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# Pest categorisation of *Pulvinaria psidii*

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## Abstract

The EFSA Panel on Plant Health performed a pest categorisation of *Pulvinaria psidii* (Hemiptera: Coccidae), the green shield scale, for the EU. *P. psidii* was originally described from Hawaii on *Psidium* sp. and it is now established in many countries in tropical and subtropical regions of the world. Within the EU, the pest has been reported from mainland Spain and the Canary Islands. *P. psidii* is not listed in Annex II of Commission Implementing Regulation (EU) 2019/2072. It is highly polyphagous, feeding on 230 plant species belonging to more than 70 botanical families with preference for avocado (*Persea americana*), citrus (*Citrus* spp.), coffee (*Coffea* sp.), guava (*Psidium guajava*), litchi (*Litchi chinensis*), mango (*Mangifera indica*), mulberry (*Morus* sp.) and pomegranate (*Punica granatum*). It has also been recorded feeding on some solanaceous plants: tomato (*Solanum lycopersicum*) and pepper (*Capsicum annuum*), as well as on ornamental plants. Climatic conditions and availability of host plants in southern EU countries would most probably allow this species to successfully establish and spread. Economic impact in cultivated hosts including citrus, mangoes, mulberries, as well as vegetable and ornamental crops is anticipated if establishment occurs. Indeed, *P. psidii* has already been reported causing damage to *Melia azedarach*, a widely used ornamental tree that lines streets in Valencia. There is contradictory information regarding impact in mangoes in Spain. This could be due to the relatively recent establishment of the pest. Phytosanitary measures are available to reduce the likelihood of entry and further spread. *P. psidii* meets the criteria that are within the remit of EFSA to assess for this species to be regarded as a potential Union quarantine pest.

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**Keywords:** green shield scale, Hemiptera, Coccidae, pest risk, plant health, plant pest, quarantine

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Figure 1: Courtesy of Chris Malumphy

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## Table of contents

# 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 1E (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

*Pulvinaria psidii* is one of a number of pests listed in Annex 1C to the Terms of Reference (ToRs) to be subject to pest categorisation to determine whether it fulfils the criteria of a potential Union quarantine pest (QP) 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 QP, risk reduction options will be identified.

### 1.3. Additional information

This pest categorisation was initiated following the commodity risk assessment of jasmine (*Jasminum polyanthum*) unrooted cuttings from Israel performed by EFSA PLH Panel (2020), in which *P. psidii* was identified as a relevant non-regulated EU pest which could potentially enter the EU on *J. polyanthum*.

## 2. Data and methodologies

### 2.1. Data

#### 2.1.1. Information on pest status from NPPOs

In the context of the current mandate, EFSA is preparing pest categorisations for new/emerging pests that are not yet regulated in the EU. When official pest status is not available in the European and Mediterranean Plant Protection Organization (EPPO) Global Database (EPPO, online), EFSA consults the NPPOs of the relevant MSs. To obtain information on the official pest status for *P. psidii*, EFSA has consulted the NPPO of Spain. The results of this consultation are presented in Section 3.2.2.

#### 2.1.2. Literature search

A literature search on *P. psidii* 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.

#### 2.1.3. Database search

Pest information, on host(s) and distribution, was retrieved from the EPPO Global Database, 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 *Pulvinaria psidii* which could be used as reference material for molecular diagnosis. GenBank® (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 *Pulvinaria psidii*, 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 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. While 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 QP 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)

| Criterion of pest categorisation | Criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest (article 3) |
|---|---|
| **Identity of the pest (Section 3.1)** | Is the identity of the pest clearly defined, or has it been shown to produce consistent symptoms and to be transmissible? |
| **Absence/presence of the pest in the EU territory (Section 3.2)** | 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. |
| **Pest potential for entry, establishment and spread in the EU territory (Section 3.4)** | 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. |
| **Potential for consequences in the EU territory (Section 3.5)** | Would the pests' introduction have an economic or environmental impact on the EU territory? |
| **Available measures (Section 3.6)** | Are there measures available to prevent pest entry, establishment, spread or impacts? |
| **Conclusion of pest categorisation (Section 4)** | 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 species is established and *Pulvinaria psidii* (Maskell, 1893) is the accepted scientific name.

*Pulvinaria psidii* (Maskell, 1893) (Figure 1) is a scale insect within the order Hemiptera and the family Coccidae. It is commonly known as green shield scale, guava mealy scale and guava soft scale. It was originally described as *Pulvinaria psidii* by Maskell (1893) from specimens collected in Hawaii (USA), on *Psidium* sp. (Germain et al., 2008). Synonyms include *Chloropulvinaria psidii*, *Pulvinaria cupaniae, P. darwiniensis*, *P. cussoniae*, *P. gymnosporiae* and *P. psidii philippina* (García Morales et al., 2016).

The EPPO code[1] (Griessinger and Roy, 2015; EPPO, 2019) for this species is: PULVPS (EPPO, online).

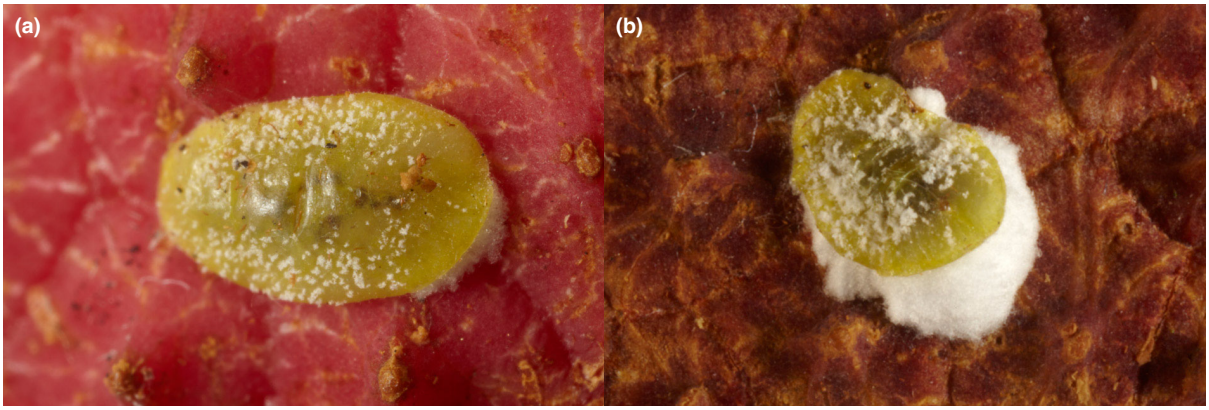


**Figure 1:** *Pulvinaria psidii*: (a), teneral adult female (body length 4 mm); (b), mature adult (body length 4.5 mm) female with ovisac (Source: Chris Malumphy)

### 3.1.2. Biology of the pest

*P. psidii* is parthenogenetic and males are unknown (Mau and Kessing, 1992). Hamon and Williams (1984) reported that it takes 2–3 months to complete one life cycle; in Egypt and Taiwan, it has two or three overlapping generations each year (Salama and Saleh, 1970; Bakr et al., 2012, García Morales et al., 2016). Observations in an Egyptian guava orchard suggest that the optimal temperature for development of *P. psidii* is 26.0–27.3°C, and relative humidity about 72% (Salama and Saleh, 1970; Biosecurity Australia, 2004). On guava, each female lays an average of about 200 eggs (El-Minshawy and Moursi, 1976; Mohamed et al., 2012), which are protected beneath the body of the female and a waxy ovisac that projects out posteriorly from beneath the female (El-Minshawy and Moursi, 1976, Mohamed et al., 2012). It has three nymphal instars. Table 2 summarises key features of the biology of each life stage.

**Table 2:** Important features of the life history strategy of *Pulvinaria psidii*

| Life stage | Phenology and relation to host | Other relevant information |
|---|---|---|
| Egg | Eggs are deposited in an ovisac on twigs or leaves (Mau and Kessing, 1992). In Egypt, ovisacs appear throughout the year although their numbers are very low from January to April. Peak numbers of ovisacs occur in mid-June and mid-September. There can be a later, smaller peak in November or December (Bakr et al., 2012). | The formation of the ovisac and egg deposition takes 5 days (Hamon and Williams, 1984). |
| Nymph | First instar nymphs are known as crawlers. They move to find a suitable place to settle and feed (El-Minshawy and Moursi, 1976). On guava trees in Egypt, the numbers of nymphs peak in mid-May and mid-August (Elwan et al., 2011); further peaks are possible in September or October (Bakr et al., 2012). | The nymphal stage lasts from 50 to 70 days (Mau and Kessing, 1992). |

[1] 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).

| Life stage | Phenology and relation to host | Other relevant information |
|---|---|---|
| Adult | In Egypt, the first generation occurs on guava from early March to early/mid-August; the second from early May to mid-November with a peak in mid-August. There are three overlapping generations on mango trees and ornamental plants (spring, summer, autumn) (Elwan et al., 2011; Bakr et al., 2012) | The duration of the 1st generation is 5–5.5 months (mean Temp: 20.7–21.3°C, RH: 70.7–71.9%). The 2nd generation lasts 6–6.5 months (mean Temp: 24.2–25°C, RH: 69.4–70.4%) (Elwan et al., 2011).<br>Laboratory experiments revealed that among three constant temperatures tested (18, 24 and 30°C), highest fecundity on guava and mango trees occurred at 30°C and adult life span was 33.4 and 37.1 days respectively (Moustafa and Abd-Rabou, 2010) |

### 3.1.3. Host range/species affected

*P. psidii* is a polyphagous insect which can feed on more than 230 plant species belonging to more than 70 botanical families (Appendix A provides a full host list) with preference for avocado (*Persea americana*), citrus (*Citrus* sp.), coffee (*Coffea* sp.), guava (*Psidium guajava*), litchi (*Litchi chinensis*), mango (*Mangifera indica*), mulberry (*Morus* sp.) and pomegranate (*Punica granatum*) (García Morales et al., 2016). *P. psidii* has also been recorded feeding on Solanaceae such as tomato (*Solanum lycopersicum*) and pepper (*Capsicum annuum*), and ornamental plants such as *Anthurium* sp., *Camellia* sp., *Ficus* sp., *Gardenia* sp., *Jasminum* sp. and *Nerium oleander* (García Morales et al., 2016).

### 3.1.4. Intraspecific diversity

No intraspecific diversity has been reported for *P. psidii*.

### 3.1.5. Detection and identification of the pest

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

**Yes**, visual detection is possible, and morphological and molecular identification methods are available.

**Detection**

Careful visual examination of plants and fruits is an effective way for the detection of *P. psidii*. Accumulation of honeydew, sooty mould and honeydew-seeking ants are general signs of phloem feeding insect infestations; they can be used to pinpoint the areas where plants may be inspected for the presence of soft scales (Camacho and Chong, 2015). *P. psidii* occurs on leaves and small young stems (Hamon and Williams, 1984) but quickly colonises flower panicles, and then fruits when they appear on the tree (Biosecurity New Zealand, 2008). *P. psidii* scales produce a mass of eggs in a cottony ovisac which is relatively easy to detect (EFSA PLH Panel, 2020). Double-sided sticky tape around stems can also be used to monitor the crawlers (Bethke and Wilen, 2010).

**Symptoms**

According to Swirski et al. (1997), Bakr et al. (2009), Koul and Taak (2017), EFSA PLH Panel (2021) the main symptoms of *P. psidii* infestation are:

- large quantities of honeydew egested by the scales;
- black sooty mould growing on the honeydew;
- fruit discoloration;
- plants covered with flocculent white egg sacs attached to the body of the female;
- leaf curling;
- heavy infestation causes yellowing, defoliation, reduction in fruit set and loss in plant vigour.

With the exception of the white ovisacs, these symptoms are similar to those caused by many other phloem-feeding insects and should not be considered as diagnostic.

