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## Pest categorisation of *Aonidiella orientalis*

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### Abstract

The EFSA Panel on Plant Health performed a pest categorisation of *Aonidiella orientalis* (Hemiptera: Diaspididae), the oriental scale, for the EU. *A. orientalis* is a species mostly occurring in tropical and subtropical areas. It is not listed in Annex II of Commission Implementing Regulation (EU) 2019/2072. It is a polyphagous species, with hosts in more than 160 plant genera belonging to more than 70 families. Numerous important crops suffer economic losses from *A. orientalis* such as citrus, figs, mangoes, papayas, bananas, palms, tea and some ornamentals. *A. orientalis* has also been recorded on several other crops which are important for the EU such as cotton, apricots, peaches and grapes, but there are no records of economic impact on these hosts. This scale insect reproduces rapidly and may reach high population density between 15 and 30°C. In the tropics, the scale breeds continuously, generations overlap and all life stages coexist. In Queensland, Australia, *A. orientalis* can have up to six generations each year. The main natural dispersal stage is the first instar which crawls over the natal host plant or to adjacent host plants and can be dispersed further by wind. Plants for planting, vegetables, cut flowers and fruits provide potential pathways for entry into the EU. Between 1997 and 2019, the UK intercepted *A. orientalis* more than 120 times, most frequently on mangoes and guava fruit. Climatic conditions and host availability in southern EU MS are favourable for outdoor establishment. Phytosanitary measures are available to reduce the likelihood of entry and spread. The main uncertainties include the area of establishment and magnitude of impact. *A. orientalis* meets the criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest.

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**Keywords:** oriental scale, Hemiptera, Diaspididae, pest risk, plant health, plant pest, quarantine

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Figure 1: Courtesy of Chris Malumphy.



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## 1. Introduction

### 1.1. Background and Terms of Reference as provided by the requestor

#### 1.1.1. Background

The new Plant Health Regulation (EU) 2016/2031, on the protective measures against pests of plants, is applying from 14 December 2019. Conditions are laid down in this legislation in order for pests to qualify for listing as Union quarantine pests, protected zone quarantine pests or Union regulated non-quarantine pests. The lists of the EU regulated pests together with the associated import or internal movement requirements of commodities are included in Commission Implementing Regulation (EU) 2019/2072. Additionally, as stipulated in the Commission Implementing Regulation 2018/2019, certain commodities are provisionally prohibited to enter in the EU (high risk plants, HRP). EFSA is performing the risk assessment of the dossiers submitted by exporting to the EU countries of the HRP commodities, as stipulated in Commission Implementing Regulation 2018/2018. Furthermore, EFSA has evaluated a number of requests from exporting to the EU countries for derogations from specific EU import requirements.

In line with the principles of the new plant health law, the European Commission with the Member States are discussing monthly the reports of the interceptions and the outbreaks of pests notified by the Member States. Notifications of an imminent danger from pests that may fulfil the conditions for inclusion in the list of the Union quarantine pest are included. Furthermore, EFSA has been performing horizon scanning of media and literature.

As a follow-up of the above-mentioned activities (reporting of interceptions and outbreaks, HRP, derogation requests and horizon scanning), a number of pests of concern have been identified. EFSA is requested to provide scientific opinions for these pests, in view of their potential inclusion by the risk manager in the lists of Commission Implementing Regulation (EU) 2019/2072 and the inclusion of specific import requirements for relevant host commodities, when deemed necessary by the risk manager.

#### 1.1.2. Terms of reference

EFSA is requested, pursuant to Article 29(1) of Regulation (EC) No 178/2002, to provide scientific opinions in the field of plant health.

EFSA is requested to deliver 53 pest categorisations for the pests listed in Annex 1A, 1B, 1D and 1 E (for more details see mandate M-2021-00027 on the [Open.EFSA portal](#)). Additionally, EFSA is requested to perform pest categorisations for the pests so far not regulated in the EU, identified as pests potentially associated with a commodity in the commodity risk assessments of the HRP dossiers (Annex 1C; for more details see mandate M-2021-00027 on the [Open.EFSA portal](#)). Such pest categorisations are needed in the case where there are not available risk assessments for the EU.

When the pests of Annex 1A are qualifying as potential Union quarantine pests, EFSA should proceed to phase 2 risk assessment. The opinions should address entry pathways, spread, establishment, impact and include a risk reduction options analysis.

Additionally, EFSA is requested to develop further the quantitative methodology currently followed for risk assessment, in order to have the possibility to deliver an express risk assessment methodology. Such methodological development should take into account the EFSA Plant Health Panel Guidance on quantitative pest risk assessment and the experience obtained during its implementation for the Union candidate priority pests and for the likelihood of pest freedom at entry for the commodity risk assessment of High Risk Plants.

### 1.2. Interpretation of the Terms of Reference

*Aonidiella orientalis* is one of a number of pests listed in Annex 1B to the Terms of Reference (ToR) to be subject to pest categorisation to determine whether it fulfils the criteria of a potential Union quarantine pest for the area of the EU excluding Ceuta, Melilla and the outermost regions of Member States referred to in Article 355(1) of the Treaty on the Functioning of the European Union (TFEU), other than Madeira and the Azores, and so inform EU decision-making as to its appropriateness for potential inclusion in the lists of pests of Commission Implementing Regulation (EU) 2019/2072. If a pest fulfils the criteria to be potentially listed as a Union quarantine pest, risk reduction options will be identified.

### 1.3. Additional information

This categorisation was initiated following the commodity risk assessments of plants for planting of *Albizia julibrissin* Durazzini (EFSA PLH Panel, 2020a), *Ficus carica* L (EFSA PLH Panel, 2021a), *Jasminum polyanthum* Franchet (EFSA PLH Panel, 2020b) and *Persea americana* Mill. (EFSA PLH Panel, 2021b), in which *A. orientalis* was identified as a relevant non-regulated EU pest which could potentially enter the EU on those species.

## 2. Data and methodologies

### 2.1. Data

#### 2.1.1. Literature search

A literature search on *A. orientalis* was conducted at the beginning of the categorisation in the ISI Web of Science bibliographic database, using the scientific name of the pest as search term. Papers relevant for the pest categorisation were reviewed, and further references and information were obtained from experts, as well as from citations within the references and grey literature.

#### 2.1.2. Database search

Pest information, on host(s) and distribution, was retrieved from the European and Mediterranean Plant Protection Organization (EPPO) Global Database (EPPO, online), the CABI databases and scientific literature databases as referred above in Section 2.1.1.

Data about the import of commodity types that could potentially provide a pathway for the pest to enter the EU and about the area of hosts grown in the EU were obtained from EUROSTAT (Statistical Office of the European Communities).

The Europhyt and TRACES databases were consulted for pest-specific notifications on interceptions and outbreaks. Europhyt is a web-based network run by the Directorate General for Health and Food Safety (DG SANTÉ) of the European Commission as a subproject of PHYSAN (Phyto-Sanitary Controls) specifically concerned with plant health information. TRACES is the European Commission's multilingual online platform for sanitary and phytosanitary certification required for the importation of animals, animal products, food and feed of non-animal origin and plants into the European Union, and the intra-EU trade and EU exports of animals and certain animal products. Up until May 2020, the Europhyt database managed notifications of interceptions of plants or plant products that do not comply with EU legislation, as well as notifications of plant pests detected in the territory of the Member States and the phytosanitary measures taken to eradicate or avoid their spread. The recording of interceptions switched from Europhyt to TRACES in May 2020.

GenBank was searched to determine whether it contained any nucleotide sequences for *A. orientalis* which could be used as reference material for molecular diagnosis. GenBank® ([www.ncbi.nlm.nih.gov/genbank/](http://www.ncbi.nlm.nih.gov/genbank/)) is a comprehensive publicly available database that as of August 2019 (release version 227) contained over 6.25 trillion base pairs from over 1.6 billion nucleotide sequences for 450,000 formally described species (Sayers et al., 2020).

### 2.2. Methodologies

The Panel performed the pest categorisation for *A. orientalis* following guiding principles and steps presented in the EFSA guidance on quantitative pest risk assessment (EFSA PLH Panel, 2018), the EFSA guidance on the use of the weight of evidence approach in scientific assessments (EFSA Scientific Committee, 2017) and the International Standards for Phytosanitary Measures No. 11 (FAO, 2013).

The criteria to be considered when categorising a pest as a potential Union quarantine pest (QP) is given in Regulation (EU) 2016/2031 Article 3 and Annex I, Section 1 of the Regulation. Table 1 presents the Regulation (EU) 2016/2031 pest categorisation criteria on which the Panel bases its conclusions. In judging whether a criterion is met the Panel uses its best professional judgement (EFSA Scientific Committee, 2017) by integrating a range of evidence from a variety of sources (as presented above in Section 2.1) to reach an informed conclusion as to whether or not a criterion is satisfied.

The Panel's conclusions are formulated respecting its remit and particularly with regard to the principle of separation between risk assessment and risk management (EFSA founding regulation (EU)

No 178/2002); therefore, instead of determining whether the pest is likely to have an unacceptable impact, deemed to be a risk management decision, the Panel will present a summary of the observed impacts in the areas where the pest occurs, and make a judgement about potential likely impacts in the EU. Whilst the Panel may quote impacts reported from areas where the pest occurs in monetary terms, the Panel will seek to express potential EU impacts in terms of yield and quality losses and not in monetary terms, in agreement with the EFSA guidance on quantitative pest risk assessment (EFSA PLH Panel, 2018). Article 3 (d) of Regulation (EU) 2016/2031 refers to unacceptable social impact as a criterion for quarantine pest status. Assessing social impact is outside the remit of the Panel.

**Table 1:** Pest categorisation criteria under evaluation, as derived from Regulation (EU) 2016/2031 on protective measures against pests of plants (the number of the relevant sections of the pest categorisation is shown in brackets in the first column)

	<b>Criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest (article 3)</b>
<b>Identity of the pest (Section 3.1)</b>	Is the identity of the pest clearly defined, or has it been shown to produce consistent symptoms and to be transmissible?
<b>Absence/presence of the pest in the EU territory (Section 3.2)</b>	Is the pest present in the EU territory? If present, is the pest in a limited part of the EU or is it scarce, irregular, isolated or present infrequently? If so, the pest is considered to be not widely distributed.
<b>Pest potential for entry, establishment and spread in the EU territory (Section 3.4)</b>	Is the pest able to enter into, become established in, and spread within, the EU territory? If yes, briefly list the pathways for entry and spread.
<b>Potential for consequences in the EU territory (Section 3.5)</b>	Would the pests' introduction have an economic or environmental impact on the EU territory?
<b>Available measures (Section 3.6)</b>	Are there measures available to prevent pest entry, establishment, spread or impacts?
<b>Conclusion of pest categorisation (Section 4)</b>	A statement as to whether (1) all criteria assessed by EFSA above for consideration as a potential quarantine pest were met and (2) if not, which one(s) were not met.

### 3. Pest categorisation

#### 3.1. Identity and biology of the pest

##### 3.1.1. Identity and taxonomy

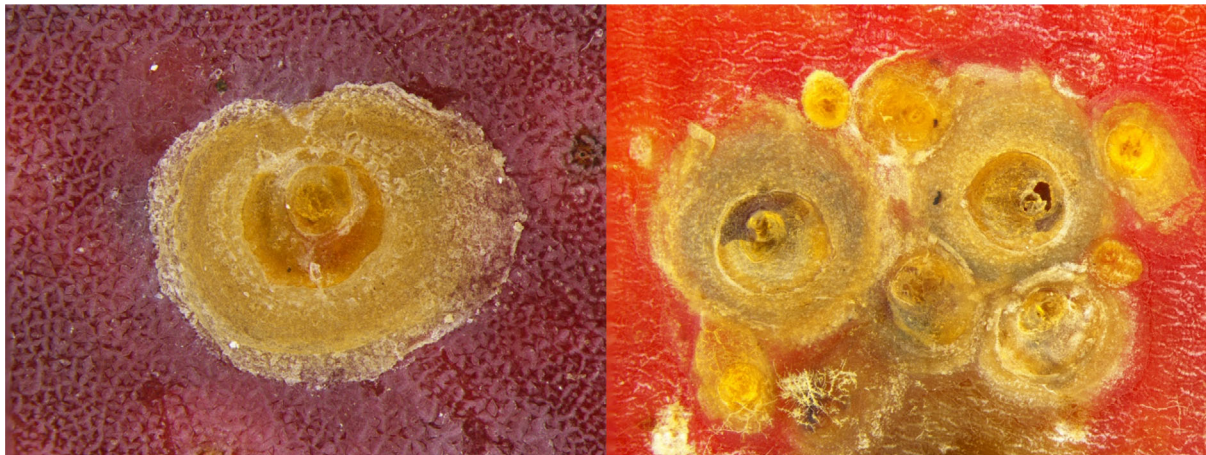
*Is the identity of the pest clearly defined, or has it been shown to produce consistent symptoms and/or to be transmissible?*

**Yes**, the identity of the pest is established. *Aonidiella orientalis* (Newstead) is the accepted name.

*A. orientalis* (Newstead) (Figure 1) is an insect within the order Hemiptera, family Diaspididae. *A. orientalis* was first described by Newstead in 1894, as *Aspidiotus orientalis*, from *Panicum* sp. in India. It was redescribed by Green in 1896 as *Aspidiotus osbeckiae* from *Osbeckia* sp. in Sri Lanka; as *Aspidiotus cocotiphagus* by Marlatt in 1908 from *Cocos nucifera* in Cuba, and as *Chrysomphalus pedroniformis* by Cockerell and Robinson in 1915 from *Vitis vinifera* in the Philippines (CABI, online; García Morales et al., 2016). The common names of the species are oriental red scale and oriental yellow scale (CABI, online). The EPPO code<sup>1</sup> (Griessinger and Roy, 2015; EPPO, 2019) for this species is AONDOR (EPPO, online).

