

THE NORWAY MAPLE APHID - *PERIPHYLLUS LYROPICTUS* (KESSLER) (*HEMIPTERA: APHIDIDAE*) REDISCOVERED IN BĂNEASA- BUCUREȘTI AREA (SOUTH ROMANIA)

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Abstract: The paper reports the rediscovery of the aphid *Periphyllus lyropictus* on the Norway maple *Acer platanoides* in northern part of Bucharest (Băneasa area) in southern Romania, after more than 50 years from the first record of the species in this zone. Aphid colonies varying in size, consisting of apterous forms in various instars, and mixed colonies of wingless and winged morphs were recorded on the lower and upper sides of the Norway maple leaves throughout the season. Parasitized aphids were observed in autumn. Parasitoid specimens emerged by rearing in the laboratory were assigned to the genus *Trioxys*. We consider that *P. lyropictus* is widespread in the country, mainly in association with the Norway maple, and assume that it went unnoticed for a long period after the 70s.

Key words: *Periphyllus lyropictus*, *Acer platanoides*, Băneasa - București

Periphyllus lyropictus (Kessler 1883), commonly known as the Norway maple aphid, belongs to the genus *Periphyllus* van der Hoeven (1863) into the tribe Chaitophorini, subfamily Chaitophorinae, family Aphididae. This species has been described over time under various names as *Chaitophorus lyropictus* (Kessler 1886), *Chaitophorinella lyropictus* (v.d. Goot 1915), *Chaitophorinella lyrepicta* (Takahashi 1919), *Chaetophorella aceris* (Börner 1940), *Chaetophorella fusca* (Börner 1940), *Periphyllus fuscus* (Börner 1940) as is cited in Boguleanu (1994).

Of the 48 species of aphids grouped into the genus *Periphyllus* in the world, 14 species, including *P. lyropictus*, are represented in Europe (Tomić & Petrović-Obradović, 2022). The species of the genus *Periphyllus* are associated with species of the soapberry family (Sapindaceae), mainly with species of the genus *Acer* (maple), only a few species of this genus feed on species of *Aesculus* (chestnut) and *Koelreuteria* (golden rain tree) (Wieczorek et al., 2017).

The aphid *P. lyropictus* is native to Europe widespread on the Norway maple *A. platanoides*. As it is shown in many studies in European countries, such as Hungary (Ripka et al., 1998), Poland (Mackoś, 2007; Junkiert et al., 2011), Italy (Pollini, 2013), the United Kingdom (Dransfield & Brightwell, 2015) and Ukraine (Stukalyuk et al., 2020), *A. platanoides* is the main host plant for this species. However, *P. lyropictus* has been identified feeding on other maple species like *Acer campestre*, *A. pseudoplatanus*, *A. saccharinum* and *A. negundo* (Ripka et al., 1998; Junkiert et al., 2011; Wieczorek & Junkiert, 2012; Stukalyuk 2017). *P. lyropictus* was also found in a dendrological collection in central Poland on *A. triflorum* (Ratajczak et al., 2011). The Norway maple is also of European origin from the Romanian central part of the continent and Germany, spread across the continent up to the Southern Urals and Cis-Urals which represent the eastern limit of its distribution zone (Stukalyuk 2017).

The aphid *P. lyropictus* entered North America on seedlings of the Norway maple deliberately imported from England in 1756 (Nowak & Rowntree, 1990) where, like its host, become invasive species. On the American continent, *A. platanoides* was widely planted as ornamental species in urban and peri-urban green spaces for its aesthetic value becoming in a short period a naturalized but also an invasive species (Fang & Wang 2020) contributing to the continuous spread of the aphid in new locations. Distribution area of *P. lyropictus*, both in European and American continents, is related to that of the Norway maple. A consistent presence of the aphid on maple trees in urban green areas was reported, and less on maple in forest layers (Stukalyuk, 2017).

Regarding the presence of *P. lyropictus* in the Romanian aphid fauna, this species was identified for the first time by Ceianu on *A. platanoides* since the 50s, in the forest fields of the Experimental Station Bărağan located in Ialomița County, the south-east of the country (Boguleanu, 1994), and then in 1971 in Herastrau Park, the north of Bucharest (Holman and Pintera, 1981) and recently in Timisoara, the west of the country (Virteiu & Grozea, 2023).