### Identification

The identification of *P. psidii* requires microscopic examination of slide-mounted adults and verification of the presence of key morphological characteristics. Detailed morphological descriptions, illustrations, and keys of adult *P. psidii* and other species of the family Coccidae can be found in Qin (1989), Qin and Gullan (1992) and Tanaka and Kamitani (2020).

Molecular techniques based on the nucleotide sequences of the mitochondrial cytochrome c oxidase subunit I (COI) gene (barcoding region) and 28S rDNA have been developed for species identification (Wang et al., 2015). GenBank contains gene nucleotide sequences for *P. psidii*.

### Description

Qin and Gullan (1992) describe all the developmental stages of *P. psidii*. The egg of *P. psidii* is pale green, oval and measures 0.22 × 0.17 mm. Eggs are embedded in the cottony matter of the ovisac. The ovisac is white, and projects posteriorly at first but eventually more or less surrounds the insect and measures 4–7 mm long (El-Minshawy and Moursi, 1976). First instar nymphs (crawlers) are covered with a few spiral wax filaments (Beshr et al., 2009).

Second instar nymphs are elongate about 0.83 mm wide and characterised by having an eight-segmented antenna which is about 0.16 mm in length (El-Minshawy and Moursi, 1976). Older instars are flat and green (Nafus, 1996).

The body of the adult female is oval, relatively convex in cross-section, up to 4.5 mm long. The body of young females is green, becoming darker as they mature, and completely brown after oviposition, with fluffy white wax covering the dorsum at the time of oviposition. The ovisac produced beneath and behind the female, it is slightly convex (Miller et al., 2014). Further detailed description is available in Henderson and Crosby (2011).

## 3.2. Pest distribution

### 3.2.1. Pest distribution outside the EU

*P. psidii* occurs in southeast Asia, North, Central and South America, including the Antilles, Africa and Oceania (Clausen, 1978; Williams & Williams, 1988; García Morales et al., 2016; CABI, online) (Figure 2). For a detailed list of countries where *P. psidii* is present, see Appendix B.

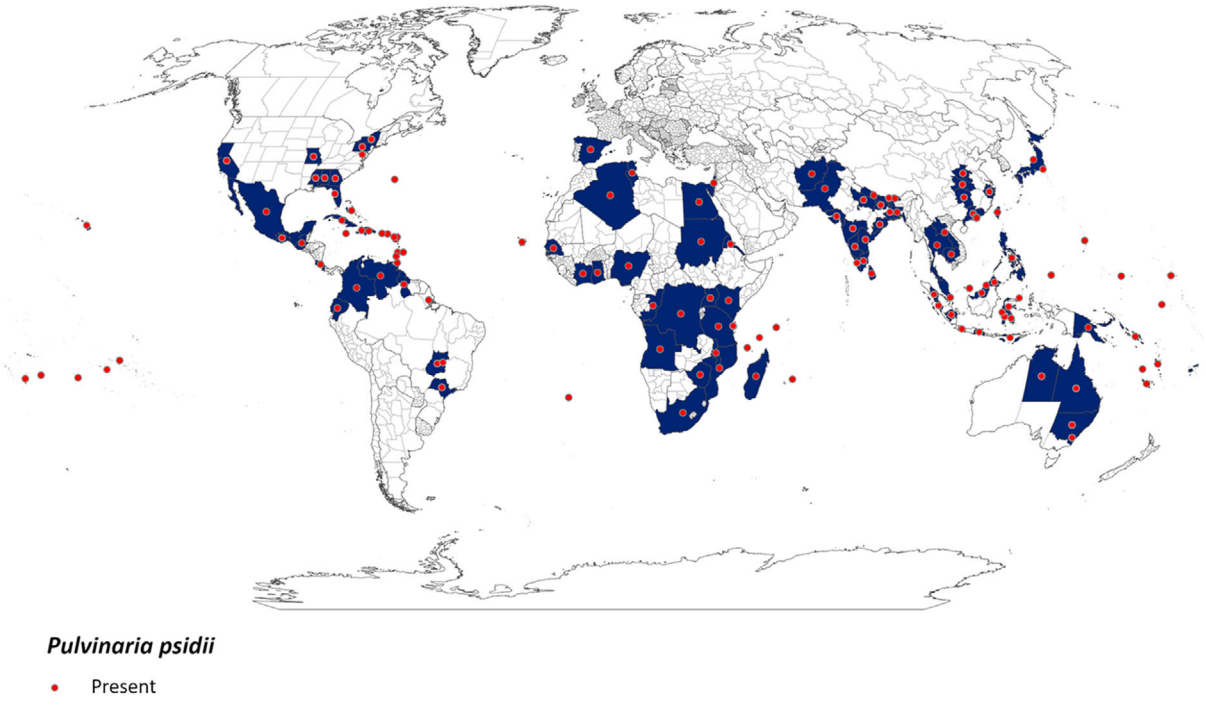


**Figure 2:** Global distribution of *Pulvinaria psidii* (data source: García Morales et al., 2016; CABI, online)

Records from Missouri and north-east USA may be from findings in greenhouses or other protected environments.

García Morales et al. (2016) report *P. psidii* as present in the UK based on a finding in a greenhouse in the 1920s (Green, 1928). However, it has not been found again and is considered not to be present in the UK.

### 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*.

**Yes**. *P. psidii* has been recorded in Spain in the city of Valencia and in Andalusia.

In Spain, the pest has been detected in the Canary Islands (Gómez-Menor Guerrero, 1967; Jaques and Urbaneja, 2006), which are not part of the pest risk assessment area, and in mainland Spain (Boyero et al., 2017; Rodrigo et al., 2020; Del Pino et al., 2021a,b). The Spanish NPPO confirmed its presence in Spain (Table 3) on ornamental plants in the city of Valencia and in Andalusia, where it was also found on mangoes. No formal action has been taken.

**Table 3:** Status of *Pulvinaria psidii* in Spain according to the information received from the NPPO

| **Autonomous community** | **Information from NPPO regarding *P. psidii*** |
|---|---|
| Canary Islands | Detected on the island of Tenerife. The last record of this species is from 1986 and since that date there is no knowledge of it. We cannot consider that it is established. No phytosanitary measures are applied. |
| Valencia | Detected in the city of Valencia in municipally owned gardens. No measures are applied. |
| Andalusia | This harmful organism was notified on 19/2/2018 being detected in the mango crop. In this Service there is no evidence that it is giving problems in the cultivation of mango. No formal action has been taken. |

CABI distribution maps indicate the presence of *P. psidii* in Germany (likely an invalid record, perhaps based on an interception). It has also been intercepted in USA ports between 1995 and 2012 in commodities from France and the Netherlands (Miller et al., 2014). However, there are no records of *P. psidii* being found in France or the Netherlands. Such US interceptions likely result from plant products being imported to France and the Netherlands from areas where the pest occurs and re-exported to the USA. Recent comprehensive checklists (Foldi and Germain, 2018) of Coccoidea of France do not mention *P. psidii*. Jansen (2000) reports *P. psidii* has only been found in the Netherlands during import inspections.

## 3.3. Regulatory status

### 3.3.1. Commission implementing regulation 2019/2072

*P. psidii* is not listed in Annex II of Commission Implementing Regulation (EU) 2019/2072, an implementing act of Regulation (EU) 2016/2031. However, the species is included in the list of pests that are regulated by the Commission Implementing Regulation (EU) 2021/419 as regards certain plants for planting of *Jasminum polyanthum* Franchet originating in Israel and Commission Implementing Regulation (EU) 2021/1936 as regards certain plants for planting of *Ficus carica* L. and *Persea americana* Mill. originating in Israel.

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

According to the Commission Implementing Regulation (EU) 2019/2072, Annex VI, introduction of several *P. psidii* hosts in the Union from certain third countries is prohibited (Table 4).

Plants for planting of *Annona* L., *Diospyros* L., *Ficus* L., *Jasminum* L., *Nerium* L., *Persea* Mill., *Prunus* L., and *Salix* L., which are hosts of *P. psidii* (Appendix A) are considered High Risk Plants for the EU and their import is prohibited pending risk assessment (EU 2018/2019).

**Table 4:** List of plants, plant products and other objects that are *Pulvinaria psidii* hosts whose introduction into the Union from certain third countries is prohibited (Source: Commission Implementing Regulation (EU) 2019/2072, Annex VI)

| **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** |
| 8. | Plants for planting of *Chaenomeles* Ldl., *Crateagus* L., *Cydonia* Mill., *Malus* Mill., *Prunus* L., *Pyrus* L. and *Rosa* L., other than dormant plants free from leaves, flowers and fruits | ex 0602 10 90<br>ex 0602 20 80<br>ex 0602 40 00<br>ex 0602 90 41<br>ex 0602 90 45<br>ex 0602 90 46<br>ex 0602 90 47<br>ex 0602 90 48<br>ex 0602 90 50<br>ex 0602 90 70<br>ex 0602 90 91<br>ex 0602 90 99 | Third countries other than:<br><br>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, Ukraine and the United Kingdom. |
| 9. | Plants for planting of *Cydonia* Mill., *Malus* Mill., *Prunus* L. and *Pyrus* L. and their hybrids, and *Fragaria* L., other than seeds | ex 0602 10 90<br>ex 0602 20 20<br>ex 0602 90 30<br>ex 0602 90 41<br>ex 0602 90 45<br>ex 0602 90 46<br>ex 0602 90 48<br>ex 0602 90 50<br>ex 0602 90 70<br>ex 0602 90 91<br>ex 0602 90 99 | Third countries, other than:<br><br>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, the United Kingdom and United States other than Hawaii |
| 11. | Plants of *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf., and their hybrids, other than fruits and seeds | ex 0602 10 90<br>ex 0602 20 20<br>0602 20 30<br>ex 0602 20 80<br>ex 0602 90 45<br>ex 0602 90 46<br>ex 0602 90 47<br>ex 0602 90 50<br>ex 0602 90 70<br>ex 0602 90 91<br>ex 0602 90 99<br>ex 0604 20 90<br>ex 1404 90 00 | All third countries |

| 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** |
| 12. | Plants for planting of *Photinia* Ldl., other than dormant plants free from leaves, flowers and fruits | ex 0602 10 90<br>ex 0602 90 41<br>ex 0602 90 45<br>ex 0602 90 46<br>ex 0602 90 47<br>ex 0602 90 48<br>ex 0602 90 50<br>ex 0602 90 70<br>ex 0602 90 91<br>ex 0602 90 99 | China, Democratic People's Republic of Korea, Japan, Republic of Korea and United States |
| 18. | Plants for planting of *Solanaceae* other than seeds and the plants covered by entries 15, 16 or 17 | ex 0602 10 90<br>ex 0602 90 30<br>ex 0602 90 45<br>ex 0602 90 46<br>ex 0602 90 48<br>ex 0602 90 50<br>ex 0602 90 70<br>ex 0602 90 91<br>ex 0602 90 99 | Third countries other than:<br><br>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, Ukraine and the United Kingdom |

## 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 has already entered the EU territory. It could further enter the EU territory with plants for planting, cut flowers, vegetables and fruits.

*Comment on plants for planting as a pathway*.

Plants for planting are one of the main pathways for *P. psidii* to enter the EU (Table 5).

Plants for planting and fruits, vegetables and cut flowers are the main potential pathways for entry of *P. psidii* (Table 5).

**Table 5:** Potential pathways for *Pulvinaria psidii* into the EU 27

| **Pathways** | **Life stage** | **Relevant mitigations** [e.g. prohibitions (Annex VI), special requirements (Annex VII) or phytosanitary certificates (Annex XI) within Implementing Regulation 2019/2072, Commission Implementing Regulation (EU) 2021/419, Commission Implementing Regulation (EU) 2021/1936] |
|---|---|---|
| Plants for planting | All life stages | Plants for planting that are hosts of *P. psidii* and are prohibited to import from third countries (Regulation 2019/2072, Annex VI), are listed in Table 4. Plants for planting from third countries require a phytosanitary certificate (Regulation 2019/2072, Annex XI, Part A). Some hosts are considered high risk plants (EU 2018/2019) for the EU and their import is prohibited subject to risk assessment |
| Fruits, vegetables and cut flowers | All life stages | Fruits, vegetables and cut flowers from third countries require a phytosanitary certificate to be imported into the EU (2019/2072, Annex XI, Part A). However, no requirements are specified for *P. psidii*. |

Annual imports of *P. psidii* hosts from countries where the pest is known to occur are provided in Appendix C.

