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FIRST RECORD OF *ALEUROCANTHUS SPINIFERUS*  
(QUAINTANCE) (HEMIPTERA ALEYRODIDAE) IN MONTENEGRO

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Radonjić S., Hrnčić S., Malumphy C. – First record of *Aleurocanthus spiniferus* (Quaintance) (Hemiptera Aleyrodidae) in Montenegro.

In October 2013, orange spiny whitefly *Aleurocanthus spiniferus* (Quaintance) (Hemiptera: Aleyrodidae) was detected for the first time in Montenegro. It was found in citrus orchards in Baošići (orange and mandarin), Herceg Novi (mandarin) and Kumbor (orange), in an area of Boka Kotor Bay on the Adriatic Sea (latitude 42° 26' north). *A. spiniferus* is regulated in the European Union and therefore an immediate survey of the whole Montenegrin coastal area, where citrus production occurs, was undertaken. The pest was additionally found in Džnovići, on a small number of mandarin and lemon trees. *A. spiniferus* is polyphagous and a major pest of citrus. It originated in south-east Asia and has spread widely in tropical and subtropical Asia, Africa and the Pacific Islands. In Europe it was first detected in Italy (2008) and subsequently in Croatia (2012). It presents a potential risk for citrus production in Montenegro, particularly for the important citrus producing areas of Bar and Ulcinj. These areas, geographically more southern than the area of first detection, are still free from the pest. Additionally, the whitefly presents a potential risk for other host plants grown in Montenegro where the climatic conditions are suitable for acclimatization of *A. spiniferus*.

KEY WORDS: *Aleurocanthus spiniferus*, Montenegro, first record, citrus pest.

## INTRODUCTION

*Aleurocanthus spiniferus* (Quaintance) (Hemiptera: Aleyrodidae), commonly known as orange spiny whitefly, originated in south-east Asia and has spread widely in tropical and subtropical Asia, into Africa and the Pacific Islands (EPPO/CABI, 1997). It was recorded by Kuwana as the most destructive whitefly attacking citrus in tropical Asia (KUWANA, 1928; WEEMS, 1974). This is a quarantine pest for the European Union. The genus *Aleurocanthus* Quaintance & Baker (*A. spiniferus* and *A. woglumi* Ashby are specifically listed) is regulated by EU Annex II/A1 Council Directive 2000/29/EC (ANONYMOUS, 2000). *A. spiniferus* is also listed by the European and Mediterranean Plant Protection Organization (EPPO) as a species recommended for regulation as a quarantine pest; it has recently been transferred from the A1 (absent from the EPPO region) to the A2 (locally present in the EPPO region) list (ANONYMOUS, 2013). QUAINTANCE (1903) described the species under the name *Aleurodes spiniferus* from specimens collected in Java (Indonesia) by Marlatt in 1901.

*A. spiniferus* is a polyphagous pest that infests host plants assigned to more than 30 botanical families including Ebenaceae, Lauraceae, Moraceae, Punicaceae, Rosaceae, Rutaceae and Vitaceae. CIOFFI *et al.* (2013) provided a comprehensive list of its host plants. The main hosts of economic importance are *Citrus* spp.

*A. spiniferus* has six developmental stages: the egg, four nymphal instars and the adult. In tropical conditions it has overlapping generations and all stages of *A. spiniferus* may be found throughout the year, although little breeding occurs during colder periods. The life cycle takes 2-4 months depending on climatic conditions, and there can be

between three to six generations per year (JANSEN, 2002). Each female lays 100+ eggs (WEEMS, 1974), and all developmental stages and occur on the undersurfaces of leaves. The adults fly actively when disturbed.

*A. spiniferus* feeds on plant sap and excretes copious amounts of sugary, sticky honeydew, which coats the leaves, branches and fruit surfaces. Black sooty mould develops on the honeydew, reducing the area of respiration and photosynthesis. A heavy infestation gives the plants an almost completely black appearance. As a result, contaminated foliage may drop, young leaf growth is damaged, fruit set may be reduced, and already formed fruits are unmarketable. Heavily infested plants suffer from general weakening, dieback of branches and twigs, deformed growth, and fruits are prematurely dropped (EPPO/CABI, 1997; CIOFFI *et al.*, 2013).

