Adopted: 19 June 2024

DOI: 10.2903/j.efsa.2024.8888

efsa JOURNAL

SCIENTIFIC OPINION

Pest categorisation of *Ceroplastes rubens*

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Abstract

The European Commission requested the EFSA Panel on Plant Health to conduct a pest categorisation of *Ceroplastes rubens* Maskell (Hemiptera: Coccidae), following the commodity risk assessments of *Acer palmatum* plants grafted on *A. davidii* and *Pinus parviflora* bonsai plants grafted on *P. thunbergii* from China, in which *C. rubens* was identified as a pest of possible concern to the European Union (EU). The pest, which is commonly known as the pink, red or ruby wax scale, originates in Africa and is highly polyphagous attacking plants from more than 193 genera in 84 families. It has been present in Germany since 2010 in a single tropical glasshouse. It is known to attack primarily tropical and subtropical plants, but also other host plants commonly found in the EU, such as *Malus sylvestris*, *Prunus* spp., *Pyrus* spp. and ornamentals. It is considered an important pest of *Citrus* spp. The pink wax scale reproduces mainly parthenogenetically, and it has one or two generations per year. Fecundity ranges from 5 to 1178 eggs. Crawlers settle usually on young twigs and later stages are sessile. All life stages of *C. rubens* egest honeydew on which sooty mould grows. Host availability and climate suitability suggest that parts of the EU would be suitable for establishment. Plants for planting and cut branches provide the main pathways for entry. Crawlers could spread over short distances naturally through wind, animals, humans or machinery. *C. rubens* could be dispersed more rapidly and over long distances via infested plants for planting for trade. The introduction of *C. rubens* into the EU could lead to outbreaks causing damage to orchards, amenity ornamental trees and shrubs. Phytosanitary measures are available to inhibit the entry and spread of this species. *C. rubens* satisfies the criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest.

KEYWORDS

citrus, Coccidae, pest risk, plant health, plant pest, quarantine, ruby wax scale

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

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

1.3 | Additional information

This pest categorisation was initiated following the commodity risk assessments of *Acer palmatum* plants grafted on *A. davidii* from China (EFSA PLH Panel, 2022a) and of bonsai plants from China consisting of *Pinus parviflora* grafted on *P. thunbergii* (EFSA PLH Panel, 2022b), in which *C. rubens* was identified as a relevant non-regulated pest which could potentially enter the EU on *Acer* spp. and *Pinus* spp. plants for planting.

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 NPPO of any relevant MS. To obtain information on the official pest status for *C. rubens*, EFSA contacted the NPPOs of Germany and Hungary in February and March 2024.

2.1.2 | Literature search

A literature search on *C. rubens* 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 European and Mediterranean Plant Protection Organization (EPPO) Global Database (EPPO, online), the CABI databases and scientific literature databases as referred above in Section 2.1.1.

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

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

GenBank was searched to determine whether it contained any nucleotide sequences for *Ceroplastes rubens* 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 *C. rubens*, following guiding principles and steps presented in the EFSA guidance on quantitative pest risk assessment (EFSA PLH Panel, 2018), the EFSA guidance on the use of the weight of evidence approach in scientific assessments (EFSA Scientific Committee, 2017) and the International Standards for Phytosanitary Measures No. 11 (FAO, 2013).

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

The Panel's conclusions are formulated respecting its remit and particularly with regard to the principle of separation between risk assessment and risk management (EFSA founding regulation (EU) No 178/2002); therefore, instead of determining whether the pest is likely to have an unacceptable impact, deemed to be a risk management decision, the Panel will present a summary of the observed impacts in the areas where the pest occurs, and make a judgement about potential likely impacts in the EU. 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 quarantine pest status. Assessing social impact is outside the remit of the Panel.

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

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 *Ceroplastes rubens* Maskell is the accepted name.

Ceroplastes rubens Maskell (1893) is an insect within the order Hemiptera and family Coccidae, commonly known as the pink, red or ruby wax scale (EPPO, online; García Morales et al., 2016).

C. rubens was originally described by Maskell (1893), from material collected from *Mangifera indica* (mango) and *Ficus* sp. in Queensland, Australia (García Morales et al., 2016). *Ceroplastes rubens minor* Maskell (1897) is a synonym (García Morales et al., 2016).