The aim of this work was to report a new record about the presence of the aphid *Peryphyllus lyropictus* on the Norway maple *Acer platanoides* in the north of Bucharest (south of Romania) after more than 50 years from the first record of the species in this zone.

MATERIALS AND METHODS

Direct observations and collection of biological material of the aphid *P. lyropictus* were performed on the maple trees of *A. platanoides* in the park of Research Institute for Plant Protection (the north of Bucharest) in 2020 and 2023. The collected leaf samples with colonies of aphid were analyzed in the laboratory. Aphids were examined with a stereomicroscope Stemi 508 (Karl Zeiss) and identified based on morphological characters using taxonomic keys presented in the literature (Hille Ris Lambers, 1947; Junkiert et al., 2011; Lubiarsz & Mackoś-Iwaszko, 2015). The biological material were photographed in situ with a Panasonic LUMIX DMC-FZ82 digital bridge camera and in the laboratory by means of a Zeiss Axiocam 105 color attached at the stereomicroscope.

RESULTS AND DISCUSSIONS

In this study, the aphid *Peryphyllus lyropictus* was observed and collected in 2020 and then in 2023 from leaves of *A. platanoides* in the park of Research Institute for Plant Protection (Fig. 1) in the north of Bucharest (Southern Romania). The park was surrounded by buildings of public institutions and woody vegetation in the park includes species of maples (*Acer platanoides*, *A. negundo*), linden (*Tilia* sp.), spruces (*Picea* sp.), pines (*Pinus* sp.), oaks (*Quercus cerris*), elm (*Ulmus* sp.), hawthorn (*Crataegus manogyna*), thuyas (*Thuja* sp.) and cherry plum (*Prunus cerasifera*). The aphid was detected during survey activities for early detection of invasive species carried out in northern area of Bucharest. This area has become highly urbanized in recent years, just like in many cities in the country or abroad, creating small habitats with particular microclimates that provide safe hosts for a wide range of arthropod species.

A. platanoides is one of the native maple species widely cultivated in green spaces in urban and rural areas in Romania due to its aesthetic and decorative value and adaptability to the specific environment created by the expanding urbanization process (Badea & Enescu, 2016).



Figure 1- Locations of presence of *Peryphyllus lyropictus* is reported in Romania
● - previous reports, ○ - new reports

For Romania, only a number of four reports on the presence of the aphid *P. lyropictus* have been published so far, to which is added the one from the present paper, the fifth. First report dates from 1963 and belongs to Igor Ceianu who collected the aphid from leaves of *Acer platanoides* in the forestry fields of Experimental Forestry Station Bărağan situated in Ialomița County in south-east of the country (Boguleanu, 1994). Ceianu collected the insects for his doctoral dissertation (Pests of forest crops in Bărağan), of 270 pages, between 1955 and 1960 (Doniță et. al. 2011; N. Olenici, pers. commun.) and the abstract of doctoral dissertation was published in abstract in 1963. The following two reports were, the former also by Ceianu in 1970 for the same zone above mentioned, recording *P. lyropictus* on two maple species, *Acer campestre* and *A. negundo*, and the latter by Holman and Pintera (1981) collecting this species on *A. platanoides* in Herastrau Park in northern Bucharest in 1971. After this period, no other report on the aphid was disseminated until 2022, when Virteiu & Grozea (2023) reported about the occurrence of the aphid on *A. platanoides* in six green urban sites in the area of Timișoara city (Timiș County, Western Romania) in the period October-November 2022.

The present paper confirms the presence of *P. lyropictus* on trees of *A. platanoides* in the northern part of Bucharest (Băneasa area) in 2020 and 2023, after more than 50 years from the first record in 1971 of Holman and Pintera (1981).

Aphids of the *P. lyropictus* species were recognized in investigated area by the color pattern of the wingless forms that have a pale yellow-green body with a dark greenish to brown lyre-shaped marking on the abdomen, and a broad spinal stripe on the head and thorax (Fig. 2 and 3). Another important diagnostic character was represented by the cauda of the aphids that has the shape like a helmet. The cornicles of apterous morph are conical, pale to dusky in colour.

