

New Aphid Fauna Records for Serbia

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Abstract

Nine aphid species (Hemiptera: Aphididae), mainly found in the southeastern part of the country, were determined as new records for Serbia. They belong to three subfamilies: *Aphis passeriniana* (Del Guercio, 1900); *A. podagrariae* Schrank, 1801; *A. salviae* Walker, 1852; *Brachyunguis tamaricis* (Lichtenstein, 1885); *Smiela fusca* Mordvilko, 1948; *Staticobium limonii* Contarini, 1847 and *Uroleucon pseudobscurum* (Hille Ris Lambers, 1967) from the subfamily Aphidinae; *Drepanosiphum oregonensis* Granovsky, 1939 from the subfamily Drepanosiphinae and *Pterocomma jacksoni* Theobald, 1921 from the subfamily Pterocommatinae. With the inclusion of these nine records, a total of 383 aphids have been found so far in Serbia. This represents about 70% of the species of the total aphid fauna expected to be found on plants in Serbia. All species are of Palearctic distribution and seem to be monoecious.

KEY WORDS: new monoecious species, Serbia, distribution

Introduction

There are more than 5,000 species of aphids (Hemiptera: Aphididae) described worldwide (Favret, 2019). About one-third of these species are present in Europe, of which about 400 to 700 are recorded in each European country. Aphid fauna research in Serbia has been ongoing since 1988 and has resulted in many new findings. Of 25 subfamilies recently classified around the world, 14 subfamilies have been listed for the territory of Serbia (Petrović-Obradović, 2003). So far, a total of 374 aphids are known in Serbia (Vučetić *et al.*, 2014; Jevremović *et al.*, 2016; Petrović-Obradović *et al.*, 2018; Petrović-Obradović *et al.*, 2019). However, there are many species that have not yet been discovered in Serbia, due to the lack of researchers working in this field or to geographical and climatic constraints, all the way to the plant diversity that is crucial for this group of organisms.

Aphids are small soft-bodied insects, usually less than 3 mm long, living in colonies on different parts of plants. They are phytophagous insects that feed by sucking plant sap. Most of them are monophagous, but there are also oligophagous and polyphagous species.

Aphids are characterized by very high polymorphism between generations and sometimes between individuals in the same colony. There can be up to ten different morphs of one species per year. The most common are five morphs: *fundatrix* (fx), apterous viviparous parthenogenetic female (apt), alatae viviparous parthenogenetic female (al), oviparous

female (o) and male (m) (Blackman & Eastop, 2018). Most species have all five of these morphs; one sexual generation (ovipara and male) is inherited by several generations of parthenogenetic females. This type of life cycle is called holocyclic; such aphids overwinter as eggs. Another life cycle type is anholocyclical where the aphids do not produce sexes that have only parthenogenetic reproduction throughout the year. Anholocyclic species overwinter as apterous morphs and as alatae viviparous parthenogenetic females and also nymphs. Some aphid species require host-plant alternation, which is called heteroecy. These aphids have a primary host in which they hibernate in the egg stage. The primary hosts are usually trees or bushes that serve as hosts for fundatrices and usually 1-3 generations of apterous parthenogenetic females. The next generation, composed only of females of the alatae parthenogenetic generation, leaves the primary host, flying off and colonizing the secondary hosts, herbaceous plants. Many generations of viviparous females reproduce on the secondary hosts during summer. In the autumn, aphids fly back to the primary hosts. Host-alternation is not reported in monoecious species (Eastop, 1979).

It is important to note here that apart from the economic impact, aphids are very important in ecosystems as they are food for many predatory insects and small birds. In addition, by establishing mutual relationships with ants because of the honeydew they secrete, the ants act as guardians to protect them from predators (Way, 1963).

