; Slankamen, 24.06.2011, ŽT;
	<i>Brachycaudus cardui</i> (L.)	Zrenjanin, 20.06.1996, ŽT; Užice, Trešnjica, 23.07.1996, ŽT; Beljanica Mt., 03.08.1996, ŽT; Bečej, 03.08.1996, ŽT; Mol, 03.08.1996, ŽT; Rusko Selo, 03.08.1996, ŽT; Sefkerin, 03.08.1996, ŽT; Perlez, 23.06.1997, ŽT; Stara planina Mt., Glogovac, 16.07.1997, ŽT; Stara planina Mt., Balta Berilovac, 20.07.1997, ŽT; Stara planina Mt., Čuštica, 20.07.1997, ŽT; Beljanica Mt., 12.07.1998, OP; Pčinja Canyon, Prohor Pčinjski, 10.06.2014, VŽ;
	<i>Uroleucon</i> sp. Mordvilko	Surduk, 21.06.2011, ŽT;
<i>Carduus crispus</i> L.	<i>Brachycaudus cardui</i> (L.)	Vlasina Plateau, Čemernik, 04.08.2011, SS;
<i>Carduus nutans</i> L.	<i>Brachycaudus cardui</i> (L.)	Niš, Popovac, 23.06.2012, SS;
<i>Carduus</i> sp.	<i>Aphis fabae</i>	Kragujevac, Ilićevo, 06.06.2011, AMB; Valjevo, Petnica, 12.06.2011, AP;
	<i>Brachycaudus cardui</i> (L.)	Vlasinsko jezero Lake, 06.08.2010, SS; Đerdap, Veliki Kazan, 28.05.2011, ŽT; Valjevo, Petnica, 12.06.2011, AP; Dukat Mt., 06.08.2011, AP;
<i>Carlina acaulis</i> L.	<i>Aphis carlinae</i> (Borner 1940)	Šara Mt., Ošljak, 04.07.1995, OP;
<i>Centaurea cyanus</i> L.	<i>Aphis celsarii</i> Matsumura	Divčibare, 08.08.2000, OP; Lebane, Konjino, 31.05.2014, SS;
	<i>Aphis fabae</i>	Lebane, Konjino, 31.05.2014, SS;
<i>Centaurea</i> sp.	<i>Brachycaudus cardui</i> (L.)	Kopaonik Mt., Brzeće, 29.07.2010, SS;
<i>Cephalaria transsylvanica</i> (L.) Schrad.	<i>Aphis craccivora</i>	Niš, Duvanište, 13.06.2013, PM;
<i>Chamaecytisus</i> sp.	<i>Aphis craccivora</i>	Dukat Mt., 29.06.2012, SS;

plant	aphid	finding
<i>Chaenopodium album</i> L.	<i>Aphis fabae</i>	Zemun, 30.10.1990, OP; Belgrade, Botanical Garden, 29.06.1996, ŽT; Niš, Kunovica, 16.10.1998, VŽ; Niš, Popovac, 22.05.2010, VŽ; Niš, Popovac, 22.05.2010, SS; Niš, Popovac, 10.07.2010, VŽ; Novi Belgrade, Block 62, 28.05.2011, ŽT; Sićevačka klisura Gorge, Sićevo, 04.06.2011, SS; Zemun, Galenika, 07.06.2011, AP; Slankamen, 24.06.2011, ŽT; Lebane, Konjino, 01.06.2013, SS; Sićevačka klisura Gorge, Sićevo, 06.06.2013, VŽ; Tara Mt., Derventa Canyon, 25.06.2013, VŽ; Sićevačka klisura Gorge, Sićevo, 17.07.2013, SS;
	<i>Aphis spp.</i>	Majur, 21.06.2011, ŽT;
<i>Chrysanthemum</i> sp.	<i>Aphis fabae</i> Glover	Kanjiža, 08.06.1995, ŽT;
<i>Cichorium intibus</i> L.	<i>Aphis intybi</i> Koch	Bela Crkva, 13.06.1996, ŽT; Kragujevac, 05.07.2011, AMB; Niš, Matejevac, 23.06.2012, VŽ; Lebane, Konjino, 31.05.2014, SS;
	<i>Aphis spp.</i>	Negotin, 01.07.2011, ŽT;
	<i>Aphis craccivora</i>	Tara, Derventa Canyon, 03.07.2012, VŽ;
<i>Cirsium acanthoides</i> L.	<i>Aphis fabae</i>	Lebane, Konjino, 31.05.2014, SS;