Notifications of interceptions of harmful organisms began to be compiled in Europhyt in May 1994 and in TRACES in May 2020. As at 25/02/2022, there were no records of interception of *P. psidii* in the Europhyt and TRACES databases.

Miller et al. (2014) reports that *P. psidii* was intercepted 142 times between 1995 and 2012 on a variety of hosts at USA ports of entry with specimens originating from Australia, Barbados, Cambodia, Cook Islands, Costa Rica, Cuba, Egypt, France, Grenada, Guam, Guatemala, Hawaii, Honduras, India, Indonesia, Jamaica, Laos, Lebanon, Mexico, the Netherlands, Panama, the Philippines, Puerto Rico, Singapore, South Korea, Sri Lanka, Taiwan, Thailand, Tonga and Vietnam. Miller et al. (2014) goes on to list countries and the host plants on which *P. psidii* has been found as interceptions by the USA (Appendix D).

As noted in Section 3.2.2, there are no reports of *P. psidii* being found in France or the Netherlands. Records reported as interceptions on plants originating from France and the Netherlands by Miller et al. (2014) are likely to be the result of infested plant products being imported to France and the Netherlands from areas where the pest occurs and then being re-exported to the USA.

In Australia, between 2000 and 2018, *P. psidii* was intercepted six times on *Nephelium lappaceum* and *Catha edulis* leaves (DAWE, 2021).

### 3.4.2. Establishment

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

**Yes**, the climate in the EU countries of southern Europe is suitable and there are many available hosts that can support establishment.

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

*P. psidii* is a polyphagous pest. The main hosts of the pest cultivated in the EU between 2016 and 2020 are shown in Table 6. Among others, citrus, mangoes, avocados, tomatoes, peppers and ornamental plants are important crops in the EU.

**Table 6:** Crop area of *Pulvinaria psidii* key hosts in EU[(a)] in 1,000 ha (Eurostat accessed on 16/2/2022)

| **Crop** | **2016** | **2017** | **2018** | **2019** | **2020** |
|---|---|---|---|---|---|
| Citrus | 519.01 | 502.84 | 508.99 | 512.83 | 519.98 |
| Tomatoes | 253.95 | 247.95 | 239.48 | 242.52 | 233.20 |
| Peppers | 59.95 | 59.50 | 58.92 | 59.60 | 58.27 |
| Avocados | 12.24 | 12.72 | 13.22 | 17.50 | 19.60 |

(a): Statistics refer to EU 27.

#### 3.4.2.2. Climatic conditions affecting establishment

*P. psidii* occurs mainly in tropical and subtropical regions in Asia, Africa, Australia, America and Macaronesia (Canary Islands). Moreover, in Europe it has been recorded in Spain in regions with a Mediterranean climate. Figure 3 shows the world distribution of Köppen–Geiger climate types (Kottek et al., 2006) that occur in the EU and which occur in countries where *P. psidii* has been reported.

Southern EU countries provide suitable climatic conditions for the establishment of *P. psidii*. Indeed, it is already established in a small area of mainland Spain. There is uncertainty as to whether *P. psidii* could establish in outdoors in central Europe. Establishment outdoors in Northern Europe is unlikely. Nevertheless, there is a possibility that *P. psidii* could occur in glasshouses and on indoor plantings in cooler areas.

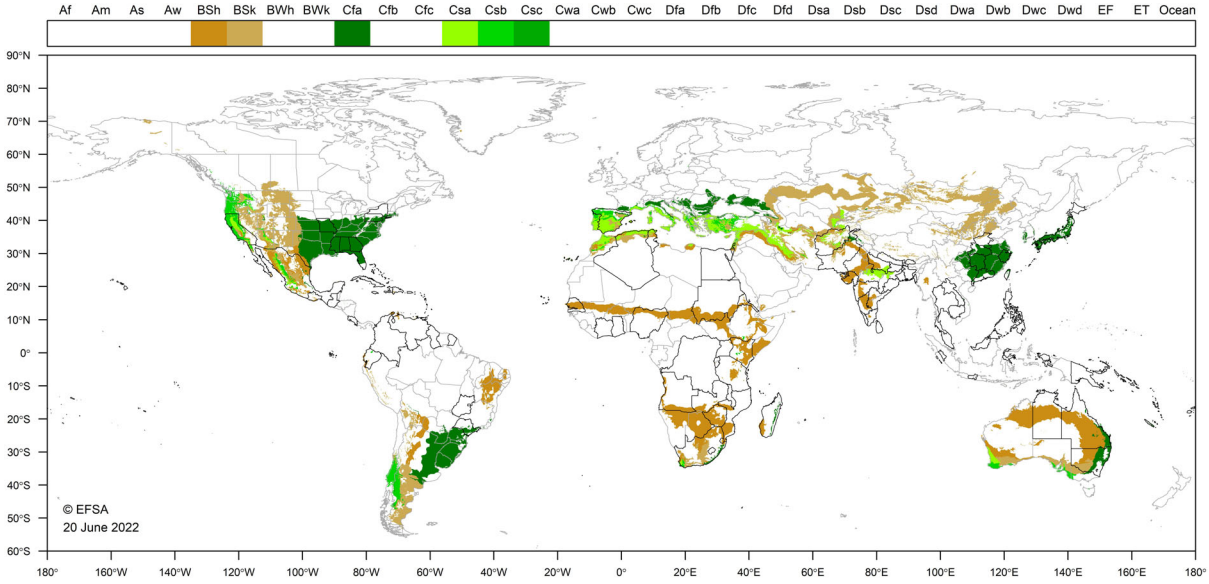


**Figure 3:** World distribution of Köppen—Geiger climate types that occur in the EU and which occur in countries where *Pulvinaria psidii* has been reported

### 3.4.3. Spread

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

Natural spread by first instar nymphs crawling or being carried by wind, other animals, or machinery, will occur locally and relatively slowly. All stages may be moved over long distances in trade of infested plant materials, specifically plants for planting, fruits, vegetables and cut flowers.

*Comment on plants for planting as a mechanism of spread*.
Plants for planting provide a main spread mechanism for *P. psidii* over long distances.

First instar nymphs (crawlers) may be carried to neighbouring plants by their own movement, wind (Bakr et al., 2012) or by hitchhiking on clothing, equipment or animals (EFSA PLH Panel, 2020).

Plants for planting, fruits, vegetables and cut flowers are the main pathways of spread of *P. psidii* over long distances.

## 3.5. Impacts

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

Yes, if *P. psidii* established more widely in the EU, it would most probably have an economic impact.

*P. psidii* sucks phloem sap from leaves and thin-barked shoots. When abundant it egests large amounts of honeydew on which blackish sooty mould grows, covering the leaf and fruit surfaces,

causing foliage drop and making fruits unmarketable (Mau and Kessing, 1992; Mohamed et al., 2012). In south Florida, *P. psidii* caused damage to ornamental plants, especially *Ficus* sp. during the warmer months (Hamon and Williams, 1984). In Egypt it is a pest of citrus, mango, guava, and ornamentals such as *Ficus* and *Aralia* (Bakr et al., 2012; García Morales et al., 2016; EFSA PLH Panel, 2021). Concerning guava, *P. psidii* is reported as one of the most important pests (El-Serafi et al., 2004; Moustafa and Abd-Rabou, 2010). In Pakistan it is a serious pest of mango (Mohyuddin and Mahmood, 1993) while in Bangladesh it has become an increasingly serious pest of guava and citrus (Bhuiya, 1998). In the tropical South Pacific region *P. psidii* is a serious pest of *Citrus*, *Coffea*, *Capsicum* and *Ficus* plants (Bhuiya, 1998). In Hawaii, in 1892, coffee plants were almost totally destroyed (Pemberton, 1964). In Israel, *P. psidii* is reported mainly in litchi and mango and on ornamental plants (EPPO, online). It is an insect of economic interest present in natural ecosystems of the Sierra de los Órganos in Mexico (Novoa et al., 2011).

*P. psidii* was detected on mango crops in Andalusia in summer 2017 (MAPA, 2021). An official response from the NPPO notes that there is no evidence that it is giving problems in the cultivation of mango. However, MAPA (2021) reports *P. psidii* occasionally causing damage in mango, litchi and ornamental ficus only when densities are high. Moreover, Del Pino et al. (2021a) report that densities of *P. psidii* are increasing and the scale is becoming an important pest of mango. These differences in appreciation give rise to uncertainty regarding impact in mango, taking into account that the pest has been introduced only recently. Rodrigo et al. (2020) indicate that *P. psidii* is causing damage to *Melia azedarach*, a widely used ornamental tree that lines streets in Valencia; large amounts of dripping honeydew is a nuisance to the public.

## 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**. Although the existing phytosanitary measures identified in Section 3.3.2 do not specifically target *P. psidii*, they mitigate the likelihood of its entry into, establishment and spread within the EU (see also Section 3.6.1).

### 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 7.

**Table 7:** 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 (Blue underline = Zenodo doc, Blue = WIP) | RRO summary | Risk element targeted (entry/establishment/spread/impact) |
|---|---|---|
| Require pest freedom | Pest free place of production (e.g. place of production and its immediate vicinity is free from pest over an appropriate time period, e.g. since the beginning of the last complete cycle of vegetation, or past 2 or 3 cycles). Pest free production site. | Entry/Spread |
| Growing plants in isolation | Place of production is insect proof originate in a place of production with complete physical isolation. | Entry/Spread |

| Control measure/Risk reduction option (Blue underline = Zenodo doc, Blue = WIP) | RRO summary | Risk element targeted (entry/establishment/ spread/impact) |
|---|---|---|
| Managed growing conditions | Used to mitigate likelihood of infestation at origin. Plants collected directly from natural habitats, have been grown, held and trained for at least two consecutive years prior to dispatch in officially registered nurseries, which are subject to an officially supervised control regime. | Entry/Spread |
| Biological control and behavioural manipulation | Biological control is successfully implemented worldwide against *P. psidii*, by predators and parasitoids. *Cryptolaemus montrouzieri* is an effective predator of *P. psidii* on guava, sapota, lemon, and coffee plants (Pemberton, 1964; Mani, 2016), it is commercially available in the EU. The parasitoids *Microterys kotinskyi* and *Coccophagus scutellaris* (also available in the EU) have been reported as effective biological agents in Bermuda, Egypt, India and other countries (Mani et al., 2009; Abd-Rabou, 2011; Mani, 2016).<br>The efficacy of a formulation of *Beauveria bassiana* (bioinsecticide) was tested in different pest stages in guava field trials (Bakr et al., 2012) | Spread/Impact |
| Chemical treatments on crops including reproductive material | Used to mitigate likelihood of infestation of pests susceptible to chemical treatments. The effectiveness of insecticide applications against soft scales may be reduced by the waxy coating of the adult. The efficacy of mineral oils, insect growth regulators and organophosphorus insecticides was tested in different pest stages in guava field trials (Bakr et al., 2012; Helmy et al., 2012). | Entry/Establishment / Spread/Impact |
| **Chemical treatments on consignments or during processing** | Treatments can be applied to plants or to plant products after harvest, during process or packaging operations and storage. e.g. fumigation; spraying/ dipping pesticides; surface disinfectants. | Entry/Spread |
| **Cleaning and disinfection of facilities, tools and machinery** | The physical and chemical cleaning and disinfection of facilities, tools, machinery, facilities and other accessories (e.g. boxes, pots, hand tools). | Spread |
| **Heat and cold treatments** | Controlled temperature treatments aimed to kill or inactivate pests without causing any unacceptable prejudice to the treated material itself. | Entry/Spread |
| **Controlled atmosphere** | Treatment of plants by storage in a modified atmosphere (including modified humidity, $O_2$, $CO_2$, temperature, pressure).<br>Used to mitigate likelihood of infestation of pests susceptible to modified atmosphere (usually applied during transport) hence to mitigate entry.<br>Controlled atmosphere storage can be used in commodities such as fresh and dried fruits. | Entry/Spread (via commodity) |

#### 3.6.1.2. Additional supporting measures

Potential additional supporting measures are listed in Table 8.