Materials and Methods

This research was conducted in the period 1996-2018 in many parts of Serbia, mainly in the southeast (the city of Niš and surroundings). Aphids were collected from different plant parts, especially terminal shoots and leaves, trunks/stems and branches. Upon collection, aphids, along with parts of the host plants, were transferred alive to the laboratory. Most of the collected samples were preserved in 70% alcohol, while some were mounted on microscope slides using standard methods (Eastop & van Emden, 1972). Specimens were identified using a stereomicroscope (Leica, Type: DMLS2) and identification keys (Blackman & Eastop, 2020). The nomenclature of aphid body parts follows Remaudière & Remaudière (1997). Samples stored in alcohol-filled tubes, as well as microscopic slides, were deposited in the collection of the Faculty of Agriculture, University of Belgrade.

Results

In this research, a total of nine aphid species were recorded in Serbia for the first time. In addition to the classification of species, information on their host plants is given, along with a brief commentary on their biology. We also provide a known distribution territory for each species. The list of findings is given chronologically.

Abbreviations: al – alatae viviparous parthenogenetic females; apt – apterous viviparous parthenogenetic females; m – males.

Subfam. Aphidinae, tribe Aphidini

Aphis passeriniana (Del Guercio, 1900)

Material examined: *Salvia officinalis* L., Kruševac, 15.05.2013, al, apt, leg. Z. Kojičić; *S. officinalis* L., Niš, 06.04.2016, apt, leg. M. Ristić.

Distribution: Palearctic (Europe and Middle East).

Biology: Monoecious on *Salvia* spp.; oviparae and males have never been found. Maybe this species is anholocyclic.

Aphis podagrariae Schrank, 1801

Material examined: *Aegopodium podagraria* L., Loznica, Tršić, 19.06.2009, al, apt, leg. D. Smiljanić; *A. podagraria* L., Niš, 05.06.2016, al, apt, leg. V. Žikić.

Distribution: Palearctic (Europe and Middle East).

Biology: Monoecious holocyclic on *Aegopodium* spp.

Aphis salviae Walker, 1852

Material examined: *Salvia nemorosa* L., Kovačica, Uzdin, 22.06.1997, apt, leg. Ž. Tomanović; *S. splendens* Sellow ex Roem. & Schult., Kruševac, 03.07.2012, apt, leg. Z. Kojičić; *S. aethiops* L., Niš, Donji Matejevac, 05.06.2013, leg. V. Žikić; *S. nemorosa* L., Prokuplje, Gornja Konjuša, 01.05.2016, apt, leg. M. Ristić.

Distribution: Europe, Algeria, Israel, Turkey and Kazakhstan.

Biology: Monoecious holocyclic on *Salvia* spp. Found on other members of the fam. Lamiaceae. Males are apterous (Blackman & Eastop, 2020).

Brachyunguis tamaricis (Lichtenstein, 1885)

Material examined: *Tamarix* sp., Niš, Niška Banja, 06.06.2013, al, apt, leg. V. Žikić; *Tamarix* sp., Niš, 25.05.2014, apt, leg. V. Žikić; *Tamarix* sp., Niš, Niška Banja, 29.05.2014, al, apt, V. Žikić.

Distribution: Palearctic (Europe and Middle East) and North Africa.

Biology: Monoecious holocyclic on *Tamarix* spp.

Subfam. Aphidinae, tribe Macrosiphini

Smiela fusca Mordvilko, 1948

Material examined: *Berteroa incana* (L.) Niš, 07.07.2013, apt, leg. M. Đorđević; *B. incana* (L.) DC., Pčinja Canyon, Gornji Starac, 10.06.2014, apt, leg. S. Stanković.

Distribution: Palearctic (Europe).

Biology: Monoecious holocyclic on *Berteroa* spp. and also found on horseradish, *A Armoracia rusticana* Gaertn., C.A.Mey. & Scherb. (Blackman & Eastop, 2020).