*A. spiniferus* was first detected in Europe in 2008 in the Apulia region of Southern Italy on oranges (PORCELLI, 2008). Since then it has been spreading in the Apulia Region, gradually invaded the whole Lecce District and expanding northward into Brindisi District (CIOFFI *et al.*, 2013). A few years later, in May 2012, the pest was recorded in Croatia, on ornamental potted orange seedlings (*Citrus x aurantium* L.) at one nursery garden in Split, a city on the coast of the Adriatic Sea, and action was taken to eradicate it (ŠIMALA and MASTEN MILEK, 2013). In October 2013, *A. spiniferus* was detected for the first time in citrus orchards in Montenegro and the purpose of this publication is to provide details of this first incursion [an isolated population of a pest recently detected in an area, not known to be established, but expected to survive for the immediate future (FAO, 2010)] in Montenegro.

## MATERIALS AND METHODS

In October 2013, the presence of a new whitefly species in Montenegro was recorded in citrus orchards in Baošići, Kumbor and Herceg Novi, in the area of the Boka Kotor Bay on the Adriatic Sea (latitude 42° 26' north) (Fig. I). The whitefly colonies looked unusual as the nymphs were black, surrounded by a fringe of white wax, and the adults were metallic grey-blue with white markings on their wings.



Fig. I. – Distribution of *Aleurocanthus spiniferus* in Montenegro (in red).

Samples of infested leaves were collected and taken to the Entomology Laboratory of the Biotechnical Faculty in Podgorica (Montenegro) for examination. Identity of the whitefly species was confirmed at The Food and Environment Research Agency (FERA) (United Kingdom). A series of 10 puparia were slide mounted in Canada balsam according to the method by MALUMPHY (2004), examined using a Leitz Diaplan high power microscope (magnification x100-400) and identified on the basis of morphological characters using the descriptions and keys provided by MARTIN (1987), JANSEN (2002) and DUBEY and KO (2012). Voucher specimens are deposited at FERA.

The Phytosanitary Directorate of Montenegro was officially informed about the first detection of *A. spiniferus* and additional surveys of the citrus producing areas in Montenegro were carried out in October, November and December, 2013.

## RESULTS AND DISCUSSION

*A. spiniferus* adults, nymphs and eggs were recorded on the undersurface of leaves of several trees in citrus orchards

in Baošići and Kumbor; in Kumbor it was found only on oranges while in Baošići it was found on both orange and mandarins (Fig. II). Several nymphs and eggs were also found on one mandarin tree in a citrus orchard in Herceg Novi. After the initial finding of *A. spiniferus* an immediate survey of the whole Montenegro coastal region, where citrus production occurs, was undertaken in October, and repeated during November and December. The pest was additionally found in Djenovići (near to where it was first detected), on a small number of mandarin and lemon trees. During these inspections it was observed that the nymphs were more frequent on the undersurface of the older leaves, while the adults and eggs were more frequent on the undersurface of younger leaves.