<sup>1</sup> An EPPO code, formerly known as a Bayer code, is a unique identifier linked to the name of a plant or plant pest important in agriculture and plant protection. Codes are based on genus and species names. However, if a scientific name is changed, the EPPO code remains the same. This provides a harmonised system to facilitate the management of plant and pest names in computerised databases, as well as data exchange between IT systems (Griessinger and Roy, 2015; EPPO, 2019).





**Figure 1:** *Aonidiella orientalis* on mango fruit: single adult female on the left (diameter 2.5 mm); and group of adult and immature stages on the right. (Photos kindly provided by Chris Malumphy)

### 3.1.2. Biology of the pest

*A. orientalis* reproduces mainly sexually. The wingless adult females probably produce sex pheromones to attract winged adult males. Parthenogenetic reproduction has also been reported (Wagner et al., 2008). A female can lay about 200 eggs (Waterhouse and Sands, 2001). The eggs are laid under the female scale cover (CABI, online). Rapid reproduction can lead to high population densities (Al-Ahmed and Badawi, 1991). In Saudi Arabia, populations peak in the spring at temperatures between 15.2 and 30.0°C (Badawi and Al-Ahmed, 1990).

There are two nymphal instars in the female and four in the male. The first instar nymphs are called 'crawlers' which have legs and are mobile. Crawlers migrate to find a suitable feeding site on the leaves, fruits and stems of the host plant where they remain until maturity (Waterhouse and Sands, 2001). When crawlers select a feeding site, the scale becomes sessile, and no further dispersal occurs. Crawlers tend to remain and feed on plants close to the natal host plant. Crawlers can walk up to 1 m but can be distributed across much greater distances by wind, insects and birds and via the transport of infested plant material (Watson, 2002).

The third and fourth male nymphal instars are called prepupa and pupa, respectively (Waterhouse and Sands, 2001). Adult males have wings and females are wingless (Waterhouse and Sands, 2001). Both males and females are ready for mating about 3 weeks after first instars settle. The adult male lacks mouthparts, so it does not feed and dies soon after mating (CABI, online). The female begins to produce crawlers 2 weeks after mating and dies after 3–4 weeks. These time periods greatly extend in winter (Queensland Government, 2017).

*A. orientalis* is mainly found on leaves, but in heavy infestations also on branches, trunks, shoots and fruits of the host plants where all life stages can be found (CABI, online). The oriental scale is not found at the growing point or on fruit until the fruits are at least half their final size. In orchards, fruits are colonised by crawlers originating from the populations on the foliage, trunks and branches.

*A. orientalis* can complete from three generations (in India) up to six generations (in Australia) each year (Waterhouse and Sands, 2001; Watson, 2002). In Iran, five generations per year were recorded, with the maximum population density in the fourth and fifth generation (Watson, 2002). *A. orientalis* had a continuous reproduction all year in Saudi Arabia and four annual generations were observed on *Ficus benjamina* (Badawi and Al-Ahmed, 1990).

Males need an average of 19.5 days to develop from the crawler stage to adult at 25°C and females need an average of 44.2 days from the crawler stage to the production of the first crawler of the subsequent generation at the same temperature (Elder and Smith, 1995).

Approximately 30 species of natural enemies are recorded by García Morales et al. (2016), mostly Aphelinidae and Encyrtidae including the parasitoid *Comperiella lemniscata* Howard (Hymenoptera: Encyrtidae), which occurs in the EU, at least in Italy and Spain (Pina et al., 2001) and which proved successful in the control of *A. orientalis* in Australia (Elder et al., 1998).

### 3.1.3. Host range/Species affected

The oriental scale has a wide range of host plants worldwide. More than 163 plant genera belonging to more than 73 families have been recorded as hosts of *A. orientalis* (García Morales et al., 2016). The full list of host plant species of *A. orientalis* is presented in Appendix A. Several hosts are cultivated in the EU and are of major importance.

### 3.1.4. Intraspecific diversity

No intraspecific diversity is reported for this species.

### 3.1.5. Detection and identification of the pest

*Are detection and identification methods available for the pest?*

**Yes**, there are methods available for detection and morphological identification of *A. orientalis*.

#### Detection

Careful visual examination of plants and fruits is an effective way for the detection of *A. orientalis*. The pest may occur on leaves, branches, trunks, shoots and fruits of host plants (Watson, 2002). Scales can be found during inspection with magnifying glasses, which is triggered by the observation of suspected symptoms. There is uncertainty on the capacity to detect crawlers on the bark with the naked eye (EFSA PLH Panel, 2021a,b).

#### Identification

The identification of *A. orientalis* requires microscopic examination of slide-mounted adult females and verification of the presence of key morphological characteristics as described by Williams and Watson (1988). Ben Dov (2006) provides a key for the separation of the 32 known species assigned to the genus *Aonidiella* based on the morphology of the adult female. EPPO produced a standard in 2005 (PM 7/51(1)), dealing with the detection and identification of *Aonidiella citrina* (Coquillett) (EPPO, 2005). It includes a key for the identification of 10 species of *Aonidiella*, including *A. orientalis*. The latter is one of the more distinct species of *Aonidiella* and therefore easier to identify than other species included in the key. There are no molecular techniques available for species identification since GenBank does not contain nucleotide sequences for *A. orientalis*.

#### Symptoms

The main symptoms of *A. orientalis* infestation are (Watson, 2002; EPPO, 2005):

- yellowing or death of the leaves
- characteristic chlorotic streaks, depressions, discoloration and distortion of leaves
- defoliation
- fruit discoloration
- premature fruit drop
- dieback of small twigs
- reduced plant vigour
- heavy infestations cause drying of leaves and give the tree a burnt appearance

These symptoms are similar to those caused by many other plant-sap feeding insects and should not be considered as diagnostic.

#### Description

Crawler: body oval with average of length and width 0.247 mm and 0.147 mm, respectively. The colour of the crawler is yellowish green. It has a pair of eyes, a pair of six segmented antenna, three pairs of well-developed legs, two pairs of spiracles, pygidium with three pairs of lobes along with dorsal seta, without macroducts, eight pairs of microducts pores opening and dorsal anus (Singh Ojha and Singh, 2019).

Adult: Female body is bright yellow; scale cover is 1.5–2.6 mm diameter, circular to oval, flat, ranging in colour from white to pale brown or yellow with a yellow to dark brown exuviae positioned more or less centrally. Scale cover of male similar in colour to the female but smaller, elongate oval (Watson, 2002).

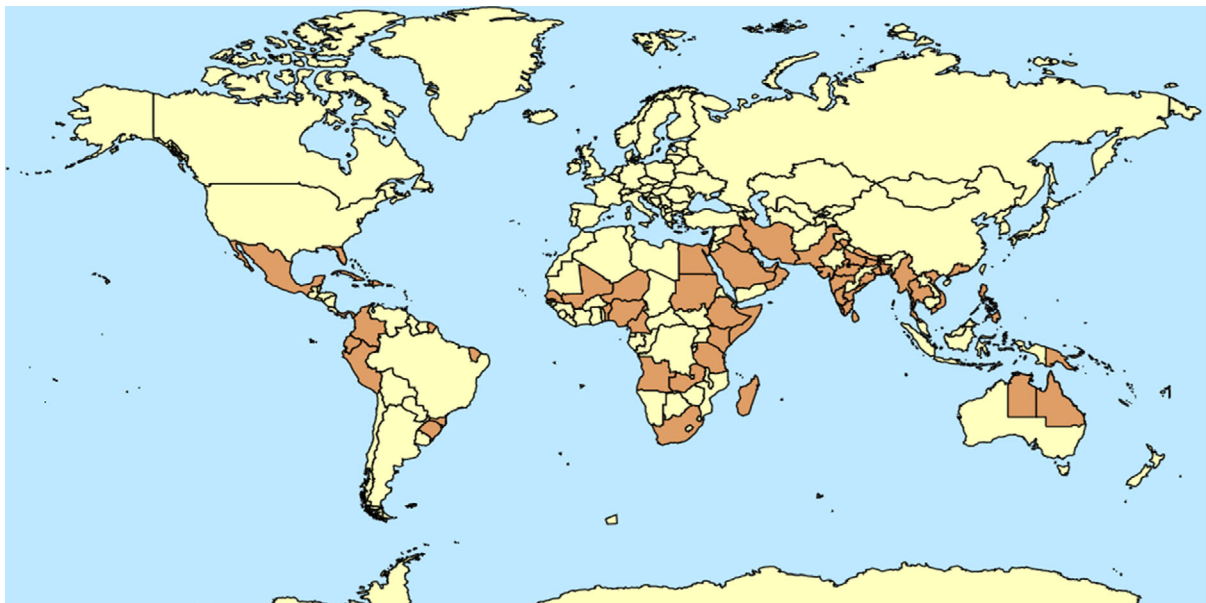


## 3.2. Pest distribution

### 3.2.1. Pest distribution outside the EU

*A. orientalis* is mainly a species of tropical and subtropical areas (CABI, online). It has a wide distribution which includes many countries in Asia, South America, North America, Central America, Caribbean, Africa and Oceania (CABI, online; García Morales et al., 2016) (Figure 2). For a detailed list of countries where *A. orientalis* is present, see Appendix B.

Also found on *Dictyosperma* sp. and *Cocos nucifera* in a tropical greenhouse at a botanical garden in the UK in 2001 and 2003. The pest is no longer present.



**Figure 2:** Global distribution of *Aonidiella orientalis* (Data source: CABI, online; accessed on 20/10/2022 and literature)

For countries considered as large by EPPO and CABI (i.e. Canada, USA, Brazil, Russia, India, China and Australia) and for which subnational distribution records are available e.g. at State or Province level, we show the occurrence at the subnational level. This can result in global maps of pest distribution appearing to look rather different when compared against global maps where any large country where the pest is known to occur is marked in its entirety.

### 3.2.2. Pest distribution in the EU

*Is the pest present in the EU territory? If present, is the pest in a limited part of the EU or is it scarce, irregular, isolated or present infrequently? If so, the pest is considered to be not widely distributed.*

**No,** *A. orientalis* is not known to be present in the EU territory.

According to Pellizzari and Porcelli (2014), live specimens of the pest were collected on leaves of *Cocos nucifera* (Arecaeae) imported from Florida (USA) to the Botanical Garden of Padova (Italy) in September 2013. However, there are no other records of the pest in the area thereafter.

## 3.3. Regulatory status

*A. orientalis* is regulated by Commission Implementing Regulations 2021/1936 on *Ficus carica* and *Persea americana* from Israel, and by 2022/1942 on *Jasminum polyanthum* from Israel.

### 3.3.1. Commission Implementing Regulation 2019/2072

*A. orientalis* is not listed in Annex II of Commission Implementing Regulation (EU) 2019/2072, an implementing act of Regulation (EU) 2016/2031, or in any emergency plant health legislation.

### 3.3.2. Hosts or species affected that are prohibited from entering the Union from third countries

As specified in Annex VI of 2019/2072, some plants which are also *A. orientalis* host plants (see Appendix A) are prohibited from entering the EU e.g. as plants for planting. Information on which plants are prohibited are shown in Table 2.

**Table 2:** List of plants, plant products and other objects that are *A. orientalis* hosts whose introduction into the Union from certain third countries is prohibited (Source: Commission Implementing Regulation (EU) 2019/2072, Annex VI)

<b>List of plants, plant products and other objects whose introduction into the Union from certain third countries is prohibited</b>			
	<b>Description</b>	<b>CN Code</b>	<b>Third country, group of third countries or specific area of third country</b>
8.	Plants for planting of [...] <i>Prunus</i> L., [...] and <i>Rosa</i> L., other than dormant plants free from leaves, flowers and fruits	ex 0602 10 90 ex 0602 20 20 ex 0602 20 80 ex 0602 40 00 ex 0602 90 41 ex 0602 90 45 ex 0602 90 46 ex 0602 90 47 ex 0602 90 48 ex 0602 90 50 ex 0602 90 70 ex 0602 90 91 ex 0602 90 99	Third countries other than Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canary Islands, Faeroe Islands, Georgia, Iceland, Liechtenstein, Moldova, Monaco, Montenegro, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo-Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Turkey and Ukraine.
9.	Plants for planting of [...] <i>Prunus</i> L., [...] and their hybrids, [...] other than seeds	ex 0602 10 90 ex 0602 20 20 ex 0602 90 30 ex 0602 90 41 ex 0602 90 45 ex 0602 90 46 ex 0602 90 48 ex 0602 90 50 ex 0602 90 70 ex 0602 90 91 ex 0602 90 99	Third countries, other than: Albania, Algeria, Andorra, Armenia, Australia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canada, Canary Islands, Egypt, Faeroe Islands, Georgia, Iceland, Israel, Jordan, Lebanon, Libya, Liechtenstein, Moldova, Monaco, Montenegro, Morocco, New Zealand, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo-Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Syria, Tunisia, Turkey, Ukraine and United States other than Hawaii.

