Short Communication

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The Japanese Wax Scale *Ceroplastes japonicus* Green, 1921 (Hemiptera: Sternorrhyncha: Coccidae), a New Species and Pest on Persimmon in the Republic of Macedonia

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Abstract: The Japanese wax scale *Ceroplastes japonicus* is native to East Asia. The species has been introduced in Europe and at present is widespread mainly in the Mediterranean countries. It is polyphagous and economically important for fruits (citrus, persimmon, apple and stone fruits) and ornamentals in urban environments. *Ceroplastes japonicus* was detected for the first time in the Republic of Macedonia in February 2016. The findings were in the town of Valandovo, on branches of persimmon (*Diospyros kaki* L., Ebanaceae) in orchards and individual trees in the yards. During the summer, autumn and winter of the same year, *C. japonicus* was detected on leaves, twigs, branches and fruits of persimmon in the regions of Valandovo and Dojran in southern part of the country. The species is able to overwinter outdoor and establish a population.

Key words: *Ceroplastes japonicus*, persimmon, occurrence in the Republic of Macedonia

Introduction

The Japanese wax scale *Ceroplastes japonicus* Green, 1921 (Hemiptera: Sternorrhyncha: Coccidae) is native to East Asia (China, Japan, North and South Korea). The species is polyphagous, reported on more than 100 plant species from 38 different families (Garcia Morales et al. 2016). *Ceroplastes japonicus* is a pest of soft and hardwood trees, fruit trees, citrus and ornamentals in urban environments (Garcia Morales et al. 2016). Pellizzari & Camporese (1994) pointed out that the species most common host plants are *Citrus, Diospyros, Ilex,* and *Hedera*. According to Xie et al. (2008), the species is a destructive pest in many forests, fruit orchards and ornamental plants in China. Some forests of persimmon, *D. kaki* L., and jujube, *Ziziphus jujube* Mall. (Rhamnaceae), in northern China, are so heavily damaged that the fruit loss is about 70%.

Ceroplastes japonicus has been introduced and recently established in Europe (Pellizzari & Camporese 1994). In 1983, the species was recorded for the first time on *Citrus trifoliata L.* in north-eastern Italy. Consequently, it has spread in the central and southern parts of Italy and in other countries. Currently, the species has restricted distribution in Europe – France, Italy, Croatia and Slovenia (Pellizzari & Germaİn 2010), Bulgaria (Pencheva & Yovkova 2016), and Russia (Gavrilov & Kuznetsova. 2004).

In February 2016, a producer of persimmon from the town of Valandovo, in the southern part of the Republic of Macedonia, brought persimmon twigs, infested heavily with *C. japonicus,* to the Entomological Laboratory of the Faculty of Agricultural Sciences and Food in Skopje. The

Table 1. Localities in the Republic of Macedonia, at which the Japanese wax scale *Ceroplastes japonicus* was detected as a result of visual inspection of persimmon trees in 2016

Date	Locality	Object of survey	Infested part of the persimmon
25.03.2016	Marvinci, Balinci, Brajkovci, Valandovo, Nov Dojran	Private persimmon orchards, Individual trees in yards	Twigs, branches
20.04.2016	Marvinci, Balinci, Brajkovci, Valandovo, Nov Dojran	Private persimmon orchards, Individual trees in yards	Twigs, branches, leaves
19.05.2016	Marvinci, Balinci, Brajkovci, Valandovo, Nov Dojran	Private persimmon orchards, Individual trees in yards	Twigs, branches, leaves
22.06.2016	Marvinci, Balinci, Brajkovci, Valandovo, Nov Dojran	Private persimmon orchards, plant nurseries, Individual trees in yards	Twigs, branches, leaves
27.07.2016	Marvinci, Balinci, Brajkovci, Valandovo, Nov Dojran Prdejci, Gevgelija	Private persimmon orchards, Individual trees in yards	Twigs, branches, leaves
20.08.2016	Marvinci, Balinci, Brajkovci, Valandovo, Nov Dojran Prdejci, Gevgelija	Private persimmon orchards, Individual trees in yards	Twigs, branches, leaves
19.09.2016	Marvinci, Balinci, Brajkovci, Valandovo, Nov Dojran Prdejci, Gevgelija	Private persimmon orchards, Individual trees in yards	Twigs, branches, leaves, fruit
25.10.2016	Marvinci, Balinci, Brajkovci, Valandovo, Nov Dojran	Private persimmon orchards, plant nurseries, Individual trees in yards	Twigs, branches, leaves, fruit
05.11.2016	Marvinci, Balinci, Brajkovci, Valandovo, Nov Dojran	Private persimmon orchards, Individual trees in yards	Twigs, branches, leaves, fruit

aim of this study was to confirm the presence of *C. japonicus* and explore its distribution in the Republic of Macedonia.

Materials and Methods

The field survey was conducted from March to November 2016. Visual inspections of the persimmon leaves, twigs, branches and fruit were done in alleys and gardens in the towns of Valandovo, Dojran and Gevgelija, and also in yards, orchards and nurseries with persimmon in the villages around Valandovo (Marvinci, Balinci, Brajkovci), Dojran (Nov Dojran), and Gevgelija (Prdejci). The visual inspections were carried out without any alternative tools (chemical or visual attractants).

The infested host plant material with the insects (leaves, stems and fruit) was collected in plastic bags and analysed at the laboratory. The collected specimens were prepared for light microscopy using the slide-mounting method according to Hodgson & Henderson (2000). The microscopic identification was done on the basis of morphological characteristics, following the keys of Pellizzari & Camporese (1994) and Camporese & Pellizzari (1994).

Results and Discussion

The identified specimens of *C. japonicas* found on persimmon trees in the village of Valandovo in February 2016 were the first record of the species for the Republic of Macedonia. During the following survey of the persimmon orchards in the southern parts of the country in 2016, the presence of *C. japonicus* was confirmed on individual persimmon trees in farmyards in the villages of Marvinci, Balinci, Brajkovci close to the town of Valandovo (N 41°19′1″, E 22°33′40″), and in a persimmon orchard at the locality of Nov Dojran, close to the town of Dojran (N 41°10′45.12″, E 22°43′28.92″) (Table 1). The inspection of the planting material of persimmon at a nursery in Dojran showed absence of *C. japonicus*. The species was not detected also on the persimmon trees in Gevgelija and the village of Prdejci.

In March and April, the pest was recorded on twigs and branches, but later in the season, from May to November, it was found dispersed on leaves, branches and fruit. The infested plant organs were covered with colonies of *C. japonicas* and honeydew coloured black by the sooty moulds. At the end of the

season, especially in the period of fruit ripening in October, some trees with leaves prematurely fallen, and with black fruit and branches with many ants on them were found.

The optimal conditions for the development of *C. japonicus* are: temperature of 24-27˚C and air humidity of 75-80%. *C. japonicus* is a cold-resistant species and may establish populations in a zone with average minimal temperature of winter equal to -10˚C and probably even lower (Pellizzari & Camporese 1994). The fact that specimens of *C. japonicus* were collected in February allows us to conclude that the species is able to overwinter outdoor and establish a population.

Conclusions

The alien Japanese wax scale *Ceroplastes japonicus* is a new species for the entomofauna in the Republic of Macedonia. The species overwinters successfully and has spread on persimmon trees in yards and orchards in the southern regions of the country. This species is a serious treat to the fruit production in the country.

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