	<i>Brachycaudus cardui</i> (L.)	Lebane, Konjino, 31.05.2014, SS;
<i>Cirsium arvense</i> (L.) Scop.	<i>Aphis fabae</i>	Vlasinsko jezero Lake, 11.08.2006, VŽ; Vlasinsko jezero Lake, 06.08.2010, VŽ; Belgrade, Ostružnica, 06.07.2011, ŽT; Vlasinsko jezero Lake, 03.08.2011, VŽ; Vlasinsko jezero Lake, 28.06.2012, VŽ; Vlasinsko jezero Lake, 15.06.2013, SS; Vlasinsko jezero Lake, 21.07.2013, SS; Merošina, Oblačinsko jezero Lake, 15.06.2014, SS;
	<i>Aphis fabae cirsiacanthoidis</i> Scopoli	Surčin, 29.05.1993, ŽT; Vlasinsko jezero Lake, 01.08.1996, ŽT; Vlasina Plateau, Čemernik, 24.07.1997, ŽT; Belgrade, Kovilovo, 11.06.1999, ŽT; Belgrade, Radmilovac, 18.06.1999, ŽT; Suva planina Mt., Glogovac, 16.07.1999, ŽT; Zrenjanin, Ečka, 31.05.2001, ŽT; Kopaonik Mt., Brzeće, 29.07.2010, VŽ; Vlasinsko jezero Lake, 06.08.2010, VŽ; Vlasina Plateau, Čemernik, 07.08.2010, SS; Vlasinsko jezero Lake, 21.07.2013, SS;
	<i>Aphis fabae solanella</i> Theobald	Valjevo, Petnica, 12.06.2011, AP;
	<i>Uroleucon aeneum</i> (Hille Ris Lambers)	Kopaonik, 27.07.2010, VŽ; Zemun, 02.06.2011, ŽT; Vlasina Plateau, Čemernik, 1400 m, 04.08.2011, VŽ; Bajina Bašta, 06.07.2012, VŽ; Merošina, Oblačinsko jezero Lake, 15.06.2014, SS;
<i>Cirsium eriophorum</i> (L.) Scop.	<i>Aphis fabae cirsiacanthoidis</i> Scopoli	Vlasinsko jezero Lake, 1250 m, 21.07.2013, SS;
	<i>Brachycaudus cardui</i> (L.)	Suva planina Mt., Korube, 17.07.1997, ŽT; Vlasinsko jezero Lake, 1250 m, 21.07.2013, SS;
<i>Cirsium lanceolatum</i> (L.) Scop.	<i>Brachycaudus cardui</i> (L.)	Beljanica Mt., 12.07.1997, ŽT;
	<i>Aphis fabae cirsiacanthoidis</i> Scopoli	Stara planina Mt., Balta Berilovac, 20.07.1997, ŽT;
<i>Cirsium palustre</i> (L.) Scop.	<i>Aphis fabae cirsiacanthoidis</i> Scopoli	Goč Mt., 13.07.2011, ŽT;
	<i>Brachycaudus cardui</i> (L.)	Vlasinsko jezero Lake, 21.07.2013, SS;
<i>Cirsium</i> sp.	<i>Aphis fabae cirsiacanthoidis</i> Scopoli	Kopaonik Mt., 17.07.2013, SS;
<i>Cirsium vulgare</i> (Savi) Ten.	<i>Brachycaudus cardui</i> (L.)	Bosilegrad, Jarešnik, 22.07.2013, SS;
<i>Clematis</i> sp.	<i>Aphis spp.</i>	Užice, Djetinja Canyon, 26.06.1999, ŽT;
<i>Coreopsis verticillata</i> L.	<i>Aphis fabae</i>	Zemun, 17.10.1991, OP;
<i>Coronilla varia</i> L.	<i>Aphis craccivora</i>	Niš, Pantelej, 28.06.2012, VŽ; Niš, Trošarina, 26.04.2014, VŽ;
<i>Corydalis sempervirens</i> (L.) Pers.	<i>Aphis fabaei</i> Glover	Niš, Pantelej, 01.06.2013, VŽ;
<i>Crepis biennis</i> L.	<i>Aphis crepidis</i> (Börner)	Mol, 23.06.1997, ŽT;
	<i>Aphis spp.</i>	Žitište, 22.07.1997, ŽT;
<i>Crepis foetida</i> L.	<i>Uroleucon cichorii</i> (Koch)	Niš, Jasenovik, 12.06.2011, MĐ; Vlasinsko jezero Lake, 1250 m, 21.07.2013, SS;