**List of plants, plant products and other objects whose introduction into the Union from certain third countries is prohibited**

	Description	CN Code	Third country, group of third countries or specific area of third country
10.	Plants of <i>Vitis</i> L., other than fruits	0602 10 10 0602 20 10 ex 0604 20 90 ex 1,404 90 00	Third countries other than Switzerland
11.	Plants of <i>Citrus</i> L., <i>Fortunella</i> Swingle, [...] and their hybrids, other than fruits and seed	ex 0602 10 90 ex 0602 20 20 0602 20 30 ex 0602 20 80 ex 0602 90 45 ex 0602 90 46 ex 0602 90 47 ex 0602 90 50 ex 0602 90 70 ex 0602 90 91 ex 0602 90 99 ex 0604 20 90 ex 1,404 90 00	All third countries
13.	Plants of <i>Phoenix</i> spp. other than fruit and seeds	ex 0602 20 20 ex 0602 20 80 ex 0602 90 41 ex 0602 90 45 ex 0602 90 46 ex 0602 90 47 ex 0602 90 50 ex 0602 90 70 ex 0602 90 99 ex 0604 20 90 ex 1,404 90 00	Algeria, Morocco
14.	Plants for planting of the family Poaceae, other than plants of ornamental perennial grasses of the subfamilies Bambusoideae and Panicoideae and of the genera <i>Buchloe</i> , <i>Bouteloua</i> Lag., <i>Calamagrostis</i> , <i>Cortaderia</i> Stapf., <i>Glyceria</i> R. Br., <i>Hakonechloa</i> Mak. ex Honda, <i>Hystrix</i> , <i>Molinia</i> , <i>Phalaris</i> L., <i>Shibataea</i> , <i>Spartina</i> Schreb., <i>Stipa</i> L. and <i>Uniola</i> L., other than seeds	ex 0602 90 50 ex 0602 90 91 ex 0602 90 99	Third countries other than: Albania, Algeria, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canary Islands, Egypt, Faeroe Islands, Georgia, Iceland, Israel, Jordan, Lebanon, Libya, Liechtenstein, Moldova, Monaco, Montenegro, Morocco, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo-Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Syria, Tunisia, Turkey and Ukraine
18.	Plants for planting of Solanaceae other than seeds and the plants covered by entries 15, 16 or 17	ex 0602 90 30 ex 0602 90 45 ex 0602 90 46 ex 0602 90 48 ex 0602 90 50 ex 0602 90 70 ex 0602 90 91	Third countries other than: Albania, Algeria, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canary Islands, Egypt, Faeroe Islands, Georgia, Iceland, Israel, Jordan, Lebanon, Libya, Liechtenstein, Moldova, Monaco, Montenegro, Morocco, North

**List of plants, plant products and other objects whose introduction into the Union from certain third countries is prohibited**

Description	CN Code	Third country, group of third countries or specific area of third country
	ex 0602 90 99	Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo-Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Syria, Tunisia, Turkey and Ukraine

### 3.4. Entry, establishment and spread in the EU

#### 3.4.1. Entry

*Is the pest able to enter into the EU territory? If yes, identify and list the pathways.*

**Yes**, the pest can enter the EU territory. The pathways are plants for planting, fruits, vegetables, and cut flowers.

*Comment on plants for planting as a pathway.*

Plants for planting provide the pathway most likely leading to introduction.

Potential pathways of entry into the EU for *A. orientalis* are presented in Table 3.

**Table 3:** Potential pathways for *Aonidiella orientalis* into the EU

Pathways	Life stage	Relevant mitigations [e.g. prohibitions (Annex VI), special requirements (Annex VII) or phytosanitary certificates (Annex XI) within Implementing Regulation 2019/2072]
Plants for planting	Eggs, nymphs and adult females	Plants for planting that are hosts of <i>A. orientalis</i> and are prohibited to import from third countries (Regulation 2019/2072, Annex VI) are listed in Table 2.  Plants for planting from third countries require a phytosanitary certificate (Regulation 2019/2072, Annex XI, Part A).
Fruits, vegetables and cut flowers	Eggs, nymphs and adult females	Fruits, vegetables and cut flowers from third countries require a phytosanitary certificate to import into the EU (2019/2072, Annex XI, Part A).  According to Regulation 2019/2072, Annex XI, Part C fruits of <i>Cocos nucifera</i> (coconuts, fresh or dried, whether or not shelled or peeled), fruits of <i>Musa</i> sp. (bananas, including plantains, fresh or dried) and fruits of <i>Phoenix dactylifera</i> (dates, fresh or dried) do not require a phytosanitary certificate for their introduction into the Union territory.

The oriental scale is a polyphagous pest with a wide range of host plants (Appendix A). Many of them are imported into the EU from areas where the pest occurs. Although there are some prohibitions in imports of some host plants for planting from third countries (Regulation 2019/2072, Annex VI), there are many other hosts that can be imported to the EU with a phytosanitary certificate.

Vegetables, cut flowers and most fruits that are imported into the EU must have a phytosanitary certificate. However, fruits of *Cocos nucifera*, *Musa* sp. and *Phoenix dactylifera*, which are hosts of *A. orientalis*, are exempt by Regulation 2019/2072 (Annex XI, Part C). Detailed data of the annual imports of host plant commodities in the EU from countries where the pest occurs, and which provide potential pathways of introduction are provided in Appendix D.

Notifications of interceptions of harmful organisms began to be compiled in Europhyt in May 1994 and in TRACES in May 2020. As of 29 July 2022, there were no records of interception of *A. orientalis* in the Europhyt and TRACES databases.

According to Pellizzari and Porcelli (2014), the pest has been intercepted several times in the UK since 1996, mostly on imported mango and guava fruits and recorded also in a greenhouse on *Dictyosperma* and *Cocos*. Moreover, live specimens were collected on leaves of *Cocos nucifera* (Arecaeae) imported from Florida (USA) to the Botanical Garden of Padova (Italy) in September 2013. It is also worth mentioning that from 1987 to 2015, *A. orientalis* was intercepted 225 times by California Department for Food and Agriculture. Many of these interceptions have been on coconut, papaya and mango from Florida, Brazil and Mexico (Leathers, 2016).

The UK has more than 120 interception records of *A. orientalis* between 1997 and 2019. It has been frequently found at high density on fresh *Annona*, citrus, guava and mango fruit. *A. orientalis* is rarely intercepted on citrus fruit with the exception of fruit imported from Iran. Between 2015 and 2017, *A. orientalis* was intercepted on 19 occasions on Iranian citrus fruit. This is significant as the dominant species of *Aonidiella* found in most other citrus-producing regions, for example, in the Mediterranean, Americas, South Africa and most of Asia, is *A. aurantii* (Defra unpublished data).

Unless moved with plants for planting, there are uncertainties over the pests' ability to transfer to a suitable host following arrival into the EU. Uncertainties also include the ability of wingless females to effectively attract a male and Allee effects (effects causing reduced survival of new colonies with a small number of individuals) (Tobin et al., 2011) as well as the impact of natural enemies in the EU.

### 3.4.2. Establishment

*Is the pest able to become established in the EU territory?*

**Yes.** Southern EU countries have suitable climates and there are many available hosts that can support establishment. Establishment is also possible in the central or northern EU in heated greenhouses, such as may be found in botanical gardens.

Climatic mapping is the principal method for identifying areas that could provide suitable conditions for the establishment of a pest taking key abiotic factors into account (Baker, 2002). Availability of hosts is considered in Section 3.4.2.1. Climatic factors are considered in Section 3.4.2.2.

#### 3.4.2.1. EU distribution of main host plants

*A. orientalis* is a highly polyphagous pest feeding on a wide range of plant species (crops, ornamentals, vegetables and fruits). The main hosts of the pest cultivated in the EU between 2017 and 2021 are shown in Table 4. Cultivated host plants of *A. orientalis* such as citrus, cotton, grapes, bananas, stone fruits, avocados and figs are highly important crops in the EU.

**Table 4:** Crop area of *A. orientalis* hosts in the EU in 1000 ha (Eurostat accessed on 19/05/2022)

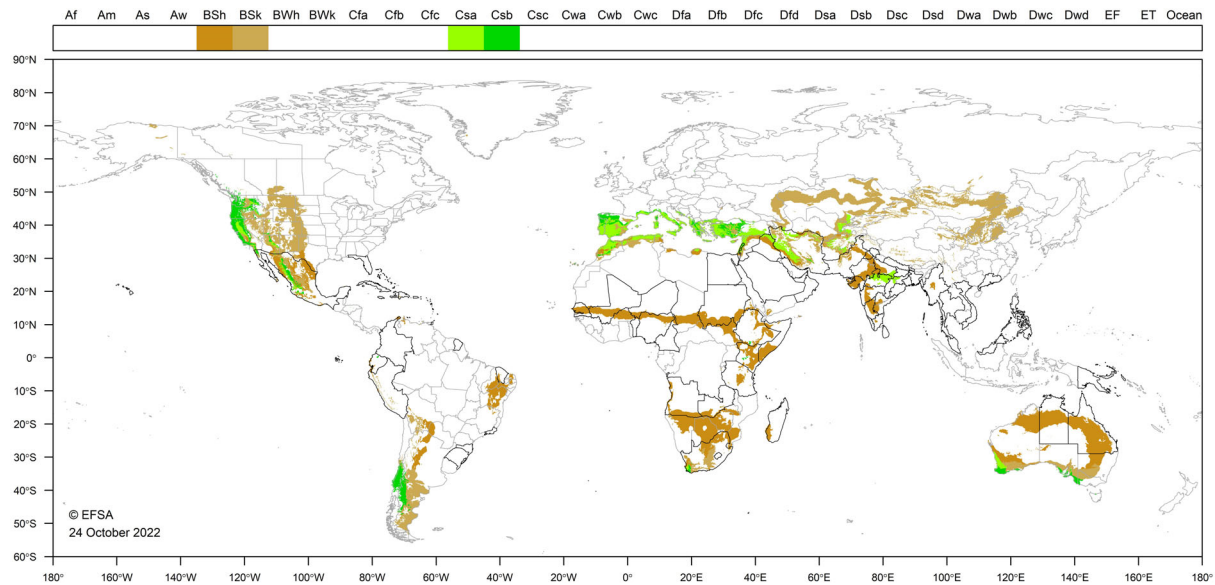
Crop	2017	2018	2019	2020	2021
Grapes	3,133.32	3,135.50	3,155.20	3,156.22	3,102.21
Stone fruits	625.46	621.32	612.67	no data	609.41
Citrus	502.84	508.99	512.83	519.98	510.28
Cotton	326.12	345.64	361.78	344.35	322.68
Figs	24.63	24.99	25.59	27.21	28.32
Bananas	18.91	17.94	18.27	19.62	20.82
Avocados	12.72	13.22	17.50	19.60	21.18

#### 3.4.2.2. Climatic conditions affecting establishment

*A. orientalis* is most frequently reported from tropical and subtropical areas of Asia, South America, North America, Central America, Caribbean, Africa and Oceania (CABI, online; García Morales



et al., 2016). Figure 3 shows the World distribution of selected Köppen–Geiger climate types (Kottek et al., 2006) that occur in the EU and which occur in countries where *A. orientalis* has been reported. In some areas of the EU, mainly in the south, the climate types are similar to those occurring in places where the pest is present. Thus, suitable climatic conditions that could support the outdoor establishment of oriental scale exist in countries like Cyprus, Greece, Malta, Portugal, Spain, southern France and Italy. In more northern EU areas, establishment may be possible in greenhouses, especially where heated.



**Figure 3:** World distribution of selected Köppen–Geiger climate types that occur in the EU and which occur in countries where *Aonidiella orientalis* has been reported

### 3.4.3. Spread

*Describe how the pest would be able to spread within the EU territory following establishment?*

The trade of infested plants for planting, vegetables, cut flowers, and fruits are the main pathways for *A. orientalis* spread within the EU territory.

*Comment on plants for planting as a mechanism of spread.*

Plants for planting would provide an important pathway for *A. orientalis* spread within the EU territory.

Crawlers (first-instar nymphs) are the mobile stage of the insect and they can spread up to 1 m by crawling to adjacent plants in contact with the natal host plant. The first-instar nymph can also be dispersed naturally by wind or phoretically (Waterhouse and Sands, 2001; Watson, 2002). Pathways for long-distance spread are primarily the trade of infested plants for planting.

### 3.5. Impacts

*Would the pests' introduction have an economic or environmental impact on the EU territory?*

**Yes**, if *A. orientalis* established in the EU, it would most probably have an economic impact on some of its host plants.

The oriental scale is a highly polyphagous scale insect. It has been recorded as an economically important pest of several agricultural crops: citrus, fig, mango, papaya, bananas, palms, tea and ornamentals (Moghaddam, 2013; García Morales et al., 2016). In Israel, it has been reported as a serious pest of mango (Wysoki et al., 1992). The infested fruits fail to enlarge in the area around the scale, so that a sunken area is formed. Moreover, at ripening an area of four to six times the diameter of the scale fails to ripen and a green spot remains and the tissue beneath also fails to ripen making the fruit unmarketable (Elder et al., 1998). A large number of scales on the trunk cause death of the surface tissue

leading to rotting and death of the trees (Elder et al., 1998). In Queensland (Australia), it infests papaya and the annual loss caused by the infestation has been estimated at AUD 600,000 due to unmarketable fruits and the damages to the trees (Elder et al., 1998). Nevertheless, *A. orientalis* has been successfully controlled in some areas; indeed, *A. orientalis* is considered a minor pest of citrus in Queensland and the Northern Territory because of biological control (Smith et al., 1997). Elder et al. (1998) report successful control in papaya using the parasitoid *C. lemniscata* (present in the EU) (Pina et al., 2001).

Numerous important crops in the EU could be significantly affected by *A. orientalis* such as citrus (*Citrus* spp.), figs (*Ficus carica*), ornamentals and palms. However, in relation to citrus, the closely related *A. aurantii* (California red scale) is common throughout the Mediterranean and is regarded as a key pest of citrus. Although *A. aurantii* is attacked by a range of hymenopteran parasitoids and generalist predators, further interventions are often necessary to manage the scale (Jacas et al., 2010). If *A. orientalis* was introduced to the EU, the same natural enemies and interventions could reduce the magnitude of potential impact of *A. orientalis* on citrus and other hosts.