A detailed description of morphological characters of *P. lyropictus* is depicted in paper of Hille Ris Lambers (1947). According to this author, alatae morph has yellow to blackish brown abdomen (Fig. 2); a number of very short transverse stripes of dark brown color along the dorsum can be seen in pale specimens which are not visible in dark specimens; the cornicles are always brownish pigmented, while the legs are little pigmented.



Figure 2 - *Periphyllus lyropictus* on the Norway maple *Acer platanoides*

The aphid develops throughout the seasons from spring to autumn, the most abundant population being in June. Unlike other species of the genus *Peryphyllus* (e.g. *P. acericola*, *P. testudinaceus*), *P. lyropictus* has a life cycle without an obligate summer diapause of the larvae and the specialized aestivating dimorphs were not observed in this species (Junkiart et al., 2011; Stukalyuk et al., 2020).

The biology of *P. lyropictus* is also described by Hille Ris Lambers (1947). Early in spring, the eggs hatch and the fundatrix develops and remains on the annual branches. These give rise to the second generation which is mostly apterous (rarely with some alatae) developing on the newly formed leaves as soon as the buds open. The next generation, the third, includes a small number of winged form. During the summer, *P. lyropictus* develops up to 10 generations living in groups on the underside of the leaves along the main veins (Fig. 3a). Sometimes the colonies also develop on the upper side of the leaves (Fig. 3b). Insects are usually gregarious and develop compact colonies. In autumn, sexual forms are observed (oviparous wingless females and winged males) and after fertilization, eggs are laid on the branches or the leaves (Fig. 4).

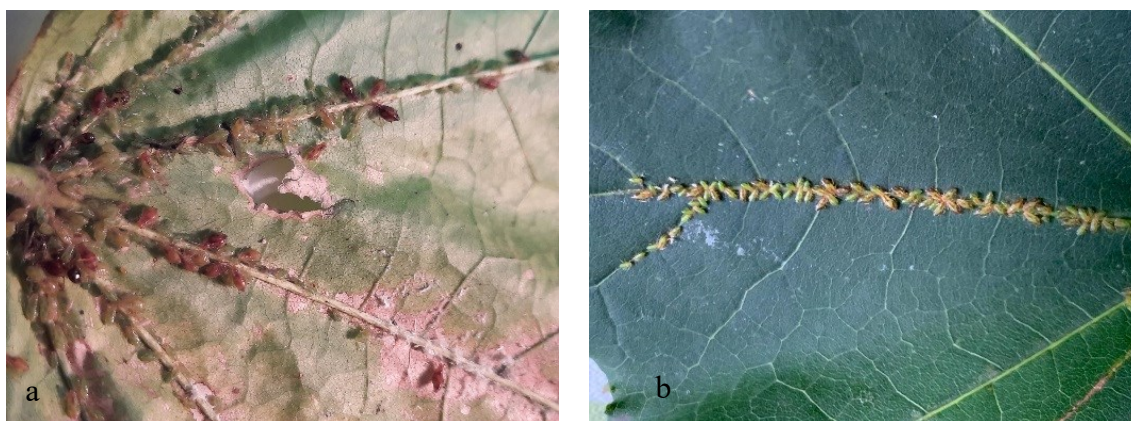


Figure 3- Colonies of *P. lyropictus* on the lower and upper sides of *Acer platanoides* leaves



Figure 4 - Eggs laid on the shoot and the underside of the leaves

Colonies of the *P. lyropictus* aphid are visited in abundance by ants that are attracted by the sweet excrement secreted by nymphs (Fig. 5). The mutualistic relationship between aphids and some ant species is well known (Bonnemain, 2010), ants are attracted and consume the honeydew secreted by aphids, thus protecting them against predators. The most frequent and abundant ant species reported to visit the aphids in the trees canopy are *Lasius emarginatus*, *L. fuliginosus* and *L. niger* but also *Temnothorax* spp. and *Myrmica* spp. (Stukalyuk et al., 2020).



Figure 5 - Colonies of the *P. lyropictus* aphid visited by ants

P. lyropictus is parasitized in its native range in Europe. The black bodies of parasitized aphids were observed and collected in study site at the beginning of the September (Fig. 6) Three wasp species from the order Hymenoptera (Ichneumonoidea: Braconidae) are recorded as parasitoids of aphids in the genus *Periphyllus* associated with *Acer* spp. in Central and Southeast Europe and are considered specialized in parasitizing this genus (Baker et al., 2009; Tomanovi et al., 2009): *Praon (Areopraon) silvestre* (Stary) that is active in spring and autumn and has an obligatory diapause in summer; *Aphidius setiger* (Mackauer) occurs continuously throughout the season and *Trioxys falcatus* (Mackauer) occurs throughout the season but has

the ability to enter diapause in summer. All are common aphid parasitoids in urban green spaces, forest and agricultural environments (Dinh et al., 2017).