	<i>Aphis gr craccivora</i>	Niš, Pantelej, 01.06.2013, VŽ;
<i>Crepis</i> sp.	<i>Aphis spp.</i>	Niš, Bujanj, 31.05.2013, MĐ;
	<i>Aphis craccivora</i>	Niš, Donji Matejevac, 05.06.2013, VŽ; Niš, Tvrdjava, 05.06.2013, MĐ;
	<i>Aphis crepidis</i> (Börner)	Vlasinsko jezero Lake, 1250 m, 28.06.2012, SS;
<i>Cucumis sativus</i> L.	<i>Aphis fabaei</i> Glover	Užice, Carina, 05.08.1996, ŽT;

plant	aphid	finding
<i>Daucus carota</i> L.	<i>Semiaphis dauci</i> (Fabricius)	Carska bara, 02.07.1996, OP;
<i>Daucus</i> sp.	<i>Semiaphis dauci</i> (Fabricius)	Kruševac, Slobodište, 13.07.2012, ZK;
<i>Digitalis ambigua</i> Murray	<i>Aphis fabae</i>	Tara, Derventa Canyon, 03.07.2012, VŽ;
<i>Dorycnium herbaceum</i> Vill.	<i>Aphis craccivora</i>	Zlatarsko jezero Lake, 20.06.1998, ŽT;
<i>Epilobium angustifolium</i> L.	<i>Aphis</i> spp.	Kopaonik Mt., 27.07.2010, VŽ;
<i>Epilobium</i> sp.	<i>Aphis</i> spp.	Sombor, 16.07.1996, OP;
<i>Euphorbia cyparissias</i> L.	<i>Aphis</i> spp.	Niš, Bujanj, 11.05.2013, MĐ;
<i>Euonymus japonicus</i> L.f.	<i>Aphis fabae</i>	Lebane, Konjino, 31.05.2014, SS;
	<i>Aphis fabae solanella</i> Theobald	Lebane, Konjino, 31.05.2014, SS;
<i>Euonymus europaeus</i> L.	<i>Aphis fabae</i>	Belgrade, Botanical Garden, 17.06.1997, ŽT;
<i>Filipendula ulmaria</i> (L.) Maxim.	<i>Macrosiphum cholodkovskiyi</i> (Mordvilko)	Dukat Mt., 29.06.2012, VŽ;
<i>Foeniculum vulgare</i> Mill.	<i>Cavariella</i> sp. Del Guercio	Sićevačka klisura Gorge, Sićevo, 28.05.2013, ZK;
<i>Galium aparine</i> L.	<i>Aphis craccivora</i>	Vlasinsko jezero Lake, 06.06.2014, SS;
	<i>Aphis fabae</i>	Belgrade, Dušanovac, 20.05.1993, ŽT; Niš, Tvrđjava, 05.06.2013, MĐ; Vlasinsko jezero Lake, 06.06.2014, SS;
<i>Genista tinctoria</i> L.	<i>Aphis genistae</i> (Börner)	Belgrade, Ostružnica, 17.06.2010, ŽT;
<i>Gentiana asclepiadea</i> L.	<i>Aphis gentianae</i> (Börner)	Stara planina Mt., Babin zub, 19.07.1994, OP;
<i>Geranium</i> sp.	<i>Aphis</i> spp.	Zemun, Galenika, 07.06.2011, AP;
<i>Hedera helix</i> L.	<i>Aphis hederæ</i> Kaltenbach	Zemun, 13.06.2011, OP; Zemun, 14.06.2011, OP; Niš, Trošarina, 18.05.2013, MĐ; Niš, Pantelej, 01.06.2013, VŽ;
<i>Heracleum sphondylium</i> L.	<i>Aphis fabae</i>	Belgrade, Botanical Garden, 29.06.1996, ŽT; Suva planina Mt., Toponički put, 19.07.1997, ŽT;
	<i>Uroleucon</i> sp. Mordvilko	Adžine livade, Žeželj, 01.06.2011, ŽT;
<i>Hypochaeris radicata</i> L.	<i>Nasonovia</i> sp. Mordvilko	Adžine livade, Žeželj, 01.06.2011, ŽT;
	<i>Aphis newtoni</i> Theobald	Belgrade, 13.10.1997, ŽT;
<i>Knautia drymeia</i> Heuff.	<i>Macrosiphum knautiae</i> Holman	Sićevačka klisura Gorge, Ostrovica, 28.05.2013, MĐ;