*A. orientalis* has also been recorded on several crops that occur in the EU such as cotton (*Gossypium* spp.), apricot (*Prunus armeniaca*), peach (*Prunus persica*), roses (*Rosa* spp.) and grape (*Vitis vinifera*), but there are no records of economic impact on these hosts from third countries.

### 3.6. Available measures and their limitations

Are there measures available to prevent pest entry, establishment, spread or impacts such that the risk becomes mitigated?

**Yes**, some host plants are prohibited as plants for planting from third countries (Section 3.3.2) while some other species as well as fruits, vegetables and cut flowers require a phytosanitary certificate to be imported into the EU territory (Section 3.4.1). There are also additional measures (Section 3.6.1) to mitigate the likelihood of *Aonidiella orientalis* entry, establishment and spread within the EU.

#### 3.6.1. Identification of potential additional measures

Phytosanitary measures (prohibitions) are currently applied to some host plants for planting (see Section 3.3.2).

Additional potential risk reduction options and supporting measures are shown in Sections 3.6.1.1 and 3.6.1.2.

##### 3.6.1.1. Additional potential risk reduction options

Potential additional control measures are listed in Table 5.

**Table 5:** Selected control measures (a full list is available in EFSA PLH Panel, 2018) for pest entry/ establishment/spread/impact in relation to currently unregulated hosts and pathways. Control measures are measures that have a direct effect on pest abundance

Control measure/ Risk reduction option ( <a href="#">Blue underline</a> = Zenodo doc, <a href="#">Blue</a> = WIP)	RRO summary	Risk element targeted (entry/establishment/spread/impact)
<a href="#">Require pest freedom</a>	As a pest with low mobility, a risk reduction option could be to source plants from a pest free area or place of production.	Entry/Spread
<a href="#">Growing plants in isolation</a>	Growing plants in insect proof glass or plastic greenhouses or isolated areas could be an effective measure to mitigate the likelihood of entry and spread of <i>A. orientalis</i> since adult females cannot fly.	Entry/Spread
<a href="#">Roguing and pruning</a>	<i>A. orientalis</i> is mainly found on leaves, but in heavy infestations also on branches, trunks, shoots and fruits of the host plants. Roguing (removal of infested plants) and pruning (removal of infested plant parts only without affecting the viability of the plant) can reduce the population density of the pest.	Entry/Spread/Impact

Control measure/ Risk reduction option ( <u>Blue underline</u> = Zenodo doc, Blue = WIP)	RRO summary	Risk element targeted (entry/establishment/ spread/impact)
<a href="#">Biological control and behavioural manipulation</a>	<i>Aonidiella orientalis</i> has been successfully controlled by three parasitoids on papaya in Queensland, Australia. Within 12 months from the introduction of <i>C. lemniscata</i> , parasitism rates reached 80% and rejection of fruit for market declined from 20–30% to 1–2% (CABI, online). Within the EU, <i>C. lemniscata</i> is present at least in Italy and Spain.	Spread/Impact
<a href="#">Chemical treatments on crops including reproductive material</a>	Chemical treatments are usually performed by mineral oil sprays. However, they are not recommended as chemicals as they interfere with the natural biological control of pest insects in orchards and plantations (CABI, online). Pesticide sprays are generally effective against crawlers and less effective against the fixed stages of <i>A. orientalis</i> because of the wax covering of its body, unless systemic insecticides are applied (EFSA PLH Panel, 2021a,b).	Entry/Spread/Establishment/ Impact
<a href="#">Chemical treatments on consignments or during processing</a>	The chemical compounds that may be applied to plants or to plant products after harvest, during process or packaging operations and storage could mitigate the likelihood of infestation of pests susceptible to chemical treatment	Entry/Spread
<a href="#">Physical treatments on consignments or during processing</a>	Washing, brushing and other mechanical cleaning methods can be used to reduce the prevalence of the pest in the consignments to be exported or to be planted.	Entry/Spread

### 3.6.1.2. Additional supporting measures

Potential additional supporting measures are listed in Table 6.

**Table 6:** Selected supporting measures (a full list is available in EFSA PLH Panel, 2018) in relation to currently unregulated hosts and pathways. Supporting measures are organisational measures or procedures supporting the choice of appropriate risk reduction options that do not directly affect pest abundance

Supporting measure ( <u>Blue underline</u> = Zenodo doc, Blue = WIP)	Summary	Risk element targeted (entry/establishment/ spread/impact)
<a href="#">Inspection and trapping</a>	Inspection is defined as the official visual examination of plants, plant products or other regulated articles to determine if pests are present or to determine compliance with phytosanitary regulations (ISPM 5). The effectiveness of sampling and subsequent inspection to detect pests may be enhanced by including trapping and luring techniques. Any shipments of fresh plant material from an infested country to another that is not infested should be inspected thoroughly to detect <i>A. orientalis</i> .	Entry/Establishment/Spread
<a href="#">Laboratory testing</a>	Examination, other than visual, to determine if pests are present using official diagnostic protocols. Diagnostic protocols describe the minimum requirements for reliable diagnosis of regulated pests.	Entry/Spread

Supporting measure ( <u>Blue underline</u> = Zenodo doc, Blue = WIP)	Summary	Risk element targeted (entry/establishment/ spread/impact)
Sampling	According to ISPM 31, it is usually not feasible to inspect entire consignments, so phytosanitary inspection is performed mainly on samples obtained from a consignment. It is noted that the sampling concepts presented in this standard may also apply to other phytosanitary procedures, notably selection of units for testing. For inspection, testing and/or surveillance purposes, the sample may be taken according to a statistically based or a non-statistical sampling methodology.	Entry/Spread
Phytosanitary certificate and plant passport	An official paper document or its official electronic equivalent, consistent with the model certificates of the IPPC, attesting that a consignment meets phytosanitary import requirements (ISPM 5) a) export certificate (import) b) plant passport (EU internal trade)	Entry/Spread
<u>Certified and approved premises</u>	Mandatory/voluntary certification/approval of premises is a process including a set of procedures and of actions implemented by producers, conditioners and traders contributing to ensure the phytosanitary compliance of consignments. It can be a part of a larger system maintained by the NPPO in order to guarantee the fulfilment of plant health requirements of plants and plant products intended for trade. Key property of certified or approved premises is the traceability of activities and tasks (and their components) inherent the pursued phytosanitary objective. Traceability aims to provide access to all trustful pieces of information that may help to prove the compliance of consignments with phytosanitary requirements of importing countries.	Entry
Certification of reproductive material (voluntary/official)	Plants come from within an approved propagation scheme and are certified pest free (level of infestation) following testing; Used to mitigate against pests that are included in a certification scheme.	Entry
<u>Delimitation of Buffer zones</u>	ISPM 5 defines a buffer zone as 'an area surrounding or adjacent to an area officially delimited for phytosanitary purposes in order to minimise the probability of spread of the target pest into or out of the delimited area, and subject to phytosanitary or other control measures, if appropriate' (ISPM 5). The objectives for delimiting a buffer zone can be to prevent spread from the outbreak area and to maintain a pest-free production place (PFPP), site (PFPS) or area (PFA).	Spread
Surveillance	Surveillance to guarantee that plants and produce originate from a pest-free area could be an option.	Spread

### 3.6.1.3. Biological or technical factors limiting the effectiveness of measures

- *A. orientalis* is difficult to detect especially on the bark when low-density populations occur.
- Contact insecticide treatments are not effective because of the waxy protection of the scale cover.
- The high number of the potential host plant species of *A. orientalis* makes the inspections of all consignments imported from countries where the pest occurs difficult.

## 3.7. Uncertainty

No key uncertainties have been identified.

## 4. Conclusions

*A. orientalis* satisfies all the criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest (Table 7).

**Table 7:** The Panel's conclusions on the pest categorisation criteria defined in Regulation (EU) 2016/2031 on protective measures against pests of plants (the number of the relevant sections of the pest categorisation is shown in brackets in the first column)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Key uncertainties
<b>Identity of the pest (Section 3.1)</b>	The identity of the pest is clearly defined and <i>Aonidiella orientalis</i> (Newstead) is the accepted name.	None
<b>Absence/presence of the pest in the EU (Section 3.2)</b>	The pest is not known to be present in the EU territory.	None
<b>Pest potential for entry, establishment and spread in the EU (Section 3.4)</b>	<i>A. orientalis</i> is able to enter into, become established, and spread within the EU territory. The main pathways are: <ul style="list-style-type: none"> <li>• plants for planting</li> <li>• fruits, vegetables and cut flowers</li> </ul>	None
<b>Potential for consequences in the EU (Section 3.5)</b>	The pests' introduction could have an economic impact on several agricultural crops in the EU: citrus, fig, palms and ornamentals.	None
<b>Available measures (Section 3.6)</b>	There are measures available to prevent the entry, establishment and spread of <i>A. orientalis</i> within the EU. These measures include the inspections and chemical treatments on consignments of fresh plant material from infested countries.	None
<b>Conclusion (Section 4)</b>	The criteria assessed by EFSA for consideration as a potential quarantine pest are met.	
Aspects of assessment to focus on/ scenarios to address in future if appropriate:		

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## Abbreviations

EPPO	European and Mediterranean Plant Protection Organisation
FAO	Food and Agriculture Organisation
IPPC	International Plant Protection Convention
ISPM	International Standards for Phytosanitary Measures
MS	Member State
PLH	EFSA Panel on Plant Health
PZ	Protected Zone
TFEU	Treaty on the Functioning of the European Union
ToR	Terms of Reference

## Glossary

Containment (of a pest)	Application of phytosanitary measures in and around an infested area to prevent spread of a pest (FAO, 2021)
Control (of a pest)	Suppression, containment or eradication of a pest population (FAO, 2021)
Entry (of a pest)	Movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled (FAO, 2021)
Eradication (of a pest)	Application of phytosanitary measures to eliminate a pest from an area (FAO, 2021)
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2021)
Greenhouse	A walk-in, static, closed place of crop production with a usually translucent outer shell, which allows controlled exchange of material

	and energy with the surroundings and prevents release of plant protection products (PPPs) into the environment.
Hitchhiker	An organism sheltering or transported accidentally via inanimate pathways including with machinery, shipping containers and vehicles; such organisms are also known as contaminating pests or stowaways (Toy and Newfield, 2010)
Impact (of a pest)	The impact of the pest on the crop output and quality and on the environment in the occupied spatial units
Introduction (of a pest)	The entry of a pest resulting in its establishment (FAO, 2021)
Pathway	Any means that allows the entry or spread of a pest (FAO, 2021)
Phytosanitary measures	Any legislation, regulation or official procedure having the purpose to prevent the introduction or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests (FAO, 2021)
Quarantine pest	A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (FAO, 2021)
Risk reduction option (RRO)	A measure acting on pest introduction and/or pest spread and/or the magnitude of the biological impact of the pest should the pest be present. A RRO may become a phytosanitary measure, action or procedure according to the decision of the risk manager
Spread (of a pest)	Expansion of the geographical distribution of a pest within an area (FAO, 2021)

## Appendix A – *Aonidiella orientalis* host plants/species affected

Host plants of *Aonidiella orientalis* based on CABI, online and García Morales et al. (2016)

Host status	Host name	Plant family	Common name	Reference
Cultivated hosts	<i>Acacia</i>	Fabaceae	wattles	CABI, online
	<i>Acacia saligna</i>	Fabaceae	coojong	García Morales et al., 2016
	<i>Acalypha</i>	Euphorbiaceae	copperleaf	García Morales et al., 2016
	<i>Adansonia</i>	Malvaceae	baobab	García Morales et al., 2016
	<i>Aegle</i>	Rutaceae		García Morales et al., 2016
	<i>Aegle marmelos</i>	Rutaceae	Indian bael, golden apple, Bengal quince	CABI, online
	<i>Agave</i>	Agavaceae		CABI, online
	<i>Agave americana</i>	Agavaceae	century plant, American aloe	García Morales et al., 2016
	<i>Agave sisalana</i>	Agavaceae	sisal hemp	CABI, online
	<i>Albizia</i>	Fabaceae		García Morales et al., 2016
	<i>Albizia julibrissin</i>	Fabaceae	silk tree, pink silk tree, mimosa	García Morales et al., 2016
	<i>Albizia lebeck</i>	Fabaceae	Indian siris, acacia-tree, Broome raintree, East Indian walnut	CABI, online
	<i>Allamanda cathartica</i>	Apocynaceae	yellow allamanda, golden trumpet, common trumpetvine	García Morales et al., 2016
	<i>Aloe vera</i>	Asphodelaceae	true aloe, barbados aloe, bitter aloe, burn aloe, Mediterranean aloe, West Indian aloe	García Morales et al., 2016
	<i>Alpinia nutans</i>	Zingiberaceae	shellflower, dwarf cardamom	García Morales et al., 2016
	<i>Alstonia</i>	Apocynaceae		García Morales et al., 2016
	<i>Alstonia scholaris</i>	Apocynaceae	white cheesewood, blackboard tree	García Morales et al., 2016
	<i>Annona</i>	Annonaceae	Cherimoya, custard apple, graveola, sugar apple, sweet apple	CABI, online
	<i>Annona glabra</i>	Annonaceae	pond apple, alligator apple, corkwood, mangrove anona, monkey apple	García Morales et al., 2016
	<i>Annona squamosa</i>	Annonaceae	sugar apple, sweetsop, Cachiman, Cuban sugar apple, custard apple	CABI, online
	<i>Antigonon leptopus</i>	Polygonaceae	coral vine	García Morales et al., 2016
	<i>Archontophoenix cunninghamiana</i>	Arecaceae	Bangalow palm, king palm, Illawara palm	García Morales et al., 2016
	<i>Areca</i>	Arecaceae		CABI, online
	<i>Aristolochia</i>	Aristolochiaceae	birthwort, pipevine	García Morales et al., 2016
	<i>Asparagus</i>	Asparagaceae	asparagus, garden asparagus	García Morales et al., 2016
	<i>Asparagus aethiopicus</i>	Asparagaceae	asparagus fern, asparagus grass, foxtail fern	García Morales et al., 2016
<i>Averrhoa carambola</i>	Oxalidaceae	carambola, star fruit, five-corner	García Morales et al., 2016	
<i>Azadirachta indica</i>	Meliaceae	neem tree, neem, Indian lilac	CABI, online	
<i>Barleria cristata</i>	Acanthaceae	bluebell barleria, Philippine violet	García Morales et al., 2016	