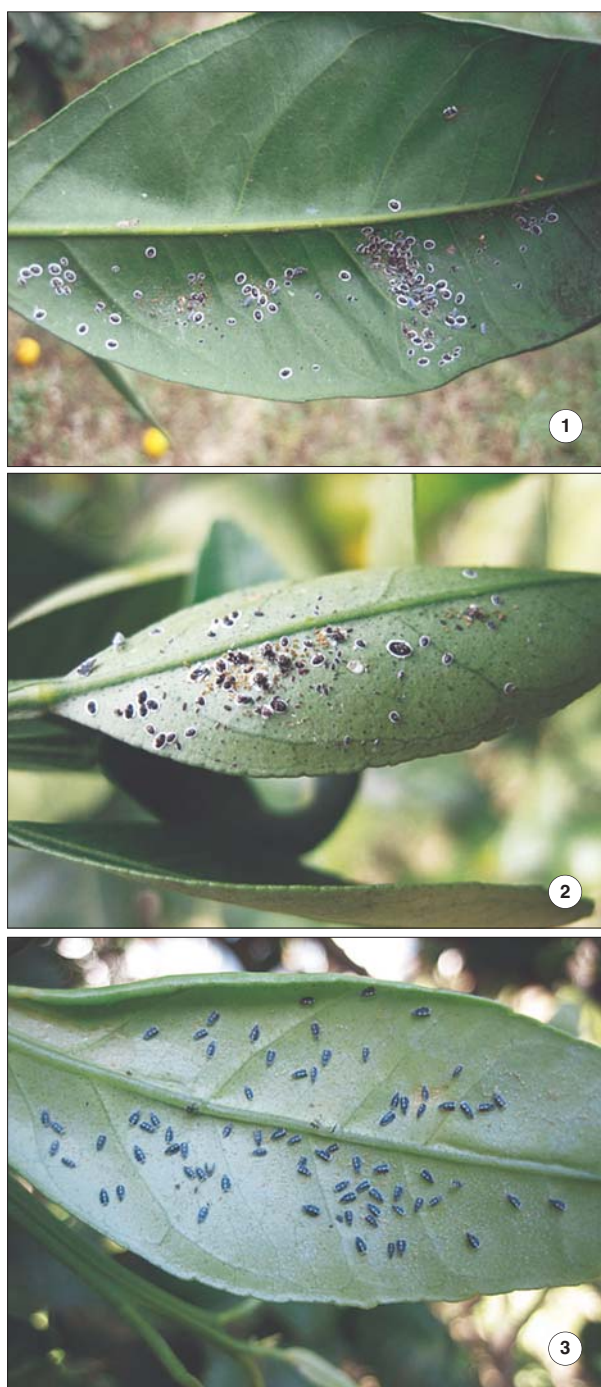


Fig. II. – Colony of *Aleurocanthus spiniferus* on undersurface of orange leaf: nymphs (1, 2); adults (3).

Colonies of *A. spiniferus* are highly conspicuous and unlikely to be confused with any other whitefly species currently found in Europe. The field characteristics of the species are shown in Fig. III, 1-6. Adult female *A. spiniferus* are about 1.7 mm in length, and the males 1.35 mm long: at rest, their general appearance is metallic grey-blue, being the colour of their wings which cover most of the body; a pale transverse mark across the middle of the wings is distinctive. The head and thorax are dark red to brown, and the abdomen dark orange to red. The eyes are reddish-brown and the antennae and legs are white with pale-yellow markings. The eggs are

elongate-oval with the lower surface convex and upper surface slightly concave, producing a kidney shape, 0.2 mm long, and are usually laid in a characteristic spiral pattern, attached to the undersurface of the leaves by a short, slender pedicel extending from the lower surface near the base of the egg. The chorion is covered with a distinct lattice with little evidence of wax. The eggs are yellowish when first laid, turning darker with maturity, becoming dark golden brown as the embryo develops. Hatched eggs are a translucent golden brown. The first-nymphal instar is elongate oval, with six well developed legs, 0.30 x 0.15 mm, dusky in colour, with 2 pairs of

