

***Periphyllus californiensis* (Shinji, 1917) A LITTLE KNOWN PEST ON *Acer palmatum* Thunb. IN BULGARIA**

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Abstract

Periphyllus californiensis (Hemiptera: Aphididae) is a pest infesting mainly plants from *Acer* and *Aesculus* genera. In Bulgaria, it has been for the first time found in 2010 on *Acer palmatum* in ornamental nursery in Sofia. The aim of the present study was to provide morphological and biological characterization of this comparatively new for Bulgaria pest species. The origin of this pest and its distribution world wide are described. In the neighboring to Bulgaria countries this aphid species has not been recorded so far. The hypothesis about its appearing in Bulgaria is that *P. californiensis* might have been introduced much earlier than 2010 with already infested plants imported from abroad.

Key words: *Acer palmatum*, aphid, Aphididae, Bulgaria, *Periphyllus californiensis*, pest

The intensive import of ornamental plants in Bulgaria significantly contributes to the spread of various alien and little known pests, including species of Aphididae family (Hemiptera).

The species *Periphyllus californiensis* (Shinji, 1917) was reported for the first time in Bulgaria by Yovkova et al. (2013). The pest originates from the temperate zones of East Asia (Wieczorek, 2011). It is currently distributed in Europe, North America, Australia and New Zealand (Blackman and Eastop, 2012). In Europe *P. californiensis* was found for the first time in England (Stroyan, 1955) and later in the Netherlands, Italy, Denmark, Germany, Switzerland (Wittenberg, 2005; Coeur d'acier et al., 2010), Croatia (Čuljak et al., 2005), Poland (Junkeirt et al., 2011) and France (Anonymous, 2012).

P. californiensis has been reported mainly on ornamental plant species from *Acer* and *Aesculus* genera. Shanjhajan and Bukhari (2006) have registered this pest also on *Populus euphratica*. This host is not grown in Bulgaria. The aphid infests mainly *Acer palmatum* and *A. japonicum* in their natural habitats. *P. californiensis* feeds along the veins underside of the leaves of its host (Holman, 2009; Blackman and Eastop, 2012).

MATERIAL AND METHODS

In order to identify aphid infestations on *Acer palmatum*, during the period 2008 – 2013 visual observations by the routing method in over 35 locations across the country were held monthly. Ten of the visited objects were located in Sofia. The collected aphids were fixed in 70% ethanol.

Permanent microscope slides were prepared, following the traditional method of Hille Ris Lambers (1950). Species identification was carried out using identification key of Blackman and Eastop (2012). The description of *P. californiensis* was based on observations on live individuals and also on microscope slides. The live individuals were studied under binocular "Zeiss", and the microscope slides – under microscope "Zeiss Primo Star". The main morphological characteristics and morphometric measurements were performed on the basis of permanent microscope slides. The presented biological and ecological characteristics of the pest species are based on the studies of Furuta (1986; 1987; 1990; 1994), Wang and Furuta (2002) and Wang (2006).

RESULTS AND DISCUSSION

P. californiensis was established for the first time in Bulgaria in ornamental nursery in Sofia in May 2010 on *Acer palmatum*. Dense colonies of larvae, nymphs, wingless and winged viviparous females were registered on young shoots and on underside of young leaves. Deformations were not established on the infested plant parts.

In the fall of 2010, the same species was registered in the greenhouses of The Botanical Garden of Bulgarian Academy of Science on the same host.

Apteræ reach size of 2.5 – 2.8 (3.5) mm. They are olive-green to brown in color with black dorsal scleritis, located on the abdomen. Head, hind tibia and almost whole antennae are black. Siph are dark. Oval marginal and dorsal lateral scleritis are observed on the thorax and abdomen of the fixed specimens.

Alatae (Figure 1) are smaller in size than the apterae, they reach 2.2 – 2.3 mm. Abdomen is green with dark abdominal scleritis. Head, thorax, almost the whole antennae, the apex part of the femur and the whole tibia are black. Abdominal tergite of fixed individuals have small oval marginal scleritis and fused pleural and spinal scleritis. The rhinaria of the third antennal segment are oval and their number varies between 10 and 23.



Fig. 1. Alatae of *Periphyllus californiensis* (fixed in 70% ethanol, magnification under binocular "Zeiss")

The main specific feature differing this species from all other species of the same genus reported in Bulgaria so far is that hind tibia is entirely black.

P. californiensis is holocyclic and monoecious. It infests mainly species of *Acer* genus. Its eggs hatch in early spring before bud burst. Those eggs located of shaded trees hatch earlier, due to the early bud burst.

In Japan egg hatching begins after mid-February and continues until about 20th of March. Earlier hatched larvae have the ability to survive without feeding until bud burst, but no moulting is observed before the start of feeding.

Aphids of the first alatae generation deposit their larvae simultaneously with the fundatrices. The first alatae generation completes its birth rate for a shorter period of time than the fundatrices. For example, the fundatrices deposit 50% of the larvae during the first 3-4 days and complete depositing for 8-10 days, while the alatae individuals deposit 50% of the larvae for 1-2 days and complete depositing in 3-4 days. During the growing season aphids prefer orange-yellow leaved forms of Japanese

maple, and in the autumn – shaded trees.

Eggs are laid mostly in the axils of the buds and shoots, and in the crevices of the bark. Oviposition in Tokyo occurs at the end of November and lasts about a month. Embryonic development finishes seven days after the end of diapause. Fifty percent of the eggs hatch at about 130° to 135 °C amount of effective temperature. The lower temperature threshold of egg development is 4.6 °C.

P. californiensis may have a negative impact on growth and seed forming of its host when infestations are severe.

These studies have shown that infested by *P. californiensis* plants of both locations are bred and grown in Bulgaria. The pest species has probably been introduced in our country long before its registration.

The pest species has not been established in our neighbouring countries and it probably might have been imported with an infested plant material.

The aphids found in the greenhouse of The Botanical Garden of Bulgarian Academy of Science probably have entered accidentally inside the greenhouse with the air ventilation from nearby infested *Acer* plants.

CONCLUSIONS

According to the biological and ecological requirements of this species it can be expected that *P. californiensis* could survive outdoors during the cold winter months and to settle permanently in our country.

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