<i>Kochia scoparia</i> (L.) Schrad.	<i>Aphis</i> sp.	Lebane, Konjino, 06.07.2010, SS;
<i>Lactuca</i> sp.	<i>Aphis craccivora</i>	Lebane, Konjino, 01.06.2013, SS;
<i>Lamium</i> sp.	<i>Aphis</i> spp.	Zemun, 23.06.1995, OP; Smederevo, Lugavčina, 06.06.1999, OP;
<i>Laserpitium halleri</i> Crantz	<i>Aphis</i> spp.	Zemun, Altina, 09.06.2011, AP; Dobanovci, 17.06.2011, AP;
<i>Levisticum officinale</i> W. D. J. Koch	<i>Aphis fabae</i>	Užice, 14.08.1999, ŽT;
<i>Lilium</i> sp.	<i>Aphis</i> spp.	Belgrade, Zvezdara, 10.05.1997, ŽT;
<i>Lolium italicum</i> A. Braun	<i>Sitobion avenae</i> (Fabricius)	Obrenovac, 15.06.1989, OP;
<i>Lolium perene</i> L.	<i>Aphis fabae</i>	Lebane, Konjino, 06.06.2010, SS;
<i>Lotus corniculatus</i> L.	<i>Aphis craccivora</i>	Kruševac, Slobodište, 22.06.2013, ZK;
<i>Lycopus europaeus</i> L.	<i>Aphis</i> spp.	Valjevo, Petnica, 17.05.1998, ŽT;
<i>Lythrum salicaria</i> L.	<i>Aphis</i> sp.	Dobanovci, 17.06.2011, ŽT; Sićevačka klisura Gorge, Sićevo, 28.05.2013, ZK;
<i>Malus domestica</i> Borkh.	<i>Aphis pomi</i> De Geer	Novi Belgrade, 15.11.1992, OP; Niš, Donji Matejevci, 05.06.2013, VŽ;
	<i>Dysaphis plantaginea</i> (Passerini)	Niš, Pasi Poljana, 27.05.2013, VŽ;
<i>Malus</i> sp.	<i>Aphis pomi</i> De Geer	Zemun, Galenika, 18.06.2011, AP;
<i>Malva sylvestris</i> L.	<i>Aphis umbrella</i> (Börner)	Belgrade, Kalemegdan, 29.09.1990, OP; Novi Belgrade, 23.11.1991, OP; Zemun, 07.12.1991, OP; Belgrade, Radmilovac, 22.06.1995, OP; Višnjica, 15.06.2011, OP; Niš, Mediana, 21.05.2013, SS; Niš, Quay, 02.07.2013, MĐ; Niš, Trošarina, 28.09.2013, VŽ; Niš, Mediana, 25.10.2013, VŽ;
<i>Matricaria chamomilla</i> L. pro parte	<i>Aphis fabae</i>	Lebane, Konjino, 01.06.2013, SS;
<i>Matricaria inodora</i> L.	<i>Aphis fabae</i>	Surčin, 12.05.1989, OP;
<i>Matricaria perforata</i> Méral	<i>Aphis fabae</i>	Vlasinsko jezero Lake, 05.08.2011, SS;
<i>Medicago lupulina</i> L.	<i>Aphis craccivora</i>	Užice, Djetinja Canyon, 26.06.1999, OP;
<i>Medicago minima</i> (L.) Bartal.	<i>Aphis craccivora</i>	Vlasinsko jezero Lake, 05.08.2011, SS;
<i>Medicago sativa</i> L.	<i>Aphis craccivora</i>	Kosmaj Mt., 24.05.1995, ŽT; Paličko jezero Lake, 06.09.1995, ŽT; Bečeji, 20.06.1996, ŽT; Zrenjanin, 20.06.1996, ŽT; Žabalj,

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		20.06.1996, ŽT; Belgrade, Besni fok, 10.06.1997, ŽT; Kač, 10.06.1997, ŽT; Perlez, 23.06.1997, ŽT; Senta, 23.06.1997, ŽT; Valjevo, Petnica, 28.06.1997, AP; Zemun, 20.05.2011, AP; Novi Belgrade, Block 45, 06.06.2011, ZK; Bešnjaja Mt., 14.06.2011, ŽT; Zemun, Galenika, 17.06.2011, AP; Slankamen, 24.06.2011, ŽT; Kragujevac, Ilićevo, 06.07.2011, AMB;