**Table 8:** 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 (Blue underline = Zenodo doc, Blue = WIP) | Summary | Risk element targeted (entry/establishment/ spread/impact) |
|---|---|---|
| **Inspection and trapping** | 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. | Entry/Spread/Impact |
| **Laboratory testing** | 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 |
| 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. | Entry |
| 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)<br>(a) export certificate (import)<br>(b) plant passport (EU internal trade) | Entry/Spread |
| **Certified and approved premises** | 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/Spread |
| 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/Spread |
| **Delimitation of Buffer zones** | 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 |

| Supporting measure (Blue underline = Zenodo doc, Blue = WIP) | Summary | Risk element targeted (entry/establishment/ spread/impact) |
|---|---|---|
| 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

- *P. psidii* may not be easily detected in cases where low densities occur.
- *P. psidii* is polyphagous, making the inspections of all consignments containing hosts from countries where the pest occurs difficult.
- Limited number of available registered active substances against *P. psidii*.
- Limited effectiveness of insecticides due to the presence of protective cover over the scales.

### 3.7. Uncertainty

The main source of uncertainty regards the magnitude of potential impact within the EU.

- There is contradictory information regarding the impact of *P. psidii* in mango in Spain.

## 4. Conclusions

*Pulvinaria psidii* satisfies all the criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union QP (Table 9).

**Table 9:** 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 |
|---|---|---|
| **Identity of the pest (Section 3.1)** | The identity of *Pulvinaria psidii* is established. Taxonomic keys based on morphology of adults exist. There are also molecular techniques for species identification. | None |
| **Absence/presence of the pest in the EU (Section 3.2)** | The pest has a restricted distribution in the EU territory (mainland Spain: the city of Valencia, and Andalusia). | None |
| **Pest potential for entry, establishment and spread in the EU (Section 3.4)** | *P. psidii* is able to further enter, become established and spread within the EU territory, especially in the southern EU MS. The main pathways are plants for planting, cut flowers, fruits, and vegetables. | None |
| **Potential for consequences in the EU (Section 3.5)** | The introduction of the pest could cause yield and quality losses on several crops and reduce the value of ornamental plants. | There is contradictory information regarding the impact of the pest on mangoes in Spain. |
| **Available measures (Section 3.6)** | There are measures available to prevent further entry, establishment and spread of *P. psidii* within the EU. Risk reduction options include inspections, chemical and physical treatments on consignments of fresh plant material from infested countries and the production of plants for import in the EU in pest free areas. | None |
| **Conclusion (Section 4)** | *P. psidii* satisfies all the criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest. | |
| Aspects of assessment to focus on/scenarios to address in future if appropriate | | |

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## Glossary

| | |
|---|---|
| Containment (of a pest) | Application of phytosanitary measures in and around an infested area to prevent spread of a pest (FAO, 2018) |
| Control (of a pest) | Suppression, containment or eradication of a pest population (FAO, 2018) |
| 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, 2018) |
| Eradication (of a pest) | Application of phytosanitary measures to eliminate a pest from an area (FAO, 2018) |
| Establishment (of a pest) | Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2018) |
| 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, 2018) |
| Pathway | Any means that allows the entry or spread of a pest (FAO, 2018) |
| 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, 2018) |

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|---|---|
| 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, 2018) |
| 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, 2018) |

## Abbreviations

| | |
|---|---|
| EPPO | European and Mediterranean Plant Protection Organization |
| FAO | Food and Agriculture Organization |
| 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 |

## Appendix A – *Pulvinaria psidii* host plants/species affected

Source: CABI (online, accessed on 16/2/2022), and García Morales et al. (2016). Common names derived from EPPO (online, accessed on 16/2/2022).

| Host status | Host name | Plant family | Common name | Reference |
|---|---|---|---|---|
| Cultivated hosts | *Aizoaceae* | Aizoaceae | | García Morales et al. (2016) |
| | *Alpinia purpurata* | Zingiberaceae | Red ginger | García Morales et al. (2016) |
| | *Alpinia* | Zingiberaceae | | García Morales et al. (2016) |
| | *Alstonia scholaris* | Apocynaceae | Devil tree, dita bark, milk wood, scholar tree, white cheesewood | García Morales et al. (2016) |
| | *Alternanthera ficoidea* | Amaranthaceae | Carb white, rabbit meat, rabbit weed, rupturewort, sanguinaria, shoo-fly joyweed | García Morales et al. (2016) |
| | *Annona* | Annonaceae | | García Morales et al. (2016) |
| | *Anthurium cubense* | Araceae | | García Morales et al. (2016) |
| | *Anthurium* | Araceae | | García Morales et al. (2016) |
| | *Antidesma bunius* | Phyllanthaceae | Bignay, China laurel, salamander tree | García Morales et al. (2016) |
| | *Antidesma membranaceum* | Phyllanthaceae | | García Morales et al. (2016) |
| | *Antidesma* | Phyllanthaceae | | García Morales et al. (2016) |
| | *Antigonon leptopus* | Polygonaceae | Bride's tears, cemetery vine, chain of love, coral vine, corallita, Mexican creeper, pink vine, St James' flower, St Michael's flower | García Morales et al. (2016) |
| | *Aralia* | Araliaceae | | García Morales et al. (2016) |
| | *Ardisia sieboldii* | Primulaceae | | García Morales et al. (2016) |
| | *Artocarpus heterophyllus* | Moraceae | Jackfruit | García Morales et al. (2016) |
| | *Artocarpus integer* | Moraceae | Champedak, chempedak, jack fruit, tjampedak | García Morales et al. (2016) |
| | *Asplenium nidus* | Aspleniaceae | Bird's-nest fern | García Morales et al. (2016) |
| | *Asplenium* | Aspleniaceae | | García Morales et al. (2016) |
| | *Barringtonia* | Lecythidaceae | | García Morales et al. (2016) |
| | *Bidens pilosa* | Asteraceae | Beggartick, blackjack, common blackjack, railway daisy, Spanish needle | García Morales et al. (2016) |
| | *Bignonia* | Bignoniaceae | | García Morales et al. (2016) |
| | *Bischofia javanica* | Phyllanthaceae | Bishopwood, Java bishopwood, toog | García Morales et al. (2016) |
| | *Blighia sapida* | Sapindaceae | Achee, ackee apple, akee, aki | García Morales et al. (2016) |
| | *Boronia serrulata* | Rutaceae | Native rose, rose boronia | García Morales et al. (2016) |
| | *Bouvardia* | Rubiaceae | | García Morales et al. (2016) |
| | *Callicarpa glabra* | Lamiaceae | | García Morales et al. (2016) |

| Host status | Host name | Plant family | Common name | Reference |
|---|---|---|---|---|
| | *Callistemon* | Myrtaceae | | García Morales et al. (2016) |
| | *Calycorectes ferrugineus* | Myrtaceae | | García Morales et al. (2016) |
| | *Camellia sinensis* | Theaceae | Tea, tea plant | García Morales et al. (2016) |
| | *Camellia* | Theaceae | | García Morales et al. (2016) |
| | *Canna indica* | Cannaceae | Arrowroot canna, Indian canna | García Morales et al. (2016) |
| | *Capsicum annuum* | Solanaceae | Chilli, bell pepper, paprika, red pepper, sweet pepper | García Morales et al. (2016) |
| | *Capsicum frutescens* | Solanaceae | Bird chilli, bird pepper, Cayenne pepper, chilli, chilli pepper, hot pepper | García Morales et al. (2016) |
| | *Carissa carandas* | Apocynaceae | Caranda (plum), karanda | García Morales et al. (2016) |
| | *Carissa macrocarpa* | Apocynaceae | Carissa, Natal plum | García Morales et al. (2016) |
| | *Carissa* | Apocynaceae | | García Morales et al. (2016) |
| | *Centrosema plumieri* | Fabaceae | Butterfly pea | García Morales et al. (2016) |
| | *Ceodes grandis* | Nyctaginaceae | Lettuce tree | García Morales et al. (2016) |
| | *Chiococca alba* | Rubiaceae | Milkberry | García Morales et al. (2016) |
| | *Chrysanthemum indicum* | Asteraceae | Chrysanthemum | García Morales et al. (2016) |
| | *Chrysophyllum cainito* | Sapotaceae | Star apple | García Morales et al. (2016) |
| | *Chrysophyllum oliviforme* | Sapotaceae | Satinleaf | García Morales et al. (2016) |
| | *Cibotium* | Cibotiaceae | | García Morales et al. (2016) |
| | *Cinchona* | Rubiaceae | | García Morales et al. (2016) |
| | *Citrus aurantiifolia* | Rutaceae | Key lime, lime, Mexican lime, West Indian lime | García Morales et al. (2016) |
| | *Citrus aurantium* | Rutaceae | Bigarade, bitter orange, Seville orange, sour orange | García Morales et al. (2016) |
| | *Citrus limon* | Rutaceae | Lemon | García Morales et al. (2016) |
| | *Citrus maxima* | Rutaceae | Bali lemon, pummelo, shaddock | García Morales et al. (2016) |
| | *Citrus reticulata* | Rutaceae | Clementine, clementine tree, mandarin, tangerine | García Morales et al. (2016) |
| | *Citrus sinensis* | Rutaceae | Sweet orange | García Morales et al. (2016) |
| | *Citrus trifoliata* | Rutaceae | Golden apple, hardy orange, trifoliate orange | García Morales et al. (2016) |
| | *Citrus* | Rutaceae | | García Morales et al. (2016) |
| | *Clerodendrum* | Lamiaceae | | García Morales et al. (2016) |
| | *Clusia rosea* | Clusiaceae | Autograph tree, balsam apple, balsam fig, pitch apple, Scotch attorney | García Morales et al. (2016) |