Staticobium limonii Contarini, 1847

Material examined: *Limonium gmelinii* (Willd.) O. Kuntze, Niš, Popovac, 23.06.2012, apt, leg S. Stanković; *L. gmelinii*, Niš, Lalinačke pojate, 08.06.2013, al, apt, leg. V. Žikić.

Distribution: Palearctic (Europe and the Mediterranean region).

Biology: Monoecious on *Limonium* spp., but biology not very clear.

Uroleucon pseudobscurum (Hille Ris Lambers, 1967)

Material examined: *Hieracium* sp., Kopaonik, 17.07.2013, apt, leg. V. Žikić; *Hieracium* sp., Vlasinsko Jezero lake, 19.06.2018, apt, leg. V. Žikić.

Distribution: Palearctic (Italy, Hungary, Slovakia, Kazakhstan and Japan).

Biology: Probably monoecious on *Hieracium* spp.; no data about sexual forms. In large colonies on stems of *Hieracium* sp.

Discussion

In the last 20 years, many fauna records of aphids in Serbia have been published. When the first checklist of aphid fauna was made it contained 338 species (Petrović, 1998). Over the following five years, extensive research was conducted in the wider area of Serbia, in natural and agroecosystems. In a monograph of aphids in Serbia (Petrović-Obradović, 2003), the number of newly registered species reached 353 (including several new described species). Since then, records of the presence of 21 aphids, mainly allochthonous or invasive species, have been published. These species are listed herein along with references: *Cinara cedri* Mimeur (Glavendekić, 2005); *Prociphilus (Meliarhizophagus) fraxinifolii* (Riley) (Petrović-Obradović *et al.*, 2007); *Aphis spiraeicola* Patch. (Petrović-Obradović *et al.*, 2009); *Chaitophorus populifolli* Essig, *Myzocallis walshii* (Monell) and *Trichosiphonaphis polygonifoliae* (Shinji) (Petrović-Obradović *et al.*, 2010); *Macrosiphum albifrons* Essig, *Acyrtosiphon cyparissiae* (Koch), *Ctenocallis setosus* (Kaltenbach), *Myzodium modestum* (Hottes), *Myzocallis castanicola* Baker, *M. occidentalis* Remaudière et Nieto Nafria, *Tinocallis platani* (Kaltenbach) and *Wahlgreniella ossiannilssoni* Hille Ris Lambers (Vučetić *et al.*, 2014); *Muscaphis* sp. (Jevremović *et al.*, 2016); *Illinoia liriodendri* (Monell), *Wahlgreniella nervata* (Gillette), *Takecallis arundicolens* (Clarke), *Tinocallis takachihoensis* Higuchi) and *Ericaphis scammelli* (Mason) (Petrović-Obradović *et al.*, 2018) and *Macrosiphoniella helichrysi* Remaudière 1952 (Petrović-Obradović *et al.*, 2019). Together with the nine new species, the total number of aphid species known for the territory of Serbia is now 383 species. The genera *Brachyunguis*, *Smiela* and *Staticobium* are new genera for the fauna of Serbia. Species of the genera *Brachyunguis* and *Staticobium* are usually connected with plants growing in salty desert soil, including different shrubs (*Tamarix* for *B. tamaricis*) or herbaceous plants such as *Limonium* for *S. limonii*.

All nine species have Palearctic distribution and are present in some European countries. For eight of the species, apterous viviparous parthenogenetic females were collected with or without alatae viviparous parthenogenetic females. The introduced species *D. oregonensis*, like all *Drepanosiphum*, produces only winged parthenogenetic females, so an apterous morph has never been reported. On the other hand, males have been collected only for *D. oregonensis*. Oviparous females have not been found for any of the studied species. The reason for this is that collecting of the material took place during the spring and summer, while the sexual forms appear in the fall. All nine species presented herein are monoecious, with no host alternation. In the world aphid fauna, about 90% of aphids are monoecious (Eastop, 1979). New research on the aphid fauna is necessary and will probably result in new findings for Serbia.

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