<i>Melilotus album</i> Medik.	<i>Aphis craccivora</i>	Vlasinsko jezero Lake, 28.06.2012, VŽ;
<i>Melilotus officinalis</i> (L.) Pall.	<i>Aphis craccivora</i>	Žitište, 22.06.1997, ŽT; Negotin, 01.07.2011, OP;
<i>Mentha aquatica</i> L.	<i>Aphis affinis</i> Del Geurcio	Surčin, 20.05.1989, OP; Belgrade, Radmilovac, 12.06.1995, OP; Užice, Duboko, 18.06.1995, ŽT; Belgrade, Radmilovac, 09.06.2011, OP;
<i>Mentha longifolia</i> (L.) Huds.	<i>Aphis afinis</i> Del Geurcio	Vlasinsko jezero Lake, 15.06.2013, SS;
<i>Mentha piperita</i> L.	<i>Aphis affinis</i> Del Geurcio	Kruševac, 18.06.2013, ZK;
<i>Musa sapientia</i> Cavendish	<i>Aphis spiraeicola</i> Patch	Kruševac, 21.06.2013, ZK;
	<i>Aphis fabae</i>	Kruševac, 21.06.2012, ZK;
<i>Nepeta nuda</i> L.	<i>Aphis nepetae</i> Kaltenbach	Bosilegrad, Jarešnik, 22.07.2013, VŽ;
	<i>Aphis frangulae</i> Kaltenbach	Dukat Mt., 06.08.2011, AP;
	<i>Aphis origani</i> Passerini	Beljanica Mt., 12.07.1998, ŽT;
<i>Oenanthe stenoloba</i> Schur	<i>Aphis fabae</i>	Vlasinsko jezero Lake, 05.08.2011, MIM;
<i>Oenothera biennis</i> L.	<i>Aphis oenotherae</i> Oestlund	Novi Belgrade, Block 45, 05.06.2002, ŽT;
<i>Onopordum acanthium</i> L.	<i>Brachicaudus cardui</i> (L.)	Preševo, Slavujevac, 10.06.2014, SS;
<i>Papaver somniferum</i> L.	<i>Aphis fabae</i>	Kanjiža, 08.06.1995, ŽT;
<i>Pastinaca sativa</i> L.	<i>Aphis fabae</i>	Belgrade, Radmilovac, 22.08.1996, OP;
	<i>Aphis</i> spp.	Vlasinsko jezero Lake, 05.08.2011, MIM;
<i>Phaseolus vulgaris</i> L.	<i>Aphis fabae</i>	Kovačica, 22.06.1996, ŽT;
	<i>Aphis craccivora</i>	Užice, Duboko, 18.06.1995, ŽT;
<i>Phragmites australis</i> (Cav.) Trin.	<i>Hyalopterus pruni</i> (Geoffroy)	Belgrade, Radmilovac, 10.05.1995, OP;
<i>Picris hieracioides</i> L.	<i>Hyperomyzus picridis</i> (Börner & Blunck)	Paličko jezero Lake, 06.09.1995, ŽT;
<i>Plantago lanceolata</i> L.	<i>Aphis fabae</i>	Vlasinsko jezero Lake, 05.08.2011, MIM;
<i>Polygonum aviculare</i> L.	<i>Myzus persicae</i>	Suva planina Mt., Toponički put, 19.07.1997, ŽT;
	<i>Aphis polygonata</i> (Nevsky)	Zemun, 05.06.2011, AP; Zemun, Galenika, 09.06.2011, AP;
<i>Polygonum lapathifolium</i> L.	<i>Capitophorus</i> sp. van der Goot	Niš, Pantelej, 13.10.2013, VŽ;
<i>Populus tremula</i> L.	<i>Capitophorus</i> sp. van der Goot	Niš, Popovac, 22.05.2010, VŽ;
<i>Prunus cerasifera</i> Ehrh.	<i>Hyalopterus pruni</i> (Geoffroy)	Belgrade, Karađorđev park, 08.06.1996, ŽT;
	<i>Phorodon humuli</i>	Novi Belgrade, 17.06.1993, OP;
<i>Prunus cerasifera pisardi</i> (Carrière) L. H. Bailey	<i>Phorodon humuli</i>	Niš, Mediana, 21.05.2013, VŽ;