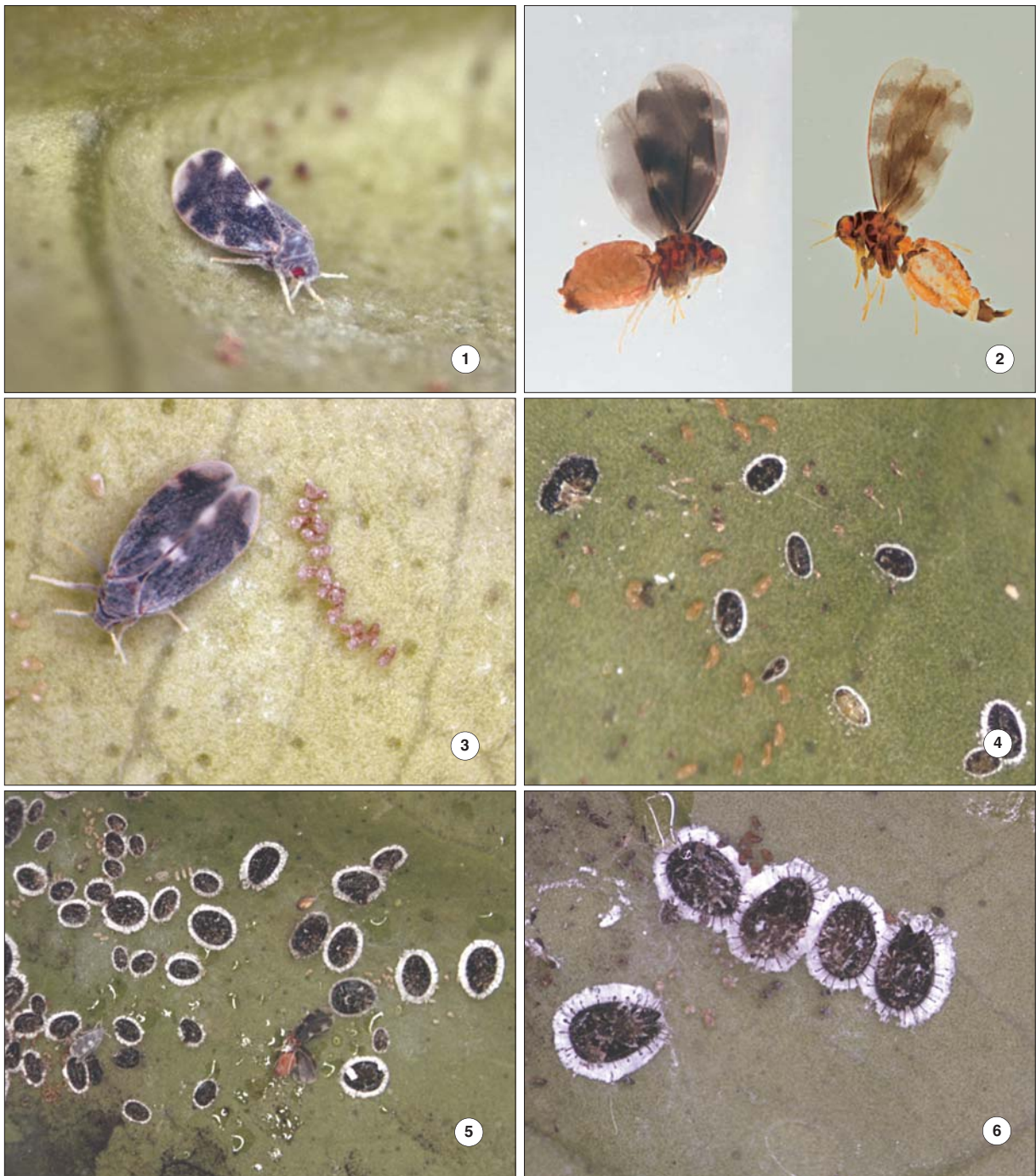


Fig III. – *Aleurocanthus spiniferus*: adult (1- resting pose, 2- female (left) and male (right)); elongate-oval to kidney-shaped eggs (3); eggs and young nymphs - 1<sup>st</sup> and 2<sup>nd</sup> instars (4); older nymphs 3<sup>rd</sup> and 4<sup>th</sup> instars and sooty mould (5); 4<sup>th</sup> instars - puparia (6)

greatly enlarged dorsal setae (cephalic and first abdominal). The second-nymphal instar is ovoid, slightly convex, with reduced, non-functional legs, 0.4 x 0.2 mm, dark-brown to pale-black with yellow markings, with easily distinguished, radiating spines; the third-nymphal instar is more ovate, 0.74-0.87 mm, generally black with a rounded, greenish spot on the anterior part of the abdomen, the spines are well developed and obvious; the fourth-nymphal instar, or puparium, is ovate, shiny-black, with the females about 1.25 mm in length, and the males slightly smaller, about 1.0 mm in length. The dorsal surface bears many stout, glandular spines and there is a distinct white wax marginal secretion. Exuviae of earlier instars often remain stacked up on the median area of the puparium (EPPO/CABI, 1997).

Identification to species requires microscopic

examination of the derm (external surface) of slide-mounted puparia or empty pupal cases (as for all Aleyrodidae) (JANSEN, 2002). Important diagnostic characters of the puparium of *A. spiniferus* include: puparium black; glandular spines present on all the dorsal areas, apex of spines acute, most of them reaching well beyond margin; female puparium with 30 pairs of dorsal spines, of which 11 pairs on submargin; all the submarginal spines placed singly; abdominal submedian spines vary in length; vasiform orifice cordate with operculum almost filling the orifice; margin coarsely toothed with seven to nine marginal teeth per 0.1 mm (Fig. IV, 1-2) (JANSEN, 2002; DUBEY and KO, 2012). *A. spiniferus* puparia are morphologically similar to those of the related citrus blackfly *A. woglumi* and may be separated using the key presented by DUBEY and KO (2012).