Host status	Host name	Plant family	Common name	Reference
	<i>Bauhinia</i>	Fabaceae		García Morales et al., 2016
	<i>Bauhinia purpurea</i>	Fabaceae	purple bauhinia, butterfly tree, orchid tree, Hong Kong orchid tree	García Morales et al., 2016
	<i>Bauhinia variegata</i>	Fabaceae	mountain ebony	CABI, online
	<i>Begonia</i>	Begoniaceae	begonia	García Morales et al., 2016
	<i>Bischofia javanica</i>	Phyllanthaceae	bishop wood, java cedar, red cedar	García Morales et al., 2016
	<i>Bombax ceiba</i>	Malvaceae	silk cotton tree, Indian bombax, red cotton tree	García Morales et al., 2016
	<i>Boswellia serrata</i>	Burseraceae	Indian olibanum tree, Indian frankincense tree	García Morales et al., 2016
	<i>Bougainvillea</i>	Nyctaginaceae	Bougainvillea	García Morales et al., 2016
	<i>Broussonetia papyrifera</i>	Moraceae	paper mulberry, paper mulberry tree, tapa cloth tree	García Morales et al., 2016
	<i>Bruguiera sexangula</i>	Rhizophoraceae	upriver orange mangrove	García Morales et al., 2016
	<i>Butea monosperma</i>	Fabaceae	flame of the forest	García Morales et al., 2016
	<i>Buxus sempervirens</i>	Buxaceae	common boxwood, European box	García Morales et al., 2016
	<i>Cactus</i>	Cactaceae	cacti	García Morales et al., 2016
	<i>Cajanus cajan</i>	Fabaceae	Bengal pea, cajan pea, Congo pea, pigeon pea, red gram	CABI, online
	<i>Callistemon rigidus</i>	Myrtaceae	Stiff bottlebrush	García Morales et al., 2016
	<i>Callistemon salignus</i>	Myrtaceae	willow bottlebrush	García Morales et al., 2016
	<i>Camellia</i>	Theaceae	Camellia	CABI, online
	<i>Camellia sinensis</i>	Theaceae	tea, tea plant	CABI, online
	<i>Campsis radicans</i>	Bignoniaceae	trumpet creeper, trumpet vine, yellow trumpet vine, trumpet creeper	García Morales et al., 2016
	<i>Canna indica</i>	Cannaceae	Canna lily, African arrowroot, arrowroot, canna, edible canna, Indian canna, Indian shot, purple arrowroot, Queensland arrowroot, red canna	García Morales et al., 2016
	<i>Carica papaya</i>	Caricaceae	Pawpaw, papaya, tree melon	CABI, online
	<i>Carissa</i>	Apocynaceae		García Morales et al., 2016
	<i>Carissa carandas</i>	Apocynaceae	Caranda (plum), karanda	García Morales et al., 2016
	<i>Casimiroa</i>	Rutaceae	sapote	García Morales et al., 2016
	<i>Cassia</i>	Fabaceae	Cassia, sennas	García Morales et al., 2016
	<i>Cassia fistula</i>	Fabaceae	Indian laburnum, cassia stick tree, golden pipe tree, golden rain, golden shower, pudding-pipe tree, purging cassia, purging fistula	CABI, online
	<i>Catha edulis</i>	Celastraceae	Arabian tea, khat	García Morales et al., 2016
	<i>Ceiba pentandra</i>	Malvaceae	kapok, copal, kapok tree, silk cotton tree, white silk-cotton tree	García Morales et al., 2016
	<i>Celtis</i>	Cannabaceae	nettle tree, hackberry	García Morales et al., 2016



Host status	Host name	Plant family	Common name	Reference
	<i>Celtis australis</i>	Cannabaceae	European nettle wood, European hackberry, hackberry, lote tree, Mediterranean hackberry, nettle tree, honey berry tree	García Morales et al., 2016
	<i>Ceratonia siliqua</i>	Fabaceae	Carob, carob tree, locust bean, locust tree, St John's bread	García Morales et al., 2016
	<i>Citharexylum</i>	Verbenaceae	fiddlewoods, zitherwoods	García Morales et al., 2016
	<i>Citrus</i>	Rutaceae	Citrus	CABI, online
	<i>Citrus aurantium</i>	Rutaceae	Bigarade, bitter orange, Seville orange, sour orange	García Morales et al., 2016
	<i>Citrus limon</i>	Rutaceae	lemon, true lemon tree	García Morales et al., 2016
	<i>Citrus maxima</i>	Rutaceae	pummelo, Bali lemon, shaddock	García Morales et al., 2016
	<i>Citrus medica</i>	Rutaceae	Citron, cidran	García Morales et al., 2016
	<i>Citrus sinensis</i>	Rutaceae	sweet orange	García Morales et al., 2016
	<i>Clematis terniflora</i>	Ranunculaceae	sweet autumn clematis, fall clematis, Japanese clematis, leatherleaf clematis, sweet autumn virginsbower, yam-leaved clematis	García Morales et al., 2016
	<i>Cocculus laurifolius</i>	Menispermaceae	laurel-leaved snail tree	García Morales et al., 2016
	<i>Cocos</i>	Arecaceae		García Morales et al., 2016
	<i>Cocos nucifera</i>	Arecaceae	coconut, common coconut palm	CABI, online
	<i>Codiaeum variegatum</i>	Euphorbiaceae	garden croton, Bombay laurel, croton	CABI, online
	<i>Coffea arabica</i>	Rubiaceae	Arabian coffee, coffee tree	García Morales et al., 2016
	<i>Combretum indicum</i>	Combretaceae	Rangoon creeper, Burma creeper, Chinese honeysuckle, quisqualis, rangoon-creeper	García Morales et al., 2016
	<i>Cordia</i>	Boraginaceae		García Morales et al., 2016
	<i>Cordia myxa</i>	Boraginaceae	sebesten, lasoda	García Morales et al., 2016
	<i>Cordia obliqua</i>	Boraginaceae	clammy cherry, cordia-tree	García Morales et al., 2016
	<i>Cordia sinensis</i>	Boraginaceae	grey-leaved saucer berry, grey-leaved cordia	García Morales et al., 2016
	<i>Crateva religiosa</i>	Capparaceae	Bengal quince, caper tree, sacred garlic-pear, temple plant	García Morales et al., 2016
	<i>Cucurbita</i>	Cucurbitaceae	pumpkin	CABI, online
	<i>Cycas</i>	Cycadaceae		CABI, online
	<i>Cycas revoluta</i>	Cycadaceae	sago cycas, Japanese fern-palm	CABI, online
	<i>Cycas rumphii</i>	Cycadaceae	fern-palm, sago-palm	CABI, online
	<i>Dalbergia</i>	Fabaceae	rosewoods	García Morales et al., 2016
	<i>Dalbergia sissoo</i>	Fabaceae	Bombay blackwood, Himalaya raintree, India teakwood, Indian dalbergia, Indian rosewood	CABI, online

Host status	Host name	Plant family	Common name	Reference
	<i>Delonix regia</i>	Fabaceae	Flamboyant, fire tree, flame of the forests, flame tree, gold mohar, peacock flower, poinciana, read tree, royal gulmohur, royal peacock, royal poinciana	García Morales et al., 2016
	<i>Diospyros</i>	Ebenaceae	Siamese persimmon	García Morales et al., 2016
	<i>Duranta</i>	Verbenaceae		García Morales et al., 2016
	<i>Duranta erecta</i>	Verbenaceae	Golden dewdrops, Brazilian sky flower, duranta, forget-me-not tree, garden dew drop, golden eardrops, golden tears, pigeonberry, skyflower	García Morales et al., 2016
	<i>Elaeagnus pungens</i>	Elaeagnaceae	Thorny olive, leathery silver-bush, pungent elaeagnus, silverberry, silverthorn, spotted elaeagnus, thorny elaeagnus	García Morales et al., 2016
	<i>Elaeis guineensis</i>	Arecaceae	African oil palm, oil palm	CABI, online
	<i>Eriobotrya japonica</i>	Rosaceae	Loquat, Japanese medlar, Japanese plum	García Morales et al., 2016
	<i>Erythrina</i>	Fabaceae	coral tree	García Morales et al., 2016
	<i>Eucalyptus</i>	Myrtaceae	Eucalypts	García Morales et al., 2016
	<i>Eugenia</i>	Myrtaceae		CABI, online
	<i>Feijoa</i>	Myrtaceae		CABI, online
	<i>Ficus</i>	Moraceae		CABI, online
	<i>Ficus auriculata</i>	Moraceae	Himalayan fig, imperial tree	García Morales et al., 2016
	<i>Ficus benghalensis</i>	Moraceae	Banyan, banyan fig, banyan tree, east Indian fig, Indian banyan	CABI, online
	<i>Ficus benjamina</i>	Moraceae	Benjamin's fig, ficus tree, Java fig, small-leaved rubber plant, tropical laurel, weeping fig, Benjamin tree	CABI, online
	<i>Ficus carica</i>	Moraceae	Common fig, fig	CABI, online
	<i>Ficus elastica</i>	Moraceae	rubber plant, India rubber fig, India rubber tree, rubber fig tree	García Morales et al., 2016
	<i>Ficus religiosa</i>	Moraceae	sacred fig tree, Bodhi tree, bo tree, peepul tree, pipal tree, sacred fig, sacred tree	García Morales et al., 2016
	<i>Ficus retusa</i>	Moraceae	Retuse fig, blunt-leaved fig, Chinese banyan, Indian laurel	García Morales et al., 2016
	<i>Glycosmis pentaphylla</i>	Rutaceae	Orangeberry, gin berry	García Morales et al., 2016
	<i>Gmelina arborea</i>	Lamiaceae	Candahar, beechwood, gmelina, goomar teak, Kashmir tree, Malay beechwood, white teak, yamane	García Morales et al., 2016
	<i>Gomphocarpus physocarpus</i>	Asclepiadaceae	balloon cotton bush, balloon plant, nailhead, swan plant, balloon gomphocarpus, balloon milkweed	CABI, online

Host status	Host name	Plant family	Common name	Reference
	<i>Gossypium hirsutum</i>	Malvaceae	American upland cotton, upland cotton, Bourbon cotton	CABI, online
	<i>Grevillea robusta</i>	Proteaceae	Silky oak, Australian silky-oak, she-oak, silver oak, southern silky-oak	García Morales et al., 2016
	<i>Grewia asiatica</i>	Malvaceae	Indian phalsa, phalsa	García Morales et al., 2016
	<i>Hedera</i>	Araliaceae	Ivy	CABI, online
	<i>Heliconia</i>	Heliconiaceae	lobster-claws, toucan beak, wild plantain, false bird-of-paradise	García Morales et al., 2016
	<i>Hibiscus</i>	Malvaceae	Rosemallows	CABI, online
	<i>Hiptage benghalensis</i>	Malpighiaceae	hiptage	García Morales et al., 2016
	<i>Ipomoea</i>	Convolvulaceae	morning glory	García Morales et al., 2016
	<i>Ipomoea alba</i>	Convolvulaceae	white moonflower, evening glory, giant moonflower, moonflower vine, tropical white morning glory, white morning glory	García Morales et al., 2016
	<i>Jasminum</i>	Oleaceae	jasmine	García Morales et al., 2016
	<i>Kigelia africana</i>	Bignoniaceae	sausage tree, African sausage tree	García Morales et al., 2016
	<i>Lagerstroemia indica</i>	Lythraceae	Indian crape myrtle, crape myrtle, crepeflower, Pride of India, Queen crape myrtle, Queen of flowers, Queen of shrubs, Queen's flower	García Morales et al., 2016
	<i>Lawsonia inermis</i>	Lythraceae	Egyptian privet, camphire, henna, henna tree, mignonette tree	García Morales et al., 2016
	<i>Limonia</i>	Rutaceae		García Morales et al., 2016
	<i>Limonia acidissima</i>	Rutaceae	elephant apple, wood apple	García Morales et al., 2016
	<i>Litchi chinensis</i>	Sapindaceae	lichi, leechie, lici, litchee, litchi nut, litchia, lychee	CABI, online
	<i>Lonicera japonica</i>	Caprifoliaceae	Japanese honeysuckle, gold and silver flower, white honeysuckle	García Morales et al., 2016
	<i>Maclura pomifera</i>	Moraceae	Osage orange, Boxwood, Osageorange	García Morales et al., 2016
	<i>Madhuca longifolia</i>	Sapotaceae	honey tree, butter tree	García Morales et al., 2016
	<i>Magnolia grandiflora</i>	Magnoliaceae	Southern magnolia	García Morales et al., 2016
	<i>Manfreda variegata</i>	Asparagaceae	Mottled tuberose	García Morales et al., 2016
	<i>Mangifera indica</i>	Anacardiaceae	mango, edible mango, Indian mango	CABI, online
	<i>Manilkara zapota</i>	Sapotaceae	sapodilla, bully tree, chapoti, chicle, chiku, marmalade plum, noseberry, sapodilla plum, sapota	CABI, online
	<i>Melia</i>	Meliaceae		García Morales et al., 2016
	<i>Melia azedarach</i>	Meliaceae	Chinaberry, Barbados lilac, China tree, Chinaberry tree, Persian lilac, pride of India, umbrella tree, white cedar	CABI, online
	<i>Millettia pinnata</i>	Fabaceae	Indian beech, Pongame oil tree	García Morales et al., 2016