<i>Prunus cerasus</i> L.	<i>Myzus cerasi</i>	Niš, PMF, 10.05.2013, VŽ;
	<i>Brachicaudus helichrysi</i>	Belgrade, Radmilovac, 10.05.1995, OP;
<i>Prunus persica</i> (L.) Batsch	<i>Brachicaudus schwartzi</i>	Belgrade, 02.05.1995, OP; Belgrade, Radmilovac, 10.05.1995, OP; Smederevo, Lugavčina, 24.05.1995, OP; Niš, Pasi Poljana, 27.05.2013, VŽ;
<i>Punica granatum</i> L.	<i>Aphis nasturtii</i> Kaltenbach	Belgrade, Crveni krst, 17.07.1996, ŽT;
<i>Ranunculus</i> sp.	<i>Aphis fabae</i>	Sićevačka klisura Gorge, Ostrovica, 28.05.2013, MĐ;
<i>Ribes</i> sp.	<i>Aphis schilderi</i> (Börner)	Belgrade, Konjarnik, 06.06.2011, ŽT;
<i>Robinia pseudacacia</i> L.	<i>Aphis craccivora</i>	Deliblatska peščara Sands, Devojački bunar, 29.06.1992, OP; Niš, PMF, 02.06.2012, VŽ; Slankamen, 24.06.2011, ŽT;
<i>Rosa canina</i> L.	<i>Aphis</i> spp.	Brestovik, 27.05.2011, ŽT;
	<i>Aphis</i> spp.	Smederevo, 27.05.2011, ŽT;
<i>Rosa</i> sp.	<i>Aphis</i> spp.	Koštunići, 17.06.2011, ŽT;
<i>Rubus</i> sp.	<i>Aphis ruborum</i>	Bešnjaja Mt., 14.06.2011, ŽT;
		Sićevačka klisura Gorge, Ostrovica, 29.05.2010, VŽ; Zemun, 06.06.2011, OP; Koštunići, 17.06.2011, ŽT; Sićevačka klisura Gorge, Sićevo, 01.06.2012, SS; Sićevačka klisura Gorge, Ostrovica, 12.05.2013, VŽ; Tara Mt., Derventa Canyon, 26.06.2014, SS;
<i>Rubus caesius</i> L.	<i>Aphis ruborum</i>	Kragujevac, Čumić, 14.05.2011, AMB; Sićevačka klisura Gorge, Sićevo, 04.06.2011, VŽ; Ivanovići, 05.06.2011, ŽT; Kragujevac,

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		Grošničko jezero Lake, 05.06.2011, AMB; Ljig, 05.06.2011, ŽT; Kragujevac, Iličevo, 06.06.2011, AMB; Kragujevac, Košutnjačko brdo, 13.06.2011, AMB;
	<i>Aphis idaei</i>	Sićevačka klisura Gorge, Sićevo, 23.06.2012, VŽ;
<i>Rubus discolor</i> Boiss.	<i>Aphis ruborum</i>	Preševo, Slavujevac, 10.06.2014, SS;
	<i>Aphis idaei</i>	Tara Mt., Derventa Canyon, 03.07.2012, SS;
<i>Rubus fruticosus</i> L.	<i>Aphis idaei</i>	Niš, Matejevac, 23.06.2012, VŽ;
<i>Rubus idaeus</i> L.	<i>Aphis ruborum</i>	Čačak, Zdravljak, 24.05.2000, ŽT;
	<i>Aphis idaei</i>	Valjevo, Petnica, 18.05.1998, ŽT; Banja Vrujci Spa, Berkovac, 30.04.2000, ŽT;
<i>Rumex acetosella</i> L.	<i>Aphis fabae</i>	Kač, 10.06.1997, ŽT;
<i>Rumex obtusifolius</i> L.	<i>Aphis fabae</i>	Belgrade, Dušanovac, 29.05.1993, ŽT;
<i>Rumex</i> sp.	<i>Aphis fabae</i>	Tara Mt., Derventa Canyon, 03.07.2012, VŽ; Niš, Trošarina, 22.05.2013, MĐ; Sićevačka klisura Gorge, Sićevo, 28.05.2013, ZK;
<i>Salix cinerea</i> L.	<i>Aphis farinosa</i> J. F. Gmelin	Šara Mt., 21.07.1995, OP;
	<i>Aphis farinosa</i> J. F. Gmelin	Zlatar Mt., Aljinovići, 12.07.1991, OP;