| Host status | Host name | Plant family | Common name | Reference |
|---|---|---|---|---|
| | *Codiaeum* | Euphorbiaceae | | García Morales et al. (2016) |
| | *Coffea arabica* | Rubiaceae | Arabian coffee, coffee tree | García Morales et al. (2016) |
| | *Coffea canephora* | Rubiaceae | Congo coffee, robusta coffee | García Morales et al. (2016) |
| | *Coffea liberica* | Rubiaceae | Liberian coffee | García Morales et al. (2016) |
| | *Coffea* | Rubiaceae | | García Morales et al. (2016) |
| | *Colocasia antiquorum* | Araceae | Chinese potato, cocoyam, dasheen, eddoe, Egyptian colocasia, elephant's-ear, kalo, taro, wild taro, yam | García Morales et al. (2016) |
| | *Colocasia esculenta* | Araceae | Chinese potato, cocoyam, dasheen, eddoe, Egyptian colocasia, elephant's-ear, kalo, taro, wild taro, yam | García Morales et al. (2016) |
| | *Comocladia* | Anacardiaceae | | García Morales et al. (2016) |
| | *Cordia alliodora* | Boraginaceae | Ecuador laurel, onion cordia, salmwood | García Morales et al. (2016) |
| | *Cordia myxa* | Boraginaceae | Assyrian plum, sebesten, Sudan teak | García Morales et al. (2016) |
| | *Cordia* | Boraginaceae | | García Morales et al. (2016) |
| | *Cordyline fruticosa* | Asparagaceae | Ti plant | García Morales et al. (2016) |
| | *Costus spicatus* | Costaceae | Spiked spiralflag ginger | García Morales et al. (2016) |
| | *Crinum moorei* | Amaryllidaceae | Natal lily | García Morales et al. (2016) |
| | *Cussonia arborea* | Araliaceae | Octopus cabbage tree | García Morales et al. (2016) |
| | *Dahlia pinnata* | Asteraceae | Dahlia, garden dahlia | García Morales et al. (2016) |
| | *Dianthus* | Caryophyllaceae | | García Morales et al. (2016) |
| | *Dimocarpus longan* | Sapindaceae | Dragon's eye, longan, | García Morales et al. (2016) |
| | *Diospyros kaki* | Ebenaceae | Chinese date plum, Chinese persimmon, Japanese persimmon, kaki plum, persimmon | García Morales et al. (2016) |
| | *Diploknema butyracea* | Sapotaceae | | García Morales et al. (2016) |
| | *Dodonaea triquetra* | Sapindaceae | Common hopbush | García Morales et al. (2016) |
| | *Dodonaea* | Sapindaceae | | García Morales et al. (2016) |
| | *Duranta* | Verbenaceae | | García Morales et al. (2016) |
| | *Dysphania pumilio* | Amaranthaceae | Clammy goosefoot, Tasmanian goosefoot | García Morales et al. (2016) |
| | *Elettaria cardamomum* | Zingiberaceae | Cardamom, cardamon | García Morales et al. (2016) |
| | *Eriobotrya japonica* | Rosaceae | Japanese medlar, loquat | García Morales et al. (2016) |
| | *Erythrospermum candidum* | Achariaceae | | García Morales et al. (2016) |
| | *Etlingera* | Zingiberaceae | | García Morales et al. (2016) |
| | *Eucalyptus deglupta* | Myrtaceae | Kamarere, Mindanao gum, rainbow eucalyptus, rainbow gum | García Morales et al. (2016) |

| Host status | Host name | Plant family | Common name | Reference |
|---|---|---|---|---|
| | *Eugenia bullata* | Myrtaceae | | García Morales et al. (2016) |
| | *Eugenia* | Myrtaceae | | García Morales et al. (2016) |
| | *Euonymus frigidus* | Celastraceae | | García Morales et al. (2016) |
| | *Eupatorium* | Asteraceae | | García Morales et al. (2016) |
| | *Euphorbia* | Euphorbiaceae | | García Morales et al. (2016) |
| | *Ficus* | Moraceae | | García Morales et al. (2016) |
| | *Ficus amplissima* | Moraceae | | García Morales et al. (2016) |
| | *Ficus benghalensis* | Moraceae | Banyan, banyan fig, East India fig, horn fig, Indian banyan, | García Morales et al. (2016) |
| | *Ficus benjamina* | Moraceae | Benjamin's fig, ficus tree, Java fig, small-leaved rubber plant, tropical laurel, weeping fig | García Morales et al. (2016) |
| | *Ficus boninsimae* | Moraceae | | García Morales et al. (2016) |
| | *Ficus elastica* | Moraceae | Assam rubber tree, Indian rubber fig, Indian rubber plant, rubber fig, rubber plant | García Morales et al. (2016) |
| | *Ficus lyrata* | Moraceae | Banjo fig, fiddle-leaf, fiddle-leaf fig | García Morales et al. (2016) |
| | *Ficus macrophylla* | Moraceae | Australian banyan, Moreton Bay fig | García Morales et al. (2016) |
| | *Ficus membranacea* | Moraceae | | García Morales et al. (2016) |
| | *Ficus racemosa* | Moraceae | Cluster fig, red river fig | García Morales et al. (2016) |
| | *Ficus religiosa* | Moraceae | bo, bo tree, bodhi tree, holy fig tree, peepul, sacred fig | García Morales et al. (2016) |
| | *Ficus retusa* | Moraceae | Chinese banyan, glossy-leaf fig | García Morales et al. (2016) |
| | *Ficus rubiginosa* | Moraceae | Rusty fig | García Morales et al. (2016) |
| | *Ficus sur* | Moraceae | | García Morales et al. (2016) |
| | *Ficus thonningii* | Moraceae | | García Morales et al. (2016) |
| | *Garcinia mangostana* | Clusiaceae | Mangosteen | García Morales et al. (2016) |
| | *Garcinia* | Clusiaceae | | García Morales et al. (2016) |
| | *Gardenia jasminoides* | Rubiaceae | Cape jasmine, Cape jessamine, common gardenia, gardenia | García Morales et al. (2016) |
| | *Gardenia taitensis* | Rubiaceae | Symbol flower, Tahitian gardenia, tiare, Tiaré flower | García Morales et al. (2016) |
| | *Gardenia* | Rubiaceae | | García Morales et al. (2016) |
| | *Gerbera* | Asteraceae | | García Morales et al. (2016) |
| | *Gossypium* | Malvaceae | | García Morales et al. (2016) |
| | *Guarea guidonia* | Meliaceae | | García Morales et al. (2016) |
| | *Gymnosporia* | Celastraceae | | García Morales et al. (2016) |
| | *Handroanthus chrysanthus* | Bignoniaceae | Gold tree, golden tabebuia, yellow poui | García Morales et al. (2016) |
| | *Hedera helix* | Araliaceae | Common ivy, ivy | García Morales et al. (2016) |
| | *Hedychium* | Zingiberaceae | | García Morales et al. (2016) |

| Host status | Host name | Plant family | Common name | Reference |
|---|---|---|---|---|
| | *Heliconia psittacorum* | Heliconiaceae | Parakeet flower, parakeet heliconia, parrot flower, parrot's plantain | García Morales et al. (2016) |
| | *Hibiscus rosa-sinensis* | Malvaceae | China rose, Chinese hibiscus, Chinese rose, Hawaiian hibiscus, rose mallow, rose of China, shoe-black plant, shoe-flower | García Morales et al. (2016) |
| | *Hibiscus syriacus* | Malvaceae | Althaea, blue hibiscus, rose of Sharon, shrubby althaea, Syrian hibiscus, Syrian ketmia | García Morales et al. (2016) |
| | *Hibiscus* | Malvaceae | | García Morales et al. (2016) |
| | *Homalocladium platycladum* | Polygonaceae | Centipede plant, ribbonbush, tapeworm plant | García Morales et al. (2016) |
| | *Ipomoea alba* | Convolvulaceae | White-flowered morning glory | García Morales et al. (2016) |
| | *Ixora chinensis* | Rubiaceae | Flame of the woods, jungle flame, jungle geranium | García Morales et al. (2016) |
| | *Ixora coccinea* | Rubiaceae | Burning love, flame flower, flame of woods, jungle flame, palm of the wood | García Morales et al. (2016) |
| | *Ixora macrothyrsa* | Rubiaceae | | García Morales et al. (2016) |
| | *Ixora* | Rubiaceae | | García Morales et al. (2016) |
| | *Jasminum humile* | Oleaceae | Italian jasmine, Italian yellow jasmine | García Morales et al. (2016) |
| | *Jasminum* | Oleaceae | | García Morales et al. (2016) |
| | *Juncus concinnus* | Juncaceae | | García Morales et al. (2016) |
| | *Kalanchoe* | Crassulaceae | | García Morales et al. (2016) |
| | *Lagerstroemia indica* | Lythraceae | Indian crape myrtle | García Morales et al. (2016) |
| | *Lagerstroemia lanceolata* | Lythraceae | | García Morales et al. (2016) |
| | *Lagerstroemia* | Lythraceae | | García Morales et al. (2016) |
| | *Lasianthus lanceolatus* | Rubiaceae | | García Morales et al. (2016) |
| | *Laurus* | Lauraceae | | García Morales et al. (2016) |
| | *Lawsonia* | Lythraceae | | García Morales et al. (2016) |
| | *Litchi chinensis* | Sapindaceae | Litchee, litchi | García Morales et al. (2016) |
| | *Livistona chinensis* | Arecaceae | Chinese fan palm | García Morales et al. (2016) |
| | *Ludwigia octovalvis* | Onagraceae | Mexican primrose-willow, swamp primrose, water primrose | García Morales et al. (2016) |
| | *Macaranga* | Euphorbiaceae | | García Morales et al. (2016) |
| | *Mallotus philippensis* | Euphorbiaceae | Kamala | García Morales et al. (2016) |

| Host status | Host name | Plant family | Common name | Reference |
|---|---|---|---|---|
| | *Malvaviscus arboreus* | Malvaceae | Fire dart, marsh-mallow, scarlet rose-mallow, sleeping hibiscus, sleepy mallow, Turk's cap, wax mallow, wild cotton | García Morales et al. (2016) |
| | *Mangifera indica* | Anacardiaceae | Mango | García Morales et al. (2016) |
| | *Manilkara zapota* | Sapotaceae | Bully tree, chapoti, chicle, chiku, marmalade plum, noseberry, sapodilla, sapodilla plum, sapota | García Morales et al. (2016) |
| | *Melanthera biflora* | Asteraceae | Beach sunflower | García Morales et al. (2016) |
| | *Melastoma* | Melastomataceae | | García Morales et al. (2016) |
| | *Melastomataceae* | Melastomataceae | | García Morales et al. (2016) |
| | *Melia azedarach* | Meliaceae | Bead tree, China berry, chinaberry tree, Indian lilac, Persian lilac, pride of India, seringa, umbrella tree, white cedar | García Morales et al. (2016) |
| | *Meryta macrophylla* | Araliaceae | | García Morales et al. (2016) |
| | *Meryta sinclairii* | Araliaceae | | García Morales et al. (2016) |
| | *Metrosideros* | Myrtaceae | | García Morales et al. (2016) |
| | *Miconia robinsoniana* | Melastomataceae | | García Morales et al. (2016) |
| | *Monstera deliciosa* | Araceae | Breadfruit vine, ceriman, hurricane plant, Mexican breadfruit, split-leaf philodendron, Swiss cheese plant | García Morales et al. (2016) |
| | *Morinda citrifolia* | Rubiaceae | Indian mulberry, noni | García Morales et al. (2016) |
| | *Morinda* | Rubiaceae | | García Morales et al. (2016) |
| | *Morus alba* | Moraceae | Silkworm mulberry, white mulberry | García Morales et al. (2016) |
| | *Morus indica* | Moraceae | Japanese mulberry | García Morales et al. (2016) |
| | *Myristica castaneifolia* | Myristicaceae | | García Morales et al. (2016) |
| | *Myrtus communis* | Myrtaceae | Common myrtle, myrtle, true myrtle | García Morales et al. (2016) |
| | *Neolamarckia* | Rubiaceae | | García Morales et al. (2016) |
| | *Nephelium lappaceum* | Sapindaceae | Rambutan | García Morales et al. (2016) |
| | *Nephelium ramboutan-ake* | Sapindaceae | Pulasan | García Morales et al. (2016) |
| | *Nerium* | Apocynaceae | | García Morales et al. (2016) |
| | *Oleaceae* | Oleaceae | | García Morales et al. (2016) |
| | *Oxera* | Lamiaceae | | García Morales et al. (2016) |
| | *Palicourea domingensis* | Rubiaceae | | García Morales et al. (2016) |
| | *Pandanus* | Pandanaceae | | García Morales et al. (2016) |
| | *Pelargonium* | Geraniaceae | | García Morales et al. (2016) |
| | *Persea americana* | Lauraceae | Avocado | CABI (online) |