Host status	Host name	Plant family	Common name	Reference
	<i>Mimusops elengi</i>	Sapotaceae	Spanish cherry, Asian bulletwood, bukal, Indian medlar	García Morales et al., 2016
	<i>Mirabilis jalapa</i>	Nyctaginaceae	four o'clock flower, beauty of the night, common four-o'clock, false jalap, garden four o'clock	García Morales et al., 2016
	<i>Moringa oleifera</i>	Moringaceae	horse radish tree, behen tree, ben-oil tree, benzolive tree, bridal veil, cabbage tree, clarifier tree, drumstick tree, moringa, neverdie radish tree West Indian ben	García Morales et al., 2016
	<i>Morus</i>	Moraceae	mulberrytree	García Morales et al., 2016
	<i>Morus alba</i>	Moraceae	mora, mulberry, white mulberry, silkworm mulberry	García Morales et al., 2016
	<i>Morus nigra</i>	Moraceae	Black mulberry, black mulberrytree, black Persian, small fruited mulberry	CABI, online
	<i>Musa</i>	Musaceae	banana	CABI, online
	<i>Musa paradisiaca</i>	Musaceae	plantain	García Morales et al., 2016
	<i>Myrtus communis</i>	Myrtaceae	myrtle, common myrtle	García Morales et al., 2016
	<i>Nerium</i>	Apocynaceae	oleander	García Morales et al., 2016
	<i>Nerium oleander</i>	Apocynaceae	common oleander, oleander, rose bay, French willow, rose laurel, south sea rose, sweet oleander	CABI, online
	<i>Ochna integerrima</i>	Ochnaceae	yellow Mai flower	García Morales et al., 2016
	<i>Olea europaea</i>	Oleaceae	common olive, olive	CABI, online
	<i>Opuntia</i>	Cactaceae	prickly pear, pear cactus	García Morales et al., 2016
	<i>Persea americana</i>	Lauraceae	avocado, alligator pear, avocado pear, holly ghost pear	CABI, online
	<i>Phoenix</i>	Arecaceae		García Morales et al., 2016
	<i>Phoenix dactylifera</i>	Arecaceae	common date palm, date palm, the edible date	CABI, online
	<i>Pistacia lentiscus</i>	Anacardiaceae	mastic tree	CABI, online
	<i>Pithecellobium dulce</i>	Fabaceae	Manila tamarind, blackbead, guayamochil, Madras thorn, sweet inga	García Morales et al., 2016
	<i>Plumeria</i>	Apocynaceae	frangipani	CABI, online
	<i>Podocarpus</i>	Podocarpaceae		García Morales et al., 2016
	<i>Podocarpus neriifolius</i>	Podocarpaceae		García Morales et al., 2016
	<i>Populus alba</i>	Salicaceae	silver poplar, silver leaf poplar, white poplar	García Morales et al., 2016
	<i>Populus euphratica</i>	Salicaceae	Euphrates poplar, desert poplar, diversiform-leaved poplar, poplar diversifolia	García Morales et al., 2016
	<i>Poranopsis paniculata</i>	Convolvulaceae		García Morales et al., 2016
	<i>Prunus</i>	Rosaceae	stone fruit	CABI, online
	<i>Prunus armeniaca</i>	Rosaceae	apricot	García Morales et al., 2016
	<i>Prunus persica</i>	Rosaceae	peach, nectarine	CABI, online

Host status	Host name	Plant family	Common name	Reference
	<i>Pseudocodynia sinensis</i>	Rosaceae	Chinese quince	García Morales et al., 2016
	<i>Psidium guajava</i>	Myrtaceae	common guava, guava, yellow guava	CABI, online
	<i>Punica granatum</i>	Punicaceae	pomegranate	CABI, online
	<i>Ravenala madagascariensis</i>	Strelitziaceae		CABI, online
	<i>Ricinus</i>	Euphorbiaceae		CABI, online
	<i>Ricinus communis</i>	Euphorbiaceae	castor-oil plant, castor bean	CABI, online
	<i>Rosa</i>	Rosaceae	Roses	CABI, online
	<i>Roystonea regia</i>	Arecaceae	Cuban royal palm, Florida royal palm, royal palm	García Morales et al., 2016
	<i>Salix</i>	Salicaceae	willows	CABI, online
	<i>Salix tetrasperma</i>	Salicaceae	Indian willow	García Morales et al., 2016
	<i>Santalum album</i>	Santalaceae	Indian sandalwood, sandal, white sandalwood tree	García Morales et al., 2016
	<i>Saraca indica</i>	Fabaceae	Asoka tree, Asoka, red saraca, sorrowless tree	García Morales et al., 2016
	<i>Schleichera oleosa</i>	Sapindaceae	Macassar oil tree, Ceylon oak, honey tree, lac tree	CABI, online
	<i>Senna auriculata</i>	Fabaceae	Matura tea tree, avaram, ranawara	García Morales et al., 2016
	<i>Solanum</i>	Solanaceae	nightshade	CABI, online
	<i>Solanum melongena</i>	Solanaceae	Aubergine, eggplant	García Morales et al., 2016
	<i>Spondias dulcis</i>	Anacardiaceae	otaheite apple, golden apple, great hog plum	CABI, online
	<i>Spondias mombin</i>	Anacardiaceae	golden apple, hog-plum tree, yellow mombin, Java plum, tropical plum	García Morales et al., 2016
	<i>Swietenia mahagoni</i>	Meliaceae	Cuban mahogany, Jamaica mahogany, mahogany, Puerto Rico mahogany, small leaved mahogany, Spanish mahogany, West Indian mahogany	García Morales et al., 2016
	<i>Syzygium aromaticum</i>	Myrtaceae	clove, clove tree	García Morales et al., 2016
	<i>Syzygium cumini</i>	Myrtaceae	black plum, Malabar plum, Java plum, jamun, jambolan, black plum tree, Indian blackberry, Portuguese plum	CABI, online
	<i>Tabernaemontana</i>	Apocynaceae		García Morales et al., 2016
	<i>Tabernaemontana divaricata</i>	Apocynaceae	pinwheel flower, crape jasmine, East India rosebay, Nero's crown	García Morales et al., 2016
	<i>Tamarindus</i>	Fabaceae		García Morales et al., 2016
	<i>Tamarindus indica</i>	Fabaceae	Tamarind, Indian tamarind, kilytree	CABI, online
	<i>Tecoma</i>	Bignoniaceae		García Morales et al., 2016
	<i>Tecoma stans</i>	Bignoniaceae	yellow bells, Yellow trumpetbush, trumpetflower, yellow elder	García Morales et al., 2016
	<i>Terminalia</i>	Combretaceae		García Morales et al., 2016



Host status	Host name	Plant family	Common name	Reference
	<i>Terminalia arjuna</i>	Combretaceae	Arjuna, Malabar almond, tropical almond, white murdah	García Morales et al., 2016
	<i>Terminalia catappa</i>	Combretaceae	Singapore almond, beach almond, country almond, Indian almond, Malabar almond, sea almond, tropical almond	García Morales et al., 2016
	<i>Thunbergia grandiflora</i>	Acanthaceae	Bengal trumpet, Bengal clock vine, Bengal trumpet vine, blue thunbergia, blue trumpet vine, large thunbergia, sky vine, skyflower vine, trumpet vine	García Morales et al., 2016
	<i>Toona ciliata</i>	Meliaceae	toon, Australian red cedar, Indian cedar, Indian mahogany, Moulmein cedar, red cedar	García Morales et al., 2016
	<i>Triadica sebifera</i>	Euphorbiaceae	Chinese tallow, Chinese tallowtree, Florida aspen, chicken tree, grey popcorn tree, candleberry tree	García Morales et al., 2016
	<i>Ulmus</i>	Ulmaceae	Elm	García Morales et al., 2016
	<i>Ulmus integrifolia</i>	Ulmaceae		García Morales et al., 2016
	<i>Vitex negundo</i>	Lamiaceae	Chinese chaste tree, five-leaved chaste tree, horseshoe vitex, nisinda	García Morales et al., 2016
	<i>Vitis</i>	Vitaceae	grape	CABI, online
	<i>Vitis vinifera</i>	Vitaceae	common grapevine, grapevine, European grape, wine grape	CABI, online
	<i>Washingtonia filifera</i>	Arecaceae	desert fan palm, petticoat palm	CABI, online
	<i>Washingtonia robusta</i>	Arecaceae	Mexican Washington palm, Mexican fan palm, priest palm, thread palm	CABI, online
	<i>Wrightia coccinea</i>	Apocynaceae		García Morales et al., 2016
	<i>Zamia</i>	Zamiaceae		García Morales et al., 2016
	<i>Ziziphus</i>	Rhamnaceae		CABI, online
	<i>Ziziphus jujuba</i>	Rhamnaceae	Chinese date, Chinese jujube, common jujube, Indian plum, jujube tree	CABI, online
	<i>Ziziphus mauritiana</i>	Rhamnaceae	Indian jujube, Chinese fig, cottony jujube, desert apple, Indian cherry, Indian date, Indian jujube, Malay jujube	CABI, online
	<i>Ziziphus spina-christi</i>	Rhamnaceae	Christ's thorn jujube	García Morales et al., 2016
Wild weed hosts	<i>Acer oblongum</i>	Sapindaceae	Himalayan maple, evergreen maple, Kashmir maple	García Morales et al., 2016
	<i>Acer pictum var. mono</i>	Sapindaceae	painted maple or mono maple	García Morales et al., 2016
	<i>Ailanthus</i>	Simaroubaceae		García Morales et al., 2016
	<i>Annona emarginata</i>	Annonaceae		García Morales et al., 2016
	<i>Atylosia</i>	Fabaceae		García Morales et al., 2016
	<i>Bauhinia racemosa</i>	Fabaceae	bidi leaf tree	García Morales et al., 2016

Host status	Host name	Plant family	Common name	Reference
	<i>Bauhinia vahlii</i>	Fabaceae	malu creeper	García Morales et al., 2016
	<i>Caesalpinia bonduc</i>	Fabaceae	nicker-nut caesalpinia, yellow nickers	García Morales et al., 2016
	<i>Cajanus trinervius</i>	Fabaceae		García Morales et al., 2016
	<i>Calotropis</i>	Apocynaceae		García Morales et al., 2016
	<i>Calotropis gigantea</i>	Apocynaceae	Yercum fibre, bowstring hemp, crown flower, crown plant, giant Indian milkweed, ivory plant	CABI, online
	<i>Calotropis procera</i>	Apocynaceae	Apple of sodom, giant milkweed, mudar plant, rooster tree, rubber bush	CABI, online
	<i>Chloroxylon swietenia</i>	Rutaceae	Satinwood, Ceylon satinwood, East Indian satinwood	García Morales et al., 2016
	<i>Croton tiglium</i>	Euphorbiaceae	Purging croton	García Morales et al., 2016
	<i>Dalbergia lanceolaria</i>	Fabaceae		García Morales et al., 2016
	<i>Diospyros malabarica</i>	Ebenaceae	Malabar ebony, gaub tree, black and white ebony, pale moon ebony	García Morales et al., 2016
	<i>Diospyros montana</i>	Ebenaceae	Mountain persimmon, mottled ebony, Bombay ebony	García Morales et al., 2016
	<i>Ehretia acuminata</i>	Boraginaceae	kodo tree	García Morales et al., 2016
	<i>Ficus lacor</i>	Moraceae		García Morales et al., 2016
	<i>Ficus minahassae</i>	Moraceae		García Morales et al., 2016
	<i>Ficus opposita</i>	Moraceae	sandpaper fig	García Morales et al., 2016
	<i>Ficus palmata</i>	Moraceae	Punjab fig	García Morales et al., 2016
	<i>Ficus subulata</i>	Moraceae		García Morales et al., 2016
	<i>Justicia adhatoda</i>	Acanthaceae	Malabar nut, Malabar nut tree	García Morales et al., 2016
	<i>Mallotus</i>	Euphorbiaceae		García Morales et al., 2016
	<i>Manilkara kauki</i>	Sapotaceae		García Morales et al., 2016
	<i>Melia volkensii</i>	Meliaceae	Melia	García Morales et al., 2016
	<i>Metroxylon</i>	Arecaceae		CABI, online
	<i>Mitragyna diversifolia</i>	Rubiaceae		García Morales et al., 2016
	<i>Morus macroura</i>	Moraceae	king white mulberry, shahtoot mulberry, Tibetan mulberry, long mulberry	García Morales et al., 2016
	<i>Myrrhinium atropurpureum</i>	Myrtaceae		García Morales et al., 2016
	<i>Nyctaginia</i>	Nyctaginaceae		García Morales et al., 2016
	<i>Osbeckia</i>		Melastomataceae	
	CABI, online			
	<i>Panicum</i>	Poaceae	panicgrass	García Morales et al., 2016
	<i>Periploca aphylla</i>	Apocynaceae		García Morales et al., 2016
	<i>Phyllanthus myrtifolius</i>	Phyllanthaceae	mousetail plant	García Morales et al., 2016
	<i>Pistacia khinjuk</i>	Anacardiaceae		García Morales et al., 2016
	<i>Polyalthia</i>	Annonaceae		García Morales et al., 2016
	<i>Prosopis cineraria</i>	Fabaceae	screw-bean	García Morales et al., 2016
	<i>Protium serratum</i>	Burseraceae		García Morales et al., 2016
	<i>Pterospermum acerifolium</i>	Malvaceae	bayur tree, karnikara tree	García Morales et al., 2016

Host status	Host name	Plant family	Common name	Reference
	<i>Putranjiva roxburghii</i>	Putranjivaceae		García Morales et al., 2016
	<i>Rhamnus persicus</i>	Rhamnaceae		García Morales et al., 2016
	<i>Rhizophora mucronata</i>	Rhizophoraceae	true mangrove, loop-root mangrove, red mangrove, Asiatic mangrove	García Morales et al., 2016
	<i>Sambucus javanica</i>	Adoxaceae	Chinese elder	García Morales et al., 2016
	<i>Sapindus mukorossi</i>	Sapindaceae	Chinese soap berry	García Morales et al., 2016
	<i>Solanum arundo</i>	Solanaceae		CABI, online
	<i>Sterculia</i>	Malvaceae		García Morales et al., 2016
	<i>Sterculia guttata</i>	Malvaceae	spotted sterculia	García Morales et al., 2016
	<i>Tamarix indica</i>	Tamaricaceae		García Morales et al., 2016
	<i>Tephrosia</i>	Fabaceae	hoary-pea	García Morales et al., 2016
	<i>Weinmannia</i>	Cunoniaceae		García Morales et al., 2016

## Appendix B – Distribution of *Aonidiella orientalis*

Distribution records of *Aonidiella orientalis* based on CABI (online) and García Morales et al. (2016)

Region	Country	Sub-national (e.g. State)	Status	Reference
North America	Mexico		Present, no details	CABI, online
	Mexico	Veracruz	Present, no details	García Morales et al., 2016
	United States		Present, no details	CABI, online
	United States	Florida	Present, no details	CABI, online
Central America	Panama		Present, no details	CABI, online
Caribbean	Antigua and Barbuda		Present, no details	CABI, online
	Cuba		Present, no details	CABI, online
	Dominican Republic		Present, no details	CABI, online
	Guadeloupe		Present, no details	CABI, online
	Haiti		Present, no details	CABI, online
	Jamaica		Present, no details	CABI, online
	Martinique		Present, no details	CABI, online
	Netherlands Antilles		Present, no details	CABI, online
	Puerto Rico		Present, no details	CABI, online
	Saint Kitts and Nevis		Present, no details	CABI, online
	Saint Martin		Present, no details	CABI, online
	Trinidad and Tobago		Present, no details	CABI, online
	U.S. Virgin Islands		Present, no details	CABI, online
	Bahamas		Present, no details	CABI, online
	Barbados		Present, no details	CABI, online
	Curaçao		Present, no details	CABI, online
Sint Maarten		Present, no details	CABI, online	
South America	Brazil		Present, no details	CABI, online
	Brazil	Ceara	Present, no details	CABI, online
	Brazil	Rio Grande do Sul	Present, no details	García Morales et al., 2016
	Brazil	Rio de Janeiro	Present, no details	García Morales et al., 2016
	Brazil	Santa Catarina	Present, no details	García Morales et al., 2016
	Colombia		Present, no details	García Morales et al., 2016
	Ecuador		Present, no details	CABI, online
	French Guiana		Present, no details	CABI, online
	Peru		Present, no details	García Morales et al., 2016
	Galapagos Islands		Present, no details	García Morales et al., 2016
Africa	Angola		Present, no details	CABI, online
	Cameroon		Present, no details	CABI, online
	Egypt		Present, no details	CABI, online
	Ethiopia		Present, no details	CABI, online
	Kenya		Present, no details	CABI, online
	Mali		Present, no details	CABI, online
	Niger		Present, no details	CABI, online
	Nigeria		Present, no details	CABI, online

Region	Country	Sub-national (e.g. State)	Status	Reference
	Saint Helena		Present, no details	CABI, online
	Senegal		Present, no details	CABI, online
	Somalia		Present, no details	CABI, online
	South Africa		Present, no details	CABI, online
	Sudan		Present, no details	CABI, online
	Tanzania		Present, no details	CABI, online
	Zambia		Present, no details	CABI, online
	Benin		Present, no details	García Morales et al., 2016
	Comoros		Present, no details	García Morales et al., 2016
	Madagascar		Present, no details	García Morales et al., 2016
Asia	Bangladesh		Present, no details	CABI, online
	China		Present, no details	CABI, online
	China	Guangdong	Present, no details	CABI, online
	Hong Kong		Present, no details	CABI, online
	India		Present, no details	CABI, online
	India	Andaman and Nicobar Islands	Present, no details	CABI, online
	India	Andhra Pradesh	Present, no details	CABI, online
	India	Bihar	Present, no details	CABI, online
	India	Delhi	Present, no details	CABI, online
	India	Gujarat	Present, no details	CABI, online
	India	Himachal Pradesh	Present, no details	CABI, online
	India	Karnataka	Present, no details	CABI, online
	India	Kerala	Present, no details	CABI, online
	India	Madhya Pradesh	Present, no details	CABI, online
	India	Maharashtra	Present, no details	CABI, online
	India	Odisha	Present, no details	CABI, online
	India	Punjab	Present, no details	CABI, online
	India	Tamil Nadu	Present, no details	CABI, online
	India	Uttar Pradesh	Present, no details	CABI, online
	India	West Bengal	Present, no details	CABI, online
	Iran		Present, no details	CABI, online
	Iraq		Present, no details	CABI, online
	Israel		Present, no details	CABI, online
	Malaysia		Present, no details	CABI, online
	Malaysia	Peninsular Malaysia	Present, no details	CABI, online
	Maldives		Present, no details	CABI, online
	Myanmar		Present, no details	CABI, online
	Nepal		Present, no details	CABI, online
	Oman		Present, no details	CABI, online
	Pakistan		Present, no details	CABI, online
	Philippines		Present, no details	CABI, online
	Saudi Arabia		Present, no details	CABI, online
	Sri Lanka		Present, no details	CABI, online
	Thailand		Present, no details	CABI, online
	United Arab Emirates		Present, no details	CABI, online



Region	Country	Sub-national (e.g. State)	Status	Reference
	Lebanon		Present, no details	García Morales et al., 2016
	Vietnam		Present, no details	García Morales et al., 2016
	Ryukyu Islands		Present, no details	García Morales et al., 2016
Oceania	Australia		Present, no details	CABI, online
	Australia	Northern Territory	Present, no details	CABI, online
	Australia	Queensland	Present, no details	CABI, online
	Nauru		Present, no details	CABI, online
	Papua New Guinea		Present, no details	CABI, online
	Federated States of Micronesia	Yap	Present, no details	García Morales et al., 2016
	USA	Hawaii	Present, no details	García Morales et al., 2016

## Appendix C – UK interceptions of *Aonidiella orientalis* 1997–2019

	Pakistan	India	Iran	Dominican Republic	Thailand	Bangladesh	Brazil	Ghana	Israel	Peru	Egypt	Grenada	Jamaica	Kenya	USA	Sum
<i>Mangifera indica</i>	29	4		2			3	2	2	2	1					45
<i>Psidium guajava</i>	8	23														31
<i>Murraya koenigii</i>	7			3				1								11
<i>Annona</i> spp.	1	3			1								1	1		7
<i>Citrus limon</i>			4													4
<i>Citrus x limetta</i>			4													4
<i>Areca catechu</i>						3										3
<i>Carica papaya</i>					3											3
<i>Citrus</i> sp.			3													3
<i>Citrus bergamia</i>			2													2
<i>Fortunella</i> sp.			2													2
<i>Ziziphus jujuba</i>	2															2
<i>Amaranthus</i>	1															1
<i>Citrus hystrix</i>					1											1
<i>Cocos</i> sp.															1	1
<i>Cycas revoluta</i>												1				1
<i>Dimocarpus longan</i>				1												1
<i>Melia azadirachata</i>		1														1
<i>Moringa oleifera</i>		1														1
<i>Syzygium jambos</i>	1															1
<b>Sum</b>	<b>49</b>	<b>32</b>	<b>15</b>	<b>6</b>	<b>5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>125</b>

## Appendix D – Import data

**Table D.1: Fresh or dried citrus (CN code: 0805) imported in 100 kg into the EU (27) from regions where *Aonidiella orientalis* is known to occur (Source: Eurostat accessed on 18/05/2022)**

COUNTRY	2017	2018	2019	2020	2021
Antigua and Barbuda			19,83		
Angola		42,53			
Australia	1,284,38	644,97	10,645,40	2,343,47	4,097,42
Brazil	903,432,95	900,907,24	822,134,46	902,590,26	1,058,982,68
Bangladesh	229,58	159,67	322,42	1,183,66	289,22
Cameroon	0,20				
China	1,084,857,27	1,024,163,15	1,108,595,22	1,098,689,98	647,904,52
Colombia	79,400,99	123,887,46	136,914,85	172,197,70	194,963,20
Cuba	3,863,97	4,438,14	3,422,11	556,03	18,70
Dominican Republic	9,336,81	10,426,97	7,355,36	12,886,58	12,780,40
Ecuador	2,127,19	729,99	1,114,58	127,28	2,312,97
Egypt	2,246,998,88	2,643,272,02	2,206,932,71	2,850,745,77	3,398,717,27
Haiti	176,53	72,10	31,00	248,29	337,30
Hong Kong			2,27	1,00	0,02
India	1,00	449,63	88,51	254,95	22,37
Iraq	3,60	11,20	0,30	20,00	17,90
Iran	1,218,52	1,208,01	2,174,22	1882,74	1910,39
Israel	969,403,62	824,601,66	812,738,57	878,713,18	780,535,11
Jamaica	3,325,11	675,68	2,409,55	1,646,87	2,441,76
Kenya		8,80		34,56	0,02
Lebanon	1,504,91	7,46	7,28	3,19	53,93
Madagascar	26,42	11,62	7,16	22,16	1,91
Malaysia	39,02	83,45	7,71		
Mali					0,12
Mexico	553,818,66	589,021,12	443,743,54	349,648,63	184,527,85
Nigeria		0,03	0,10	200,00	
Nepal	1,170,00				0,56
Oman					16,23
Pakistan		2,45	0,59		272,00
Panama				650,40	
Peru	307,974,23	319,766,61	369,251,64	418,362,28	545,984,71
Philippines		0,20	7,71	0,10	
Senegal	0,20				
Somalia	193,21	367,52	514,30	342,10	556,99
Thailand	1,283,13	659,74	624,93	194,87	245,31
South Africa	5,802,017,61	6,381,124,73	6,196,837,96	7,830,147,60	7,943,673,22
United States	231,210,47	185,706,99	177,755,45	148,608,92	113,949,21
Tanzania	190,01	144,12	35,95	75,50	132,27

**Table D.2: Cotton linters (CN code: 140420)** imported in 100 kg into the EU (27) from regions where *Aonidiella orientalis* is known to occur (Source: Eurostat accessed on 18/05/2022)

COUNTRY	2017	2018	2019	2020	2021
Brazil	57,840,63	68,605,72	50,783,56	57,176,03	73,808,57
China	10,00	44,83	102,75	188,29	10,01
Egypt	1,47				
India	589,38	487,65	735,71	2,148,17	356,47
Iran				3,93	
Israel	2,15				
Pakistan					0,53
United States	32,472,85	16,629,25	7,933,06	19,294,08	54,223,09

**Table D.3: Fresh or dried avocados (CN code: 080440)** imported in 100 kg into the EU (27) from regions where *Aonidiella orientalis* is known to occur (Source: Eurostat accessed on 18/05/2022)

COUNTRY	2017	2018	2019	2020	2021
Angola		3,85		3,54	
Australia			0,01		0,31
Brazil	71,040,50	68,697,61	78,673,73	48,183,83	50,802,49
Cameroon	173,54	221,30	259,38	205,93	358,11
China	35,28		1,23	0,04	0,12
Colombia	210,139,60	251,050,33	387,367,23	663,148,97	852,201,90
Cuba	73,94	41,53	131,08	34,33	56,00
Dominican Republic	55,001,50	52,897,18	95,531,91	100,024,05	103,899,16
Ecuador	1,052,41	1,264,87	2,314,26	1763,14	3,368,06
Egypt	5,35	4,58	79,92	363,95	38,44
India	2,06	0,52	0,06		2,35
Iran	0,00				0,03
Israel	424,267,97	370,378,23	437,318,01	345,664,24	451,761,56
Jamaica					
Kenya	243,947,31	404,593,87	346,231,90	435,308,72	487,487,15
Lebanon	57,84	3,84	3,66	25,75	15,75
Madagascar				0,96	1,11
Malaysia		47,04			0,04
Mali					0,40
Mexico	445,611,06	463,741,28	767,878,48	716,092,02	750,931,46
Nigeria	3,15	3,18	0,51		
Panama			474,24		0,53
Peru	1,353,466,49	2,009,222,64	1,584,511,63	2,132,092,95	2,661,522,85
Thailand	9,76	9,66	9,06	3,39	25,85
South Africa	315,854,56	652,817,98	401,352,79	416,290,22	417,245,48
United States	1,19	2,546,86	0,02	4,66	45,38
Tanzania	25,773,58	55,517,16	60,480,96	50,769,74	56,339,46

**Table D.4: Fresh or dried bananas (CN code: 0803)** imported in 100 kg into the EU (27) from regions where *Aonidiella orientalis* is known to occur (Source: Eurostat accessed on 18/05/2022)