<i>Salvia nemorosa</i> L.	<i>Aphis salviae</i> Walker	Uzdin, 22.06.1997, ŽT;
<i>Salvia officinalis</i> L.	<i>Aphis salviae</i> Walker	Sićevačka klisura Canyon, Ostrovica, 28.05.2013, MĐ;
<i>Salvia sclarea</i> L.	<i>Aphis craccivora</i>	Niš, Pantelej, 23.06.2012, VŽ;
<i>Salvia</i> sp.	<i>Aphis craccivora</i>	Niš, Bujanj, 05.06.2013, MĐ;
<i>Salvia verticillata</i> L.	<i>Aphis</i> spp. L.	Beljanica Mt., Resava, 11.07.1998, ŽT; Crna trava, 22.07.2001, OP; Dukat Mt., 29.06.2012, SS;
<i>Sanguisorba minor</i> Scop.	<i>Aphis</i> sp. L.	Preševo, 05.06.2011, OP; Kalna, 11.06.2011, OP;
	<i>Aphis sanguisorbae</i> (Schrank)	Niš, Donji Matejevac, 05.06.2013, VŽ; Pčinja Canyon, Gornji Starac, 10.06.2014, SS;
<i>Scabiosa argentea</i> L.	<i>Aphis</i> sp. L.	Pčinja Canyon, Prohor Pčinjski, 10.06.2014, VŽ;
	<i>Macrosiphum</i> sp. Passerini	Pčinja Canyon, Prohor Pčinjski, 10.06.2014, VŽ;
<i>Solanum nigrum</i> L.	<i>Aphis fabae solanella</i> Theobald	Obedska bara Swamp, 15.06.1996, ŽT; Apatin, Prigrevica, 27.09.1997, ŽT; Srbobran, 27.09.1997, ŽT; Vršac, 02.10.1997, ŽT;
<i>Sonchus oleraceus</i> L.	<i>Uroleucon sonchi</i> (L.)	Brestovik, 27.05.2011, OP;
<i>Symphytum officinale</i> L.	<i>Aphis fabaei</i> Glover	Obedska bara Swamp, 02.06.2011, OP; Sićevačka klisura gorge, 28.05.2013, MĐ;
	<i>Aphis</i> spp.	Ečka, 31.05.2001, ŽT; Valjevo, Petnica, 20.05.1996, AP;
<i>Tamarix</i> sp.	<i>Brachyunguis tamaricis</i> (Lichtenstein)	Niš, Niška banja Spa, 06.06.2013, VŽ;
<i>Tanacetum parthenium</i> (L.) Sch. Bip.	<i>Aphis fabae</i>	Šara Mt., Muržička reka River, 21.07.1995, OP; Beljanica Mt., Suvaja, 11.07.1997, OP;
<i>Tanacetum vulgare</i> L.	<i>Metopeurum fuscoviride</i> Stroyan	Vlasinsko jezero Lake, 06.08.2010, SS; Vlasinsko jezero Lake, 15.06.2013, SS; Jerma Canyon, 19.07.2013, SS; Vlasinsko jezero Lake, 21.07.2013, SS;
<i>Taraxacum officinale</i> Weber	<i>Aphis taraxacicola</i> Blackman	Belgrade, Dušanovac 08.05.1993, ŽT; Belgrade, Dušanovac, 29.05.1993, ŽT; Belgrade, Crveni krst, 14.06.1997, ŽT;
<i>Tecoma radicans</i> (L.) Juss.	<i>Aphis spiraeicola</i> Patch	Niš, PMF, 21.05.2013, SS;
<i>Thymus</i> sp	<i>Aphis serpylli</i> Koch	Zlatar Mt., 13.07.1991, OP;
<i>Tordylium maximum</i> L.	<i>Aphis</i> spp.	Suva planina Mt., Vetanska reka River, 16.07.1997, ŽT;
<i>Tragopogon</i> sp.	<i>Aphis</i> spp.	Belgrade, Botanical Garden, 24.06.1999, ŽT;
<i>Trifolium</i> sp.	<i>Aphis craccivora</i>	Surčin, 15.06.2011, OP;
	<i>Therioaphis trifolii</i> Monell	Surčin, 15.06.2011, OP;
<i>Trifolium lagopus</i> Pourr.	<i>Aphis craccivora</i>	Pčinja Canyon, Prohor Pčinjski, 10.06.2014, BZ;