| Host status | Host name | Plant family | Common name | Reference |
|---|---|---|---|---|
| | *Persea* | Lauraceae | | García Morales et al. (2016) |
| | *Philodendron* | Araceae | | García Morales et al. (2016) |
| | *Phlox* | Polemoniaceae | | García Morales et al. (2016) |
| | *Photinia serratifolia* | Rosaceae | Chinese hawthorn, Chinese photinia | García Morales et al. (2016) |
| | *Pinus caribaea* | Pinaceae | Cuban pine | García Morales et al. (2016) |
| | *Piper methysticum* | Piperaceae | Kava pepper bush | García Morales et al. (2016) |
| | *Pisonia* | Nyctaginaceae | | García Morales et al. (2016) |
| | *Pistacia atlantica* | Anacardiaceae | Atlas pistachio, Mount Atlas mastic tree | García Morales et al. (2016) |
| | *Pittosporum boninense* | Pittosporaceae | | García Morales et al. (2016) |
| | *Pittosporum* | Pittosporaceae | | García Morales et al. (2016) |
| | *Planchonella obovata* | Sapotaceae | | García Morales et al. (2016) |
| | *Plumeria* | Apocynaceae | | García Morales et al. (2016) |
| | *Plumeria rubra* | Apocynaceae | Frangipani, red frangipani, temple tree | García Morales et al. (2016) |
| | *Pometia pinnata* | Sapindaceae | Fijian longan, island lychee, kasai, kava, langsir, matoa, taun tree | García Morales et al. (2016) |
| | *Pouteria sapota* | Sapotaceae | Mamey, mammee sapota, mammey sapote, marmelade plum | CABI (online) |
| | *Prunus cerasifera* | Rosaceae | Cherry plum, myrobalan plum | García Morales et al. (2016) |
| | *Psidium guajava* | Myrtaceae | Common guava, guava, yellow guava | García Morales et al. (2016) |
| | *Psidium* | Myrtaceae | | García Morales et al. (2016) |
| | *Psychotria asiatica* | Rubiaceae | | García Morales et al. (2016) |
| | *Psychotria elliptica* | Rubiaceae | | García Morales et al. (2016) |
| | *Psychotria nervosa* | Rubiaceae | Seminole balsamo, wild coffee | García Morales et al. (2016) |
| | *Psychotria* | Rubiaceae | | García Morales et al. (2016) |
| | *Pteralyxia macrocarpa* | Apocynaceae | | García Morales et al. (2016) |
| | *Pteridium* | Dennstaedtiaceae | | García Morales et al. (2016) |
| | *Pteris biaurita* | Pteridaceae | | García Morales et al. (2016) |
| | *Punica granatum* | Lythraceae | Pomegranate | García Morales et al. (2016) |
| | *Pycnandra* | Sapotaceae | | García Morales et al. (2016) |
| | *Russelia* | Plantaginaceae | | García Morales et al. (2016) |
| | *Salix* | Salicaceae | | García Morales et al. (2016) |
| | *Sanchezia* | Acanthaceae | | García Morales et al. (2016) |
| | *Scaevola floribunda* | Goodeniaceae | | García Morales et al. (2016) |
| | *Scaevola gaudichaudiana* | Goodeniaceae | | García Morales et al. (2016) |
| | *Schaefferia frutescens* | Celastraceae | Florida boxwood | García Morales et al. (2016) |
| | *Schefflera actinophylla* | Araliaceae | Octopus tree, Queensland umbrella tree, star leaf, umbrella tree | García Morales et al. (2016) |

| Host status | Host name | Plant family | Common name | Reference |
|---|---|---|---|---|
| | *Schefflera* | Araliaceae | | García Morales et al. (2016) |
| | *Schima wallichii* | Theaceae | | García Morales et al. (2016) |
| | *Schinus molle* | Anacardiaceae | California pepper tree, pepper tree, Peruvian mastic, Peruvian mastic tree, Peruvian pepper tree | García Morales et al. (2016) |
| | *Schinus terebinthifolia* | Anacardiaceae | Brazilian pepper tree, broad-leaf pepper tree, Christmas berry, Florida holly, pepper berry, schinus | García Morales et al. (2016) |
| | *Schinus* | Anacardiaceae | | García Morales et al. (2016) |
| | *Sedum* | Crassulaceae | | García Morales et al. (2016) |
| | *Solanum lycopersicum* | Solanaceae | Tomato | García Morales et al. (2016) |
| | *Spathodea campanulata* | Bignoniaceae | African tulip tree, fire tree, flame of the forest, fountain tree, nandi flame tree | García Morales et al. (2016) |
| | *Spondias dulcis* | Anacardiaceae | Ambarella, golden apple, great hog plum, jew-plum, Jewish plum, otaheite apple | García Morales et al. (2016) |
| | *Stachytarpheta* | Verbenaceae | | García Morales et al. (2016) |
| | *Streblus asper* | Moraceae | Sandpaper tree, toothbrush tree | García Morales et al. (2016) |
| | *Strychnos nux-vomica* | Loganiaceae | Nux-vomica poison nut, strychnine tree | García Morales et al. (2016) |
| | *Syzygium aqueum* | Myrtaceae | Watery rose apple, wax jambo | García Morales et al. (2016) |
| | *Syzygium aromaticum* | Myrtaceae | Clove, Zanzibar redhead | García Morales et al. (2016) |
| | *Syzygium buxifolium* | Myrtaceae | Boxleaf eugenia | García Morales et al. (2016) |
| | *Syzygium calophyllifolium* | Myrtaceae | | García Morales et al. (2016) |
| | *Syzygium cumini* | Myrtaceae | Black plum, jambolan, jamun, Java plum, Malabar plum | García Morales et al. (2016) |
| | *Syzygium jambos* | Myrtaceae | Malabar plum, rose apple, wax jambu | García Morales et al. (2016) |
| | *Syzygium malaccense* | Myrtaceae | Long-fruited rose apple, Malay apple, mountain apple, ohia, otaheite apple, otaheite apple, pomerac | García Morales et al. (2016) |
| | *Tamarix gallica* | Tamaricaceae | French tamarisk, French tree, manna plant | García Morales et al. (2016) |
| | *Tarenna sambucina* | Rubiaceae | | García Morales et al. (2016) |
| | *Tarenna subsessilis* | Rubiaceae | | García Morales et al. (2016) |
| | *Tecoma stans* | Bignoniaceae | Trumpet flower, yellow elder, yellow trumpet bush, yellow-bells | García Morales et al. (2016) |

| Host status | Host name | Plant family | Common name | Reference |
|---|---|---|---|---|
| | *Tecoma* | Bignoniaceae | | García Morales et al. (2016) |
| | *Terminalia brassii* | Combretaceae | | García Morales et al. (2016) |
| | *Tetrapanax papyrifer* | Araliaceae | Chinese rice paper tree | García Morales et al. (2016) |
| | *Thespesia populnea* | Malvaceae | Cork tree, Indian tulip tree, milo, Pacific rosewood, portea oil-nut, portea tree, portia, seaside mahoe, Seychelles rosewood, umbrella tree | García Morales et al. (2016) |
| | *Toxicodendron* | Anacardiaceae | | García Morales et al. (2016) |
| | *Trema orientalis* | Cannabaceae | | García Morales et al. (2016) |
| | *Uapaca kirkiana* | Phyllanthaceae | Wild loquat | García Morales et al. (2016) |
| | *Vanilla* | Orchidaceae | | García Morales et al. (2016) |
| | *Violaceae* | Violaceae | | García Morales et al. (2016) |
| | *Zantedeschia aethiopica* | Araceae | Altar lily, arum lily, calla lily, garden calla lily, pig lily, trumpet lily, white arum lily | García Morales et al. (2016) |
| | *Zingiber officinale* | Zingiberaceae | Common ginger, garden ginger | García Morales et al. (2016) |
| | *Zingiber* | Zingiberaceae | | García Morales et al. (2016) |

## Appendix B – Distribution of *Pulvinaria psidii*

Distribution records based on CABI (online, accessed on 16/2/2022), and García Morales et al. (2016), and other references.

| Region | Country | Sub-national (e.g. State) | Status | Reference |
|---|---|---|---|---|
| North America | Bahamas | | Present, no details | García Morales et al. (2016) |
| | Bermuda | | Present, no details | García Morales et al. (2016) |
| | Cuba | | Present, no details | García Morales et al. (2016) |
| | Mexico | | Present, no details | García Morales et al. (2016) |
| | Montserrat | | Present, no details | García Morales et al. (2016) |
| | United States | Alabama | Present, no details | García Morales et al. (2016) |
| | | California | Present, no details | García Morales et al. (2016) |
| | | District of Columbia | Present, no details | García Morales et al. (2016) |
| | | Florida | Present, no details | García Morales et al. (2016) |
| | | Georgia | Present, no details | García Morales et al. (2016) |
| | | Mississippi | Present, no details | García Morales et al. (2016) |
| | | Missouri | Present, no details | García Morales et al. (2016) |
| | | New York | Present, no details | García Morales et al. (2016) |
| | | Pennsylvania | Present, no details | García Morales et al. (2016) |
| Central America | Costa Rica | | Present, no details | García Morales et al. (2016) |
| | Guatemala | | Present, no details | García Morales et al. (2016) |
| Caribbean | Antigua and Barbuda | Antigua | Present, no details | García Morales et al. (2016) |
| | Barbados | | Present, no details | García Morales et al. (2016) |
| | Dominican Republic | | Present, no details | García Morales et al. (2016) |
| | Grenada | | Present, no details | García Morales et al. (2016) |
| | Guadeloupe | | Present, no details | García Morales et al. (2016) |
| | Haiti | | Present, no details | García Morales et al. (2016) |
| | Jamaica | | Present, no details | García Morales et al. (2016) |
| | Martinique | | Present, no details | García Morales et al. (2016) |
| | Puerto Rico & Vieques Island | Puerto Rico | Present, no details | García Morales et al. (2016) |
| | Ryukyu Islands | | Present, no details | García Morales et al. (2016) |
| | Saint Croix | | Present, no details | García Morales et al. (2016) |
| | Saint Kitts and Nevis Islands | Saint Kitts | Present, no details | García Morales et al. (2016) |
| | Saint Vincent and the Grenadines | | Present, no details | García Morales et al. (2016) |
| | Trinidad and Tobago | Trinidad | Present, no details | García Morales et al. (2016) |
| | U.S. Virgin Islands | | Present, no details | García Morales et al. (2016) |
| EU (27) | Spain | | Present, no details Valencia, Andalusia | CABI (online); Boyero et al., 2017; Rodrigo et al. (2020); Del Pino et al. (2021a,b) |
| | Spain | Canary Islands | Present, no details | CABI (online); Gómez-Menor Guerrero (1967); Jaques and Urbaneja (2006) |
| Africa | Algeria | | Present, no details | García Morales et al. (2016) |
| | Angola | | Present, no details | García Morales et al. (2016) |
| | Ascension Island | | Present, no details | García Morales et al. (2016) |
| | Cape Verde | | Present, no details | García Morales et al. (2016) |
| | Comoros | | Present, no details | García Morales et al. (2016) |