COUNTRY	2017	2018	2019	2020	2021
Angola	4,583,83	37,169,75	48,878,08	71,728,57	94,658,63
Brazil	26,855,08	59,677,31	104,909,74	98,434,39	83,214,81
Bangladesh	79,85	72,75	38,05	35,64	108,33
Cameroon	2,341,539,74	1,791,447,01	1,520,648,04	1,579,456,86	1,667,577,31
China	188,73	390,56	545,74	854,93	1,158,14
Colombia	11,594,479,46	11,286,833,38	11,524,355,73	12,214,420,90	12,396,794,55
Cuba				1,28	
Dominican Republic	1,453,568,63	1,617,838,21	2,309,348,78	2,296,268,32	2,638,121,93
Ecuador	13,752,240,39	15,304,049,42	14,022,207,03	15,543,743,38	16,389,114,07
Egypt	0,18	146,87			
Haiti	1,00	0,70			
Hong Kong					8,00
India	445,99	571,13	607,74	1,418,91	1,491,81
Iran		0,09	2,86	12,33	21,43
Israel				0,75	1,70
Jamaica		0,13			0,12
Kenya	0,72	6,15	11,23	14,95	36,81
Lebanon			0,05		0,18
Madagascar	521,68	1,14	586,00	469,39	5,91
Malaysia		8,02			0,64
Mexico	558,896,47	348,905,62	239,173,11	141,492,44	41,342,55
Nigeria	2,04	2,50	0,84	6,35	9,46
Pakistan		2,60	49,70		
Panama	2,141,417,29	2,333,948,39	2,546,130,91	2,611,200,69	2,150,956,65
Peru	1,155,371,63	1,259,803,18	1,084,569,14	1,011,854,40	988,063,76
Philippines	11,415,47	1,674,92	2,160,35	1,240,80	1,665,89
Thailand	674,34	603,32	526,15	334,58	743,01
South Africa	46,24	36,96	353,09	128,54	0,34
United States	6,37	1,54	6,32	10,37	1904,98
Tanzania	11,93	33,68	34,24	34,74	63,45

**Table D.5: Fresh grapes (CN code: 080610)** imported in 100 kg into the EU (27) from regions where *Aonidiella orientalis* is known to occur (Source: Eurostat accessed on 18/05/2022)

COUNTRY	2017	2018	2019	2020	2021
Angola		0,18	0,80		13,96
Australia	0,50				
Brazil	249,279,81	271,987,56	196,465,22	228,091,31	359,383,48
Bangladesh		0,50			0,32
China	6,00	0,03			6,68
Colombia		381,30	669,12	186,96	
Ecuador		345,80	1807,16	2,266,12	2,907,14
Egypt	404,801,23	429,994,87	442,798,85	462,889,85	489,796,35
India	827,467,67	722,802,04	950,910,96	733,563,65	835,020,62
Iran		2,158,50	366,00	399,80	305,77
Israel	7,165,09	6,397,33	318,24	1,080,90	
Kenya		186,96			



COUNTRY	2017	2018	2019	2020	2021
Lebanon	434,28	1,329,80	1,389,21	1,426,63	6,001,45
Mexico	358,96		186,71	184,62	
Peru	438,731,10	747,335,51	759,554,28	782,844,53	1,077,619,45
Thailand	0,14	0,16		0,87	0,43
South Africa	1,392,515,89	1,420,569,43	1,397,681,57	1,397,842,25	1,675,463,38
United States	8,868,74	4,413,37	1866,20	1,072,48	4,59

**Table D.6: Apricots, cherries, peaches including nectarines, plums and sloes fresh (CN code: 0809) imported in 100 kg into the EU (27) from regions where *Aonidiella orientalis* is known to occur (Source: Eurostat accessed on 18/05/2022)**

COUNTRY	2017	2018	2019	2020	2021
Australia	378,21	487,00	372,26	631,59	181,66
Brazil	183,53	356,14	22,65	40,40	28,84
Bangladesh	1,65			5,62	5,96
Cameroon		13,75	0,30	18,16	104,32
China		0,90	3,24		0,14
Colombia	230,90	211,68		24,00	0,02
Egypt	2,450,75	909,77	1,457,95	906,27	219,27
Hong Kong	0,01				
India		0,45		0,00	3,76
Iran	3,19	42,15	29,18	589,22	381,90
Israel	419,54	91,11	46,42	3,80	
Lebanon	44,73	86,54	12,08	4,00	0,36
Malaysia				1,78	
Mexico		212,00			
Nigeria				0,65	0,32
Pakistan	0,50	1,20	1,36	4,40	16,77
Panama			118,92		
Peru	277,70	145,20	1,509,36	97,75	
Thailand	7,34	0,85	0,28	32,98	3,99
South Africa	321,979,30	297,609,30	242,780,96	271,615,89	441,786,48
United States	4,303,88	1741,06	923,44	216,12	243,65

**Table D.7: Fresh or dried guavas, mangoes and mangosteens (CN code: 080450) imported in 100 kg into the EU (27) from regions where *Aonidiella orientalis* is known to occur (Source: Eurostat accessed on 18/05/2022)**

COUNTRY	2017	2018	2019	2020	2021
Antigua and Barbuda		193,61			
Angola		486,65	658,15	351,50	522,66
Australia	94,18	62,92			0,01
Brazil	1,158,717,06	1,241,860,63	1,437,569,20	1,577,043,99	1,796,727,47
Bangladesh	256,66	331,27	310,73	323,91	1,538,10
Cameroon	4,884,80	2,502,54	1800,84	489,96	991,86
China	51,87	180,81	78,23	104,34	248,77
Colombia	2,553,75	3,139,67	6,833,02	4,131,75	5,012,70
Cuba	216,57	14,36	103,34	230,60	135,11
Dominican Republic	85,119,28	105,553,46	118,508,00	110,481,33	160,995,11
Ecuador	13,840,91	9,491,23	9,608,87	10,660,02	7,684,59

COUNTRY	2017	2018	2019	2020	2021
Egypt	9,186,69	4,855,57	6,407,46	12,233,16	6,222,90
Haiti		4,87			
Hong Kong				6,56	8,01
India	8,148,87	9,470,36	9,315,51	7,347,61	16,575,20
Iran	12,12	3,00	9,10	1,56	19,45
Israel	140,551,30	108,353,48	121,875,16	98,143,59	124,186,39
Kenya	4,08	65,09	10,30	66,53	1,497,12
Lebanon	0,62	5,29	0,42	20,13	3,96
Madagascar	22,10	15,02	0,66	1,05	20,64
Malaysia	197,22	170,64	72,72	44,56	19,01
Mali	53,045,00	68,743,59	91,829,06	85,458,70	58,096,70
Mexico	40,848,36	46,001,68	50,935,79	51,841,89	46,655,48
Nigeria	0,10	1,13	1,95	0,03	28,59
Oman			223,93		
Pakistan	15,912,58	21,867,43	29,207,33	16,196,50	19,732,88
Panama	0,18	0,70			
Peru	850,046,15	1,146,171,88	1,012,834,88	1,187,835,17	1,207,152,78
Philippines	519,88	795,56	368,97	128,10	152,74
Senegal	114,177,24	147,536,88	125,252,79	88,969,02	172,832,95
Thailand	7,401,80	6,911,89	6,743,92	5,260,84	4,918,99
South Africa	13,015,45	9,739,99	12,116,95	8,656,28	5,777,97
United States	45,478,21	54,660,34	82,580,54	82,852,21	51,110,99
Tanzania		0,50	1,14		0,09

**Table D.8: Coconuts, Brazil nuts and cashew nuts, fresh or dried, whether or not shelled or peeled (CN code: 0801) imported in 100 kg into the EU (27) from regions where *Aonidiella orientalis* is known to occur (Source: Eurostat accessed on 18/05/2022)**

COUNTRY	2017	2018	2019	2020	2021
Australia	161,34	3,97	3,09	0,02	0,08
Brazil	28,181,64	51,378,25	59,924,59	75,715,61	45,560,33
Bangladesh					4,43
Cameroon	82,93	17,74	9,36	35,57	89,41
China	1,078,20	995,67	1,091,95	3,073,07	2,640,21
Colombia	4,91	480,00	0,62		5,17
Cuba				117,00	
Dominican Republic	1731,11	2,313,84	594,68	467,96	724,24
Ecuador	40,88		339,36	276,96	18,74
Egypt	3,23	2,77	14,96	0,84	261,19
Hong Kong		250,00		0,24	0,45
India	243,346,77	192,497,06	205,693,06	172,138,65	126,809,32
Iraq	0,02		10,11	23,16	8,21
Iran	1,86	2,53	8,34	11,03	70,29
Israel	12,32	4,95	2,36	11,16	5,27
Jamaica			0,26		0,07
Kenya	696,35	57,73	244,49	1,191,89	1734,17
Lebanon	17,33	25,79	272,60	38,16	26,00
Madagascar	624,94	783,06	426,35	524,37	991,83
Malaysia	8,394,49	4,041,78	2,329,06	4,411,77	8,128,87
Mali	232,21	97,80	1,00	132,01	15,12

COUNTRY	2017	2018	2019	2020	2021
Mexico	0,48	0,05	0,25	0,10	82,30
Nigeria	907,20	1,694,57	3,833,89	5,440,62	9,872,38
Oman		0,02		0,01	0,01
Pakistan	11,50	22,53	24,60	25,70	27,22
Panama	163,63				0,92
Peru	1,171,63	1,157,57	2,318,31	3,669,35	5,974,30
Philippines	419,893,07	419,609,28	398,109,92	395,721,76	394,019,05
Senegal	66,94	365,97	389,60	233,72	367,77
Somalia		0,10			
Thailand	78,956,34	68,012,09	59,013,35	35,161,23	32,071,59
South Africa	103,64	0,50	0,79	205,46	156,02
United States	1994,95	1,377,75	511,55	845,48	1,457,44
Tanzania	2,570,78	1,197,66	1931,29	1800,05	3,715,03

**Table D.9: Fresh or dried figs. (CN code: 080420)** imported in 100 kg into the EU (27) from regions where *Aonidiella orientalis* is known to occur (Source: Eurostat accessed on 18/05/2022)

COUNTRY	2017	2018	2019	2020	2021
Brazil	10,560,50	10,755,17	10,622,06	9,115,87	11,476,36
China	176,10	340,30	192,97	55,21	141,58
Colombia	148,96	80,89	52,88	33,81	56,77
Ecuador		0,40		17,00	12,00
Egypt	10,53	13,41	52,73	60,26	140,52
India	59,96	15,49	20,64	8,03	1,63
Iraq				2,97	6,74
Iran	340,30	780,01	540,56	1,055,88	718,26
Israel	1,300,51	1,407,53	859,70	604,67	300,40
Kenya	0,10			0,75	0,80
Lebanon	18,68	29,51	46,83	7,16	31,60
Mexico	189,76	153,89	118,92	94,08	87,54
Pakistan				5,66	0,19
Peru	1,093,92	3,172,26	3,620,43	6,429,87	7,051,84
Thailand	180,01	305,00	70,40	140,45	70,59
South Africa	899,20	624,33	464,30	474,60	750,49
United States	27,16	8,94	10,60	302,14	14,90

**Table D.10: Fresh pawpaws 'papayas' (CN code: 08072000)** imported in 100 kg into the EU (27) from regions where *Aonidiella orientalis* is known to occur (Source: Eurostat accessed on 18/05/2022)

COUNTRY	2017	2018	2019	2020	2021
Angola		302,53	777,89	2,795,00	3,565,82
Brazil	320,873,67	326,553,52	338,527,11	327,546,53	355,376,62
Bangladesh	147,75	138,57	62,33	21,95	242,21
Cameroon	240,93	149,05	110,38	88,78	146,28
China			3,00		
Colombia	375,78	25,65	0,17	171,99	33,98
Dominican Republic	823,49	473,19	469,03	836,85	268,90
Ecuador	13,580,76	632,13	342,53		

COUNTRY	2017	2018	2019	2020	2021
Egypt		48,00			
India	336,28	378,24	564,48	130,39	312,47
Israel	661,56	714,92	276,69	224,50	
Jamaica	31,12	20,83			
Kenya			1,50	48,35	2,13
Madagascar		8,82	10,64		1,50
Malaysia	114,20	12,85	38,99	0,27	6,93
Mexico	2,793,18	2,613,06	2,918,40	2,191,29	3,712,35
Pakistan	5,60	19,01	5,37		
Panama		0,60	1,00		924,90
Peru		4,27	2,76	0,64	106,79
Philippines	3,96	1,21	1,26		
Senegal	0,94				
Thailand	7,334,28	7,831,20	7,562,99	4,561,88	5,280,51
South Africa	123,55	377,24	478,96	14,08	4,00
United States	84,83	118,34	19,80	42,16	106,92
Tanzania	0,78	0,56			47,84

**Table D.11: Fresh cut roses and buds, of a kind suitable for bouquets or for ornamental purposes (CN code: 06031100) imported in 100 kg into the EU (27) from regions where *Aonidiella orientalis* is known to occur (Source: Eurostat accessed on 18/05/2022)**

COUNTRY	2017	2018	2019	2020	2021
Angola		0,31			
Australia	1,22	0,39	0,30	0,46	0,23
Brazil	30,34	18,04	14,78		
China	1,14	0,24	1,03	9,67	2,50
Colombia	37,438,29	43,427,48	42,661,66	41,575,76	50,127,10
Dominican Republic			1,63		
Ecuador	174,299,32	196,551,29	199,075,69	173,141,72	223,225,74
Egypt		0,05		4,18	
India	609,78	780,52	359,09	314,69	114,74
Iran	5,03	10,00	1,26	7,34	1,42
Israel	9,91	7,96	2,21	0,04	21,99
Kenya	1,192,113,19	1,127,273,08	1,197,531,96	1,031,716,73	1,075,643,65
Lebanon		0,45	0,40		4,90
Mexico					5,16
Nigeria		6,11	0,50	1,77	
Pakistan					0,19
Panama					5,33
Thailand	6,10	18,33	0,03	0,02	
South Africa	12,90	306,07	530,01	582,44	527,72
United States	2,02	0,30	3,31	3,91	4,34
Tanzania	30,331,78	23,222,62	20,556,23	7,701,49	