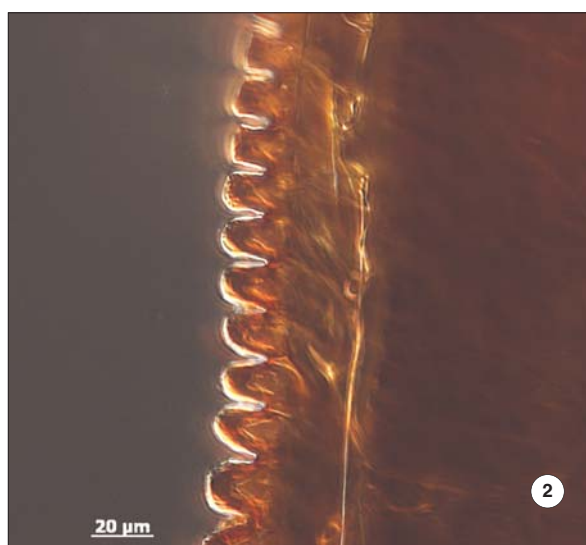


Fig. IV. – *Aleurocanthus spiniferus*: slide mounted female puparium (1); puparium margin showing the coarse marginal teeth (2)

The pathway of introduction of this quarantine species into Montenegro is unknown, as it has been recorded in established citrus orchards (older than 10 years), with no recent import connection. It is assumed that the infestation is likely to have originated from plant material imported from Italy or Croatia, where the pest has been found. Adults of *Aleurocanthus* spp. are capable of limited down-wind flight, but this is not a major means of long-range dispersal. The pest is most likely to be moved between countries on planting material of citrus or other host species, or possibly on fruits. Species of *Aleurocanthus* have been intercepted on the leaves of infested host plants moving in international trade (EPPO/CABI, 1997).

#### REFERENCES

ANONYMOUS, 2000 - Council Directive 2000/29/EC of 8 May 2000 on protective measures against the introduction into the Community of organisms harmful

to plants or plant products and against their spread within the Community + Annexes I-IX.- Official Journal of the European Communities, L 169/29.

ANONYMOUS, 2013 - EPPO A2 List of pests recommended for regulation as quarantine pests (version 2013-09). [online] URL: <http://www.eppo.int/QUARANTINE/listA2.htm>

CIOFFI M., CORNARA D., CORRADO I., JANSEN M. G. M., PORCELLI F., 2013 - The status of *Aleurocanthus spiniferus* from its unwanted introduction in Italy to date.- Bulletin of Insectology, 66 (2): 273-281.

DUBEY A.K., KO C.C., 2012 - Sexual dimorphism among species of *Aleurocanthus* *Quaintance & Baker* (Hemiptera: Aleyrodidae) in Taiwan, with one new species and an identification key. - Zootaxa, 3177: 1-23.

EPPO/CABI, 1997 - *Aleurocanthus spiniferus*. In: SMITH I.M., MCNAMARA D.G., SCOTT P.R., HARRIS K.M., (Eds.), 1997 - Quarantine Pests for Europe, Second Edition, CAB International, Wallingford: 21-24.

F.A.O., 2010 - Glossary of phytosanitary terms.

- International standards for phytosanitary measures 5: 1-27.
- JANSEN M., 2002 - *Diagnostic protocols for regulated pests. Aleurocanthus spiniferus*. - Bulletin OEPP/EPPO Bulletin, 32: 255-259.
- KUWANA, I., 1928 - *Aleyrodidae or white flies attacking citrus plants in Japan*. - Ministry of Agriculture and Forestry, Japan. Scientific Bulletin, 1:41-78.
- MALUMPHY C., 2004 - *Diagnostic protocols for regulated pests – PM7/35 Bemisia tabaci*. - Bulletin OEPP/EPPO Bulletin, 34: 281-288.
- MARTIN J.H., 1987 - *An identification guide to common whitefly pest species of the world (Homoptera, Aleyrodidae)*. - Tropical Pest Management, 33: 298-322.
- PORCELLI F., 2008 - *First record of Aleurocanthus spiniferus (Homoptera: Aleyrodidae) in Apulia, Southern Italy*. - Bulletin OEPP/EPPO Bulletin, 38: 518-520.
- QUAINTANCE A. L., 1903 - *New oriental Aleyrodidae*. - Canadian Entomologist, 35: 61-64.
- WEEMS H. V., 1974 - *Orange spiny whitefly, Aleurocanthus spiniferus (Quaintance) (Homoptera: Aleyrodidae)*. - The Florida Department of Agriculture and Consumer Services' Division of Plant Industry Entomology Circular, 151: 1-2.
- ŠIMALA M., MASTEN MILEK T., 2013 - *First Record of the Orange Spiny Whitefly, Aleurocanthus spiniferus Quaintance, 1903 (Hemiptera: Aleyrodidae), in Croatia*. - Zbornik predavanj in referatov 11. Slovenskega posvetovanja o varstvu rastlin z mednarodno udeležbo, 354-358.