| Region | Country | Sub-national (e.g. State) | Status | Reference |
|---|---|---|---|---|
| | Congo | | Present, no details | García Morales et al. (2016) |
| | Cote d'Ivoire | | Present, no details | García Morales et al. (2016) |
| | Egypt | | Present, no details | García Morales et al. (2016) |
| | Eritrea | | Present, no details | CABI (online) |
| | Ghana | | Present, no details | García Morales et al. (2016) |
| | Kenya | | Present, no details | García Morales et al. (2016) |
| | Madagascar | | Present, no details | García Morales et al. (2016) |
| | Malawi | | Present, no details | García Morales et al. (2016) |
| | Mauritius | | Present, no details | García Morales et al. (2016) |
| | Mozambique | | Present, no details | García Morales et al. (2016) |
| | Nigeria | | Present, no details | García Morales et al. (2016) |
| | Reunion | | Present, no details | García Morales et al. (2016) |
| | Saint Helena | | Present, no details | García Morales et al. (2016) |
| | Senegal | | Present, no details | García Morales et al. (2016) |
| | Seychelles | Aldabra Island | Present, no details | García Morales et al. (2016) |
| | | Farquhar Island | Present, no details | García Morales et al. (2016) |
| | | Providence Island | Present, no details | García Morales et al. (2016) |
| | South Africa | | Present, no details | García Morales et al. (2016) |
| | Spain | Canary Islands | Present in Tenerife | NPPO |
| | Sudan | | Present, no details | García Morales et al. (2016) |
| | Tanzania | | Present, no details | García Morales et al. (2016) |
| | Tanzania | Zanzibar Island | Present, no details | CABI (online) |
| | Tunisia | | Present, no details | García Morales et al. (2016) |
| | Uganda | | Present, no details | García Morales et al. (2016) |
| | Zimbabwe | | Present, no details | García Morales et al. (2016) |
| Asia | Afghanistan | | Present, no details | García Morales et al. (2016) |
| | Bangladesh | | Present, no details | García Morales et al. (2016) |
| | Bhutan | | Present, no details | García Morales et al. (2016) |
| | Bonin Islands | | Present, no details | García Morales et al. (2016) |
| | Brunei | | Present, no details | García Morales et al. (2016) |
| | Cambodia | | Present, no details | CABI (online) |
| | China | Guangdong | Present, no details | García Morales et al. (2016) |
| | | Henan | Present, no details | García Morales et al. (2016) |
| | | Hong Kong | Present, no details | García Morales et al. (2016) |
| | | Hubei | Present, no details | García Morales et al. (2016) |
| | | Hunan | Present, no details | García Morales et al. (2016) |
| | | Zhejiang | Present, no details | García Morales et al. (2016) |
| | Christmas Island | | Present, no details | García Morales et al. (2016) |
| | India | Andhra Pradesh | Present, no details | García Morales et al. (2016) |
| | | Bihar | Present, no details | García Morales et al. (2016) |
| | | Gujarat | Present, no details | García Morales et al. (2016) |
| | | Karnataka | Present, no details | García Morales et al. (2016) |
| | | Kerala | Present, no details | García Morales et al. (2016) |
| | | Maharashtra | Present, no details | García Morales et al. (2016) |
| | | Odisha | Present, no details | García Morales et al. (2016) |
| | | Sikkim | Present, no details | CABI (online) |
| | | Tamil Nadu | Present, no details | García Morales et al. (2016) |
| | | Uttar Pradesh | Present, no details | García Morales et al. (2016) |
| | | West Bengal | Present, no details | García Morales et al. (2016) |

| Region | Country | Sub-national (e.g. State) | Status | Reference |
|---|---|---|---|---|
| | Indonesia | Flores | Present, no details | García Morales et al. (2016) |
| | | Irian Jaya | Present, no details | García Morales et al. (2016) |
| | | Java | Present, no details | García Morales et al. (2016) |
| | | Sulawesi | Present, no details | García Morales et al. (2016) |
| | | Sumatra | Present, no details | García Morales et al. (2016) |
| | Israel | | Present, no details | García Morales et al. (2016) |
| | Japan | | Present, no details | García Morales et al. (2016) |
| | Laos | | Present, no details | García Morales et al. (2016) |
| | Malaysia | | Present, no details | CABI (online) |
| | | Peninsular Malaysian | Present, no details | CABI (online) |
| | | Sabah | Present, no details | García Morales et al. (2016) |
| | | Sarawak | Present, no details | García Morales et al. (2016) |
| | Nepal | | Present, no details | García Morales et al. (2016) |
| | Pakistan | | Present, no details | García Morales et al. (2016) |
| | Philippines | | Present, no details | García Morales et al. (2016) |
| | Singapore | | Present, no details | García Morales et al. (2016) |
| | Sri Lanka | | Present, no details | García Morales et al. (2016) |
| | Taiwan | | Present, no details | García Morales et al. (2016) |
| | Thailand | | Present, no details | García Morales et al. (2016) |
| Oceania | Australia | Australian Capital Territory | Present, no details | García Morales et al. (2016) |
| | | New South Wales | Present, no details | García Morales et al. (2016) |
| | | Northern Territory | Present, no details | García Morales et al. (2016) |
| | | Queensland | Present, no details | García Morales et al. (2016) |
| | Cook Islands | | Present, no details | García Morales et al. (2016) |
| | Federated States of Micronesia | Caroline Islands | Present, no details | García Morales et al. (2016) |
| | | Ponape Island | Present, no details | García Morales et al. (2016) |
| | | Truk Islands | Present, no details | García Morales et al. (2016) |
| | Fiji | | Present, no details | García Morales et al. (2016) |
| | French Polynesia | Tahiti | Present, no details | García Morales et al. (2016) |
| | Hawaiian Islands | Hawaii | Present, no details | García Morales et al. (2016) |
| | Kampuchea | | Present, no details | García Morales et al. (2016) |
| | Kiribati | | Present, no details | García Morales et al. (2016) |
| | Marshall Islands | | Present, no details | García Morales et al. (2016) |
| | Nauru | | Present, no details | CABI (online) |
| | New Britain | | Present, no details | García Morales et al. (2016) |
| | New Caledonia | | Present, no details | García Morales et al. (2016) |
| | Niue | | Present, no details | García Morales et al. (2016) |
| | Northern Mariana Islands | | Present, no details | García Morales et al. (2016) |
| | Palau | | Present, no details | García Morales et al. (2016) |
| | Papua New Guinea | | Present, no details | García Morales et al. (2016) |
| | Solomon Islands | | Present, no details | García Morales et al. (2016) |
| | Vanuatu | | Present, no details | García Morales et al. (2016) |
| | Western Samoa | | Present, no details | García Morales et al. (2016) |
| | Tonga | | Present, no details | García Morales et al. (2016) |

# Appendix C – Import data

Tables C.1–C.5.

**Table C.1:** Fresh or dried citrus (CN code: 0805) imported in 100 kg into the EU (27) from regions where *Pulvinaria psidii* is known to occur (Source: Eurostat accessed on 18/2/2022)

| Country | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|
| Afghanistan | | | | 7.00 | | |
| Angola | | | 43.00 | | | |
| Antigua and Barbuda | | | | 20.00 | | |
| Australia | 3,280.00 | 1,284.00 | 645.00 | 10,645.00 | 2,343.00 | 4,097.00 |
| Bangladesh | 228.00 | 230.00 | 160.00 | 322.00 | 1,184.00 | 289.00 |
| Brazil | 864,863.00 | 903,433.00 | 900,907.00 | 822,134.00 | 902,590.00 | 1,058,807.00 |
| China | 827,841.00 | 1,084,857.00 | 1,024,163.00 | 1,108,595.00 | 1,098,690.00 | 646,652.00 |
| Colombia | 44,825.00 | 79,401.00 | 123,887.00 | 136,915.00 | 172,198.00 | 194,963.00 |
| Congo, Democratic Republic of | | | | | | 2.00 |
| Costa Rica | 4,700.00 | 921.00 | 705.00 | 231.00 | 462.00 | 35.00 |
| Cuba | 7,166.00 | 3,864.00 | 4,438.00 | 3,422.00 | 556.00 | 19.00 |
| Dominican Republic | 11,179.00 | 9,337.00 | 10,427.00 | 7,355.00 | 12,887.00 | 12,780.00 |
| Ecuador | 949.00 | 2,127.00 | 730.00 | 1,115.00 | 127.00 | 2,313.00 |
| Egypt | 1,931,587.00 | 2,246,999.00 | 2,643,272.00 | 2,206,933.00 | 2,850,746.00 | 3,398,717.00 |
| Ghana | 280.00 | 348.00 | 100.00 | | | 262.00 |
| Guatemala | 11,409.00 | 17,178.00 | 27,057.00 | 11,816.00 | 17,814.00 | 8,481.00 |
| Guyana | | | | | 24.00 | |
| Haiti | 207.00 | 177.00 | 72.00 | 31.00 | 248.00 | 337.00 |
| India | 247.00 | 1.00 | 450.00 | 89.00 | 255.00 | 22.00 |
| Indonesia | 567.00 | 556.00 | 779.00 | 837.00 | 865.00 | 873.00 |
| Israel | 799,118.00 | 969,404.00 | 824,602.00 | 812,739.00 | 878,713.00 | 780,426.00 |
| Jamaica | 3,634.00 | 3,325.00 | 676.00 | 2,410.00 | 1,647.00 | 2,442.00 |
| Japan | 353.00 | 417.00 | 271.00 | 319.00 | 162.00 | 184.00 |
| Kenya | | | 9.00 | | 35.00 | 0.00 |
| Lao People's Democratic Republic (Laos) | 52.00 | 2.00 | | | 20.00 | 1.00 |
| Madagascar | 3.00 | 26.00 | 12.00 | 7.00 | 22.00 | 2.00 |
| Malaysia | 4.00 | 39.00 | 83.00 | 8.00 | | |
| Mexico | 570,403.00 | 553,819.00 | 589,021.00 | 443,744.00 | 349,649.00 | 184,532.00 |
| Nepal | | 1,170.00 | | | | 1.00 |
| New Zealand | 0.00 | 13.00 | 205.00 | 355.00 | 0.00 | 0.00 |
| Nigeria | | | 0.00 | 0.00 | 200.00 | |
| Pakistan | | | 2.00 | 1.00 | | 272.00 |
| Philippines | | | 0.00 | 8.00 | 0.00 | |
| South Africa | 5,278,831.00 | 5,802,018.00 | 6,381,125.00 | 6,196,838.00 | 7,830,148.00 | 7,941,164.00 |
| Taiwan | 157.00 | | | | 0.00 | |
| Tanzania, United Republic of | 180.00 | 190.00 | 144.00 | 36.00 | 76.00 | 132.00 |
| Thailand | 426.00 | 1,283.00 | 660.00 | 625.00 | 195.00 | 245.00 |
| Tunisia | 175,011.00 | 172,516.00 | 125,258.00 | 133,950.00 | 75,620.00 | 115,587.00 |

| Country | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|
| Uganda | 4.00 | 4.00 | 7.00 | 7.00 | 12.00 | 9.00 |
| United States | 301,229.00 | 231,210.00 | 185,707.00 | 177,755.00 | 148,609.00 | 113,949.00 |
| Venezuela, Bolivarian Republic of | 744.00 | 2,216.00 | 681.00 | | | |
| Zimbabwe | 297,551.00 | 328,595.00 | 397,906.00 | 348,303.00 | 391,869.00 | 434,497.00 |