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

3.1.2 | Biology of the pest

C. rubens completes its life cycle in three developmental stages (egg, nymph and adult). The female passes through four nymphal instars and the male through five (Malumphy, 2014). Adult females deposit their eggs in a mass beneath their concave ventral surface (Waterhouse & Sands, 2001). First-instar nymphs, known as crawlers, usually settle at or near the leaf veins (Blumberg, 1935; Waterhouse & Sands, 2001), however, in a study of *Citrus unshiu* in Japan, crawlers showed a preference for settling on new season twigs (Itioka & Inoue, 1991). At the end of the first-instar stage, a wax shell cover is formed on their body. This wax shell becomes larger and thicker with the subsequent growth of the nymph, protecting it against predators, parasitoids and desiccation (Itioka, 1993; Itioka & Inoue, 1991; Sands, 1984). *C. rubens* egests honeydew throughout its lifetime, attracting some ant species for foraging, and rarely wasps and flies (Malumphy, 2014). Honeydew droplets accumulate on leaves, twigs and on the scale colonies (Itioka & Inoue, 1996). This honeydew provides a medium for the growth of sooty mould fungus (Hodges et al., 2001).

Table 2 summarises key features of the biology of each life stage.

The pest is either univoltine (e.g. in China, Japan and southern New South Wales of Australia) or bivoltine (e.g. in South Africa, northern New South Wales and Queensland of Australia) (Berry, 2014; Itioka & Inoue, 1996; Malumphy et al., 2018; Smith, 1976). The duration of the life cycle varies based on the season. In Australia, summer generation can last from 4 to 6 months, while in winter from 6 to 8 months (Blumberg, 1935). According to Blumberg (1935), newly hatched nymphs do not survive after 4 or 5 days without food, while adults can produce eggs after 40–46 days of starvation.

[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 (EPPO, 2019; Griessinger & Roy, 2015)

TABLE 2 Important features of the life history strategy of *Ceroplastes rubens*.

Life stage	Phenology and relation to host	Other relevant information
Egg	Fecundity ranged from 5 to 1178 eggs in Australia, and from 500 to 800 in China (Loch & Zalucki, 1997; Lu & Jiang, 2015). Hatching occurs after 2–3 days of oviposition (Itioka & Inoue, 1991)	
Nymph	Found on twigs, usually young twigs (0–1-year-old) and leaves (especially the upper surface across or on the leaf veins) (Waterhouse & Sands, 2001). In southern New South Wales of Australia and China, first emergence of crawlers occurs during late spring, in Japan in early summer and in South Africa and northern New South Wales and Queensland of Australia early spring (Bi et al., 2022; Itioka & Inoue, 1996; Prinsloo & Uys, 2015; Waterhouse & Sands, 2001). In Japan, second- and third-instar nymphs emerge in mid-summer and late summer, respectively (Itioka & Inoue, 1996)	The crawlers have well-developed legs and are mobile. After hatching the crawlers settle to feed within 6 h. After settling, they do not move further than this point and tend to form aggregations around the adult female (Waterhouse & Sands, 2001)
Adult	Adults are found on leaves, branches and stems of host plants (Malumphy, 2014). Hill (2008) reported that *C. rubens* may cover shoots, fruit stalks and parts of the fruits. In Japan, adult females overwinter and begin to oviposit from early to mid-July for a 20 day-period (Itioka & Inoue, 1996). Reproduction is mainly parthenogenic (Waterhouse & Sands, 2001). However, in Shanghai where males are more common, it is reported that the pest reproduces sexually and overwinter as fertilised females (Lu & Jiang, 2015; Xia et al., 2005)	Males were rarely identified in Japan and never in Australia (Hamon & Williams, 1984; Itioka & Inoue, 1996; Qin & Gullan, 1994)

3.1.3 | Host range/species affected

C. rubens is a highly polyphagous pest, feeding on plants in more than 193 genera in 84 plant families (García Morales et al., 2016). It attacks primarily tropical and subtropical plants but additionally *Malus sylvestris*, *Prunus* spp., *Pyrus* spp. and ornamentals (Malumphy, 2010). The insect has also been reported as a pest of *Pinus* spp., specifically found on seedlings in nurseries (Waterhouse & Sands, 2001) and in seed orchards (Merrifield & Howcroft, 1975). According to Summerville (1935), *C. rubens* is an important pest of *Citrus* spp., mainly mandarin (*Citrus reticulata*) and Washington navel orange (*Citrus* × *aurantium* var. *sinensis*, CRC 1241A). It is occasionally found on other *Citrus* species, while rarely on grapefruit (*Citrus* × *aurantium* var. *paradisi*) and lemon (*Citrus* × *limon*). The full host list is presented in Appendix A.

3.1.4 | Intraspecific diversity

No intraspecific diversity is reported for this species.

3.1.5 | Detection and identification of the pest

Are detection and identification methods available for the pest?

Yes, there are methods available for detