

FIRST RECORD OF THE ORANGE SPINY WHITEFLY, *Aleurocanthus spiniferus* Quaintance, 1903 (Hemiptera: Aleyrodidae), IN CROATIA

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ABSTRACT

Orange spiny whitefly, *Aleurocanthus spiniferus* Quaintance, 1903 originated in south-east Asia and has spread widely in tropical and subtropical Asia, and into Africa and the Pacific. *Citrus* spp. are the main hosts of economic importance, but *A. spiniferus* has been recorded from woody hosts of more than 15 plant families. This species is listed as a quarantine threat to Europe and is included in the EU Annex II/A1 and in the EPPO A2 list. In Europe, it was reported for the first time in Italy, in 2008. In May 2012, *A. spiniferus* was first found in Croatia, on ornamental potted orange seedlings (*Citrus x aurantium* L.) from domestic production in one nursery garden in Split. The pest was detected during a regular phytosanitary inspection of a garden centre. Infested orange plants have locally numerous small, brownish to black scales with a short fringe of white wax on the underside of leaves. The identification of the whitefly species was carried out by the Institute's Laboratory for Zoology and the result was confirmed in Plant Protection Service, Wageningen. The origin of the infestation of this alien species is still unknown, but it is assumed that the infection originated from imported plant material from Italy. *A. spiniferus* causes general weakening of seriously infested plants due to sap loss and the growth of sooty mould. Dense colonies of whitefly immature stages develop on leaf undersides, whereas the adults fly actively when disturbed. Leaves and fruits have spots of sticky, transparent honeydew, which become covered in black sooty mould fungus. A heavy infestation gives trees an almost completely black appearance. The potential host range of *A. spiniferus* in the EPPO region would be essentially citrus, with some possibility of establishment on other woody plantation crops growing in the southern part of the region in climatic conditions suitable for the pest. It presents a potential risk to citrus in Croatia, especially to production of mandarin in Neretva river valley.

Key words: *Aleurocanthus spiniferus*, Croatia, first record

1 INTRODUCTION

The Orange Spiny Whitefly, *Aleurocanthus spiniferus* Quaintance, 1903 originated in tropical Asia and has spread to Africa, Australia and the Pacific Islands. *Aleurocanthus* Quaintance & Baker is a paleotropical genus, currently including over 70 described species (Martin, 2005). *A. spiniferus* is listed as a quarantine threat to Europe and is included in the EU Annex II/A1 and in the EPPO A2 list. In Europe, it was reported for the first time in Italy, in 2008 (Porcelli, 2008). In May 2012, a whitefly species *A. spiniferus* was first found in Croatia, on ornamental potted orange seedlings (*Citrus x aurantium* L.) in one nursery garden in Split.

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A. spiniferus is a polyphagous insect. *Citrus* spp. are the main hosts of economic importance, but according to Martin (1996), the pest has been recorded from woody hosts of more than 15 plant families, for example grapevine, pear, peach, guava, and rose. Dense colonies of whitefly immature stages develop on leaf undersides, whereas the adults fly actively when disturbed. Primarily, *A. spiniferus* affects host plants by sucking the sap, but it also causes indirect damage by producing honeydew and subsequently promoting the growth of black sooty mould fungus. Due to these symptoms, it causes general weakening of seriously infested plants. Heavy infestations of this insect can cause sooty mould to completely cover the leaf surface and negatively affect photosynthesis.

As other whitefly species, *A. spiniferus* has six developmental stages: egg, crawler (1st instar), two sessile nymphal instars (2nd and 3rd instars), the puparium (4th instar) and adult. All stages are found on the leaves. Eggs are elongate-oval to kidney-shaped, 0,2 mm long, laid in a very characteristic spiral pattern, yellowish at first, turning darker as the embryo develops. The first instar is active, 6-legged, elongate, 0,3 x 0,15 mm, dusky in colour, with 2 long and several shorter, radiating spiny filaments. The second and third instars are sessile, ovate and dark-brown to black in colour. The last nymphal instar is usually called a puparium is ovate and shiny-black. Female pupae are about 1,25 mm in diameter, whereas male pupae are smaller, up to 1 mm in diameter. The puparium on dorsal surface has many long, acute glandular spines and it is surrounded by a white fringe of waxy secretion (EPPO/CABI, 1997). Adult males of *A. spiniferus* are smaller than females and are up to 1.35 mm long, females are about 1.7 mm in length. The wings of adults are metallic grey-blue in appearance and light markings on the wings appear to form a band across the middle of the red abdomen. The eyes are reddish-brown and the antennae and legs are white with variable pale yellow markings (OEPP/EPPO, 2002).

Depending on conditions, the life cycle of *A. spiniferus* generally takes 2-4 months, but there can be three to six overlapping generations a year. The development is most favoured by air temperatures of 20-34°C (optimum 25,6°C) and relative humidity of 70-80 %. The species does not survive at temperatures below freezing and is not found in areas with temperatures of 43°C or over (EPPO/CABI, 1997).