**Table C.2:** Fresh or dried avocados (CN code: 080440) imported in 100 kg into the EU (27) from regions where *Pulvinaria psidii* is known to occur (Source: Eurostat accessed on 18/2/2022)

| Country | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|
| Angola | | | 3.85 | | 3.54 | |
| Australia | | | | 0.01 | | 0.31 |
| Brazil | 44,357.36 | 71,040.50 | 68,697.61 | 78,673.73 | 48,183.83 | 50,803.63 |
| Congo, Democratic Republic of | 0.66 | 1.47 | 0.10 | 0.65 | | 5.96 |
| China | 193.97 | 35.28 | | 1.23 | 0.04 | 0.12 |
| Colombia | 152,115.55 | 210,139.60 | 251,050.33 | 387,367.23 | 663,148.97 | 852,152.72 |
| Costa Rica | | 21.56 | 9.98 | 428.45 | 686.40 | 201.60 |
| Cuba | 109.09 | 73.94 | 41.53 | 131.08 | 34.33 | 56.00 |
| Dominican Republic | 53,962.41 | 55,001.50 | 52,897.18 | 95,531.91 | 100,024.05 | 104,078.68 |
| Algeria | | | | | | 0.52 |
| Ecuador | 5.27 | 1,052.41 | 1,264.87 | 2,314.26 | 1,763.14 | 3,368.06 |
| Ghana | 18.48 | 134.58 | 22.64 | 40.45 | 21.88 | 15.33 |
| Guatemala | 46.60 | 4,291.98 | 7,487.42 | 17,084.09 | 15,383.92 | 24,717.30 |
| Indonesia | | | | | | 0.02 |
| Israel | 301,123.91 | 424,267.97 | 370,378.23 | 437,318.01 | 345,664.24 | 451,393.77 |
| India | 0.04 | 2.06 | 0.52 | 0.06 | | 2.35 |
| Kenya | 228,426.16 | 243,947.31 | 404,593.87 | 346,231.90 | 435,308.72 | 487,575.86 |
| Madagascar | | | | | 0.96 | 1.11 |
| Mexico | 503,687.52 | 445,611.06 | 463,741.28 | 767,878.48 | 716,092.02 | 750,720.48 |
| Malaysia | 0.03 | | 47.04 | | | 0.04 |
| Nigeria | 1.06 | 3.15 | 3.18 | 0.51 | | |
| New Zealand | 0.85 | 0.61 | | | 0.03 | |
| Philippines | | | | | 0.05 | |
| Thailand | 3.68 | 9.76 | 9.66 | 9.06 | 3.39 | 25.85 |
| Tanzania | 26,823.05 | 25,773.58 | 55,517.16 | 60,480.96 | 50,769.74 | 56,339.46 |
| Uganda | 1,912.57 | 2,195.25 | 2,233.81 | 3,364.25 | 3,575.68 | 3,343.38 |
| United States | 8,819.53 | 1.19 | 2,546.86 | 0.02 | 4.66 | 45.38 |
| Venezuela | 0.09 | 233.40 | 111.12 | 71.29 | | |
| South Africa | 419,768.89 | 315,854.56 | 652,817.98 | 401,352.79 | 416,290.22 | 417,357.70 |
| Zimbabwe | 13,030.06 | 20,378.85 | 36,539.24 | 32,020.52 | 38,872.63 | 27,696.56 |

**Table C.3:** Fresh or dried guavas, mangoes and mangosteens (CN code: 080450) imported in 100 kg into the EU (27) from regions where *Pulvinaria psidii* is known to occur (Source: Eurostat accessed on 18/2/2022)

| Country | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|
| Angola | | | 486.65 | 658.15 | 351.50 | 522.66 |
| Antigua and Barbuda | | | 193.61 | | | |
| Australia | 25.72 | 94.18 | 62.92 | | | 0.01 |
| Bangladesh | 438.53 | 256.66 | 331.27 | 310.73 | 323.91 | 1,538.10 |
| China | 38.95 | 51.87 | 180.81 | 78.23 | 104.34 | 248.77 |
| Colombia | 2,321.38 | 2,553.75 | 3,139.67 | 6,833.02 | 4,131.75 | 5,218.98 |
| Congo, Democratic Republic of | 0.50 | 0.12 | 3.45 | 0.41 | | 7.13 |
| Costa Rica | 17,281.13 | 19,119.58 | 18,368.68 | 12,830.62 | 14,950.59 | 22,697.44 |
| Cuba | 117.98 | 216.57 | 14.36 | 103.34 | 230.60 | 135.11 |
| Dominican Republic | 96,728.22 | 85,119.28 | 105,553.46 | 118,508.00 | 110,481.33 | 160,995.72 |
| Ecuador | 20,830.01 | 13,840.91 | 9,491.23 | 9,608.87 | 10,660.02 | 7,684.59 |
| Ghana | 8,896.27 | 9,114.51 | 10,672.35 | 11,138.06 | 30,296.55 | 15,258.17 |
| Guatemala | 5,124.01 | 9,771.98 | 25,768.70 | 10,953.40 | 8,099.52 | 6,680.24 |
| Haiti | | | 4.87 | | | |
| India | 5,989.34 | 8,148.87 | 9,470.36 | 9,315.51 | 7,347.61 | 16,575.69 |
| Indonesia | 1,981.20 | 2,004.36 | 2,926.64 | 2,386.27 | 1,406.94 | 1,629.72 |
| Israel | 143,726.08 | 140,551.30 | 108,353.48 | 121,875.16 | 98,143.59 | 124,186.49 |
| Japan | 0.66 | | | | 0.01 | 7.66 |
| Kenya | 232.06 | 4.08 | 65.09 | 10.30 | 66.53 | 1,497.12 |
| Laos | 753.34 | 620.36 | 603.14 | 806.50 | 525.32 | 285.98 |
| Madagascar | 246.94 | 22.10 | 15.02 | 0.66 | 1.05 | 20.64 |
| Malaysia | 289.86 | 197.22 | 170.64 | 72.72 | 44.56 | 19.01 |
| Mexico | 35,095.07 | 40,848.36 | 46,001.68 | 50,935.79 | 51,841.89 | 46,655.48 |
| New Zealand | 0.01 | 0.08 | 0.09 | 0.07 | 0.10 | 0.22 |
| Nigeria | 0.78 | 0.10 | 1.13 | 1.95 | 0.03 | 28.59 |
| Pakistan | 17,149.78 | 15,912.58 | 21,867.43 | 29,207.33 | 16,196.50 | 19,707.93 |
| Philippines | 1,028.05 | 519.88 | 795.56 | 368.97 | 128.10 | 152.74 |
| South Africa | 8,550.13 | 13,015.45 | 9,739.99 | 12,116.95 | 8,656.28 | 5,777.97 |
| Taiwan | | | 3.48 | 17.34 | 0.92 | 5.28 |
| Tanzania | | | 0.50 | 1.14 | | 0.09 |
| Thailand | 6,460.81 | 7,401.80 | 6,911.89 | 6,743.92 | 5,260.84 | 4,918.89 |
| Tunisia | 0.08 | | | | | 0.01 |
| Uganda | 257.30 | 452.71 | 360.01 | 662.25 | 389.56 | 669.01 |
| United States | 78,874.11 | 45,478.21 | 54,660.34 | 82,580.54 | 82,852.21 | 51,111.18 |
| Venezuela | 2,917.57 | 2,033.75 | 2,401.44 | 1,939.11 | 282.69 | 522.30 |

**Table C.4:** Tomatoes, fresh or chilled (CN code: 05440) imported in 100 kg into the EU (27) from regions where *Pulvinaria psidii* is known to occur (Source: Eurostat accessed on 18/2/2022)

| Country | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|
| Angola | | 0.18 | | | | |
| Australia | | | | 2.52 | | |
| Brazil | | 27.60 | | | | |
| Colombia | | | | 2,828.76 | 236.09 | 689.58 |
| Costa Rica | 1,323.84 | 3,068.81 | 1,227.34 | 343.97 | 287.90 | 221.82 |
| Dominican Republic | 19,550.87 | 21,840.02 | 19,688.19 | 15,920.89 | 17,237.85 | 12,557.61 |

| Country | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|
| Egypt | 9,135.43 | 14,023.94 | 15,102.55 | 18,876.68 | 9,491.42 | 4,133.46 |
| Ghana | | | | | | 1.60 |
| India | | | | 0.01 | | 0.79 |
| Israel | 16,739.21 | 10,861.22 | 6,392.59 | 782.65 | 138.00 | 913.18 |
| Japan | 13.75 | 8.98 | 13.31 | 45.67 | 34.37 | 2.49 |
| Madagascar | 7.31 | | 40.00 | | | |
| Malaysia | | | | | | 0.04 |
| Philippines | | | | | | 5.23 |
| Mexico | | | | | 0.80 | |
| Thailand | 0.08 | 0.08 | 0.08 | 0.02 | 0.02 | 0.04 |
| Tunisia | 101,703.12 | 101,127.84 | 149,456.18 | 162,662 | 186,037.72 | 208,140.48 |
| Uganda | | 0.12 | | | | |
| United States | | | 0 | 0.04 | 0.13 | 0.42 |

**Table C.5:** Fresh or chilled sweet peppers (CN code: 07096010) imported in 100 kg into the EU (27) from regions where *Pulvinaria psidii* is known to occur (Source: Eurostat accessed on 18/2/2022)

| Country | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|
| Algeria | 107.77 | 204.47 | 142.72 | 145.58 | | 98.25 |
| Angola | | 0.10 | | | | |
| China | | | | 100.00 | | |
| Costa Rica | | 58.24 | | | | |
| Cuba | | | | 3.00 | | |
| Dominican Republic | 159.01 | 197.94 | 424.55 | 475.10 | 147.33 | 73.11 |
| Ecuador | | | | | 0.25 | |
| Ghana | | | | | | 0.49 |
| India | 1,479.22 | 1,511.72 | 824.40 | 2,989.78 | 1,692.78 | 758.98 |
| Indonesia | | | | | | 0.47 |
| Israel | 219,675.87 | 190,775.79 | 175,658.87 | 127,218.53 | 79,714.19 | 87,683.00 |
| Japan | 1.27 | 3.38 | 0.00 | 3.75 | | |
| Kenya | 0.16 | | 223.20 | 226.46 | 124.77 | 112.97 |
| Laos | | 351.15 | 1,037.85 | 722.85 | | 0.72 |
| Madagascar | 2.94 | 0.47 | | | 9.21 | |
| Mexico | 20.44 | | 9.50 | 118.43 | 75.11 | 16.30 |
| Nigeria | 0.55 | | | | 3.44 | 7.58 |
| Pakistan | 124.66 | 32.60 | 100.14 | 335.62 | 119.65 | 82.63 |
| South Africa | 77.49 | 72.55 | 69.52 | 26.50 | 3.92 | 3.45 |
| Sri Lanka | 24.29 | 1.25 | 26.80 | 39.37 | | |
| Thailand | 1.02 | 24.78 | 35.45 | 24.90 | 0.00 | |
| Tunisia | 1,929.28 | 3,557.67 | 6,724.86 | 3,608.72 | 9,916.08 | 15,911.61 |
| Uganda | 228.10 | 122.50 | 729.69 | 345.48 | 622.64 | 839.89 |
| United States | | | | | 0.09 | |

## Appendix D – Interceptions reported by USA

Miller et al. (2014) reports interceptions of *P. psidii* from several countries on a variety of host genera, as listed below.

| Country | Host |
|---|---|
| Antigua | *Chalcas* |
| Australia | *Ixora, Litchi* |
| Bahamas | *Gardenia, Psidium* |
| Barbados | *Euonymus, Psychotria* |
| Bermuda | *Bryophyllum, Campsis, Codiaeum, Duranta, Laurus, Nerium, Pittosporum, Rhododendron, Sedum, Tecoma* |
| Brazil | *Mammea* |
| China | *Dracontomelon, Gardenia, Lansium, Litchi* |
| China - Hong Kong | *Litchi* |
| Colombia | *Citrus, Eugenia* |
| Costa Rica | *Anthurium, Coffea, Gardenia* |
| Cuba | *Ficus, Litchi, Psidium* |
| Fiji | *Ixora* |
| Guatemala | *Dracaena* |
| India | *Coffea, Litchi, Psidium* |
| Indonesia | *Lagerstroemia, Myristica, Thea* |
| Jamaica | *Anthurium, Bidens, Citrus, Mangifera, Myristica, Phaeomena, Punica* |
| Japan | *Gardenia, Litchi* |
| Maldives | *Annona, Psidium* |
| Mexico | *Carissa, Chenopodium, Citrus, Diospyros, Ficus, Gardenia, Litchi, Plumeria, Psidium, Rhus, Zingiber* |
| Montserrat | *Psidium* |
| Panama | *Anthurium, Tectona* |
| Peru | *Mangifera* |
| The Philippines | *Eugenia, Gardenia, Lansium, Litchi, Psidium, Vanda* |
| Puerto Rico | *Gardenia* |
| Samoa | *Cordyline* |
| Singapore | *Nephelium* |
| Tahiti | *Alpinia, Annona, Gardenia* |
| Taiwan | *Dimocarpus* |
| Thailand | *Cordyline, Dracaena, Eugenia, Nephelium* |
| Trinidad | *Anthurium, Gardenia* |