Figure 6 - *P. lyropictus* parasitized on the Norway maple leaves, on the site of former associated colonies of the aphid and the citrus flatid planthopper *Metcalfa pruinosa*. A cocoon of *Neodryinus typhlocybae* (a) and an ant can be observed

From the parasitized aphids reared in the laboratory have emerged five wasps as in the figure 7. After analysing and comparing the forewings venation of resulted specimens with images of the three species of parasitoids presented above, we appreciated them to be comparable to species of the genus *Trioxyys*.

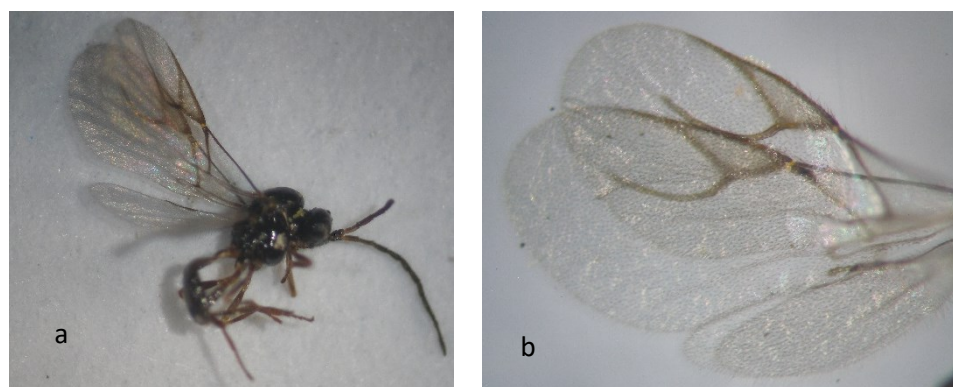


Figure 7 – Parasitoid wasp on *P. lyropictus* (a), forewings of parasitoid (b)

Aphids (Hemiptera:Aphididae) are generally acknowledged as one of the most economically important group of phytophagous pests causing damage to agricultural, horticultural and forestry plants. Through their specific type of feeding, sucking sap from plants, aphids induce direct and indirect damage to plants: adults and nymphs suck from the phloem sap of plants and extract nutrients, reducing plant growth and causing leaf deformation; toxic substances and viruses transmitted in saliva cause plant deforming and wilting; large production of secreted honeydew covers the leaves and fruits, providing an adequate support for the sooty mold development.

P. lyropictus has a negative effect on the decorative value of Norway maples. The most significant damages are caused by massive colonies of the spring generations that excrete large amounts of honeydew, which causes the leaves to stick together and dust also sticks to their

surface and therefore the decorative value of the trees decreases (Mackoś-Iwaszko et al., 2015). Young leaves are more sensitive after developing from buds in the spring, because are very thin and delicate. Mature leaves in autumn are thick and stiff and much less susceptible than spring ones. Sidewalks and objects under the crown of infested trees, in the case of ornamental trees in urban alignments, become sticky and blackened as a result of the nymphs leaking from the underside of the leaves.

Despite the fact that the Norway maple is prone to attack by pests, including aphids, it is among the woody plant species valued for its decorative and aesthetic value, widely cultivated in parks, street alignments, institutional courtyards and green spaces between buildings. The green spaces of cities undergoing continuous urbanization gather more and more species of woody plants (trees and shrubs) and grasses as well as large communities of arthropods. Aphids are among the taxonomic groups that responded positively to the urbanization level (Chatelain et al., 2023). The authors, in the recently published study conducted in Innsbruck (Austria), showed an increased abundance of aphids in the canopy of trees with the increase in the level of habitat urbanization.

CONCLUSIONS

The results in this study confirm the presence of the aphid *Periphyllus lyropictus* on the Norway maple *Acer platanoides* in northern part of Bucharest (Baneasa area) in the south of Romania, after more than 50 years from the first record of the species in this zone.

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