2 MATERIALS AND METHODS

The quarantine whitefly species *A. spiniferus* was detected during a regular phytosanitary inspection of the plants in one garden centre in Split, using the visual survey of potential host plants with the help of a magnifying lens of 10 x magnification on presence of pest puparia or pupal cases. The officary leaf sample with preimaginal whitefly stages taken by phytosanitary inspector from infested orange plants (*Citrus x aurantium* L.) were placed and stored by dry method in an envelope until insect preparation. The data relevant for faunistic entry were recorded on the outside of the envelope (Martin, 1987; 1999). The preparation and identification of the whitefly species were carried out by the Institute s Laboratory for Zoology. The taxonomy of Aleyrodidae is based on the empty pupal cases and their derm (external surface) morphology, although with adequate maceration and subsequent rinsing, puparia from which adults have not yet emerged can make excellent mounts too (Martin, 1987). The whitefly collected in leaf sample was identified to the species level on the basis of morphological characters of puparium and pupal case, using the classical identification method according to relevant morphological keys. Whitefly puparia and pupal cases were slide-mounted in Canada balsam as permanent microscopic slides according to the preparation procedure described by Martin (1999) in EPPO diagnostic protocol (OEPP/EPPO, 2002). For the species identification the following keys were used: Martin (1987), Dubey & Ko (2012), as well as a key presented in EPPO diagnostic protocol (OEPP/EPPO, 2002). For an accurate identification, a stereomicroscope (Nikon SMZ 800) and a compound microscope (Olympus BX 50) were used. Verification of our identification of

whitefly species sampled on orange leaves in Split was done by M.G.M. Jansen from PPS, Wageningen, The Netherlands. The locality of first record of whitefly species *A. spiniferus* in Croatia was marked using geography coordinates and according to the Universal Transverse coordinate system (Horvat et al., 2003).

3 RESULTS AND DISCUSSION

The quarantine whitefly species *A. spiniferus* was reported for the first time in Croatia in May 2012 on ornamental potted orange seedlings in one garden centre in Split (42°30'29" N, 16°26'40" E; UTM 33T XJ 1919 presented on Figure 1), a city on the coast of the Adriatic Sea.



Figure 1: UTM grid of Republic of Croatia and finding place of *A. spiniferus*

Infested orange plants had locally numerous small, brownish to black scales with a short fringe of white wax on the underside of leaves. As in the case of Italy, the owner noticed the infection of orange plants by pest in early 2012, but the pest was misidentified as a scale insect. Orange seedlings were of domestic origin, produced in a nearby nursery on Meje, owned by the same company. By visual control of orange seedlings and other potential pest host plants (*Citrus* spp., *Hedera* sp., *Vitis vinifera* L.) on the place of origin of infested plants, a species *A. spiniferus* was not found. Also, the imported host plants (*Citrus* spp., *Vitis vinifera* L., *Pyracantha* sp., *Parthenocissus* sp., *Rosa* sp.), mostly from Italy were inspected in the glasshouse and in the open space of garden centre on presence of *A. spiniferus* and the result was negative too. The other plant species in garden centre were also visually inspected and they were pest free. As with other whitefly species, adults of *A. spiniferus* are capable of limited flight, so the most important way of pest transmission between countries is a trade with planting material of citrus or other host species, or possibly of fruits (EPPO/CABI, 1997). Therefore, the origin of this alien species is still unknown, but it is assumed that the infection originated from imported plant material to this or some other garden centre in Croatia from Italy, where *A. spiniferus* was reported in 2008 (Porcelli, 2008). It is also possible that the pest was introduced in Croatia by direct import of infested plant material from Japan, where this species is present since 1928 (Muniappan et al., 2006). The expert

recommendation to the phytosanitary inspection was to eradicate the pest by burning of infested orange seedlings in order to prevent the insect spreading.

According to the Dubey and Ko (2012) identification key, the whitefly species *A. spiniferus* can be recognized by the following morphologic characters of the puparium: puparium black; glandular spines present on all the dorsal areas, apex of spines pointed, most of them reaching well beyond margin; operculum almost filling the orifice; venter without dense spinules; vasiform orifice cordate; abdominal submedian spines not uniform in size; margin toothed; seven to nine marginal teeth in 0,1 mm; female puparium with 30 pairs of dorsal spines, of which 11 pairs on submargin; all the submarginal spines placed singly (Figure 2).



Figure 2: The permanent microscopic slide of *A. spiniferus* pupal case (photo: M. Šimala)

According to EPPO/CABI (1997), the potential host range of *A. spiniferus* in the EPPO region would be essentially citrus, with some possibility of establishment on other woody plantation crops growing in the southern part of the region in climatic conditions suitable for the pest. The accidental introduction, acclimatization and spreading of this species in southern Italy is thus of concern to all other EPPO member states, especially Mediterranean countries. Thus, it presents a potential risk to citrus in Croatia, in particular to production of mandarin in Neretva river valley. That is why the Institute for Plant Protection plans to start the monitoring of a whitefly species *A. spiniferus* in Croatia in 2013.

4 CONCLUSIONS

1. The quarantine whitefly species *A. spiniferus* was reported for the first time in Croatia in May 2012 on ornamental potted orange seedlings from domestic production in one garden centre in Split.
2. Visual control of plants in the glasshouse and in the open space of garden centre, as well as in nursery owned by the same company, showed that the pest does not originate from nursery and has not spread from the orange seedlings to other plant species.
3. The origin of the infestation of this alien species is still unknown, but it is assumed that the infection originated from imported plant material from Italy or even from Japan.
4. The pest was eradicated by burning of infested orange plants.

5. Because *A. spiniferus* presents a potential risk to citrus in Croatia, especially to production of mandarin in Neretva river valley, the Institute for Plant Protection plans to start the monitoring of a pest in Croatia in 2013.

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