<i>Trifolium pratense</i> L.	<i>Aphis craccivora</i>	Beljanica Mt., 31.07.1996, OP; Kruševac, Slobodište, 13.07.2012, ZK;
<i>Trigonella procumbens</i> (Besser.) Rchb.	<i>Aphis craccivora</i>	Uzdin, 22.06.1997, ŽT; Kostolac, 02.06.2001, ŽT;
<i>Triticum aestivum</i> L.	<i>Anoecia corni</i> (Fabricius)	Suva planina Mt., Vetanska reka River, 17.06.1997, ŽT;
<i>Triticum vulgare</i> Vill.	<i>Sitobion avenae</i> (Fabricius)	Leskovac, 01.06.2013, VŽ;
<i>Typha latifolia</i> L.	<i>Rhopalosiphum nymphaeae</i> (L.)	Niš, Niška banja Spa, 23.07.2013, VŽ;
<i>Urtica dioica</i> L.	<i>Aphis fabae</i>	Brestovik, 27.05.2011, OP; Smederevo, 27.05.2011, OP;
	<i>Aphis</i> sp.	Niš, Popovac, 22.05.2010, VŽ; Sićevačka klisura Gorge, Sićevo, 29.05.2010, SS;

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	<i>Aphis urticata</i> J. F. Gmelin	Smederevo, Lugavčina, 15.04.1990, OP; Kokin brod, 12.07.1991, ŽT; Belgrade, Dušanovac, 08.05.1993, ŽT; Surčin, 23.05.1993, ŽT; Surčin, 02.05.1995, ŽT; Kanjiža, 08.06.1995, ŽT; Belgrade, Radmilovac, 20.05.1996, ŽT; Omoljica, 13.06.1996, ŽT; Čenta, 20.06.1996, ŽT; Užice, Trešnjica, 23.07.1996, ŽT; Belgrade, Radmilovac, 10.06.1997, ŽT; Novi Sad, 10.06.1997, ŽT; Belgrade, Radmilovac, 13.05.1998, ŽT; Niš, Popovac, 10.05.2010, VŽ; Lebane, Konjino, 06.06.2010, SS; Stara planina Mt., Bojanine vode, 11.07.2010, SS; Sićevačka klisura Gorge, Sićevo, 04.06.2011, VŽ; Rogojevac, 16.06.2011, OP; Sićevačka klisura Gorge, Sićevo, 23.06.2012, SS; Kruševac, Pakašnica, 11.05.2013, ZK; Sićevačka klisura Gorge, Sićevo, 12.05.2013, VŽ; Sićevačka klisura Gorge, Sićevo, 28.05.2013, ZK; Niš, Bubanj, 31.05.2013, MĐ; Lebane, Konjino, 01.06.2013, SS; Sićevačka klisura Gorge, Sićevo, 06.06.2013, VŽ; Sićevačka klisura Gorge, Sićevo, 22.04.2014, VŽ;
<i>Urtica urens</i> L.	<i>Aphis fabae</i>	Kumane, 20.06.1996, ŽT;
<i>Valeriana officinalis</i> L.	<i>Aphis fabae</i>	Vlasinsko jezero Lake, 21.07.2013, SS;
<i>Verbascum nigrum</i> L.	<i>Aphis verbasci</i> Schrank	Vlasinsko jezero Lake, 05.08.2011, VŽ;
<i>Verbascum</i> sp.	<i>Aphis verbasci</i> Schrank	Gornjane, 06.07.1990, OP; Belgrade, 12.10.1990, OP; Kopaonik Mt., Brzeće, 25.08.1998, OP; Lebane, Konjino, 01.07.2012, SS; Niš, Popovac, 08.06.2013, VŽ;
<i>Viburnum opulus</i> L.	<i>Aphis viburni</i> Scopoli	Belgrade, Žarkovo, 19.04.1990, OP;
<i>Vicia cracca</i> L.	<i>Aphis craccivora</i>	Vlasinsko jezero Lake, 05.08.2011, MIM; Lebane, Konjino, 31.05.2014, SS; Prokuplje, Bresničić, 15.06.2014, VŽ;
<i>Vicia cordata</i> Wulfen	<i>Aphis craccivora</i>	Niš, Mediana, 21.05.2013, SS;
<i>Zea mays</i> L.	<i>Aphis fabae</i>	Beljanica Mt., 30.07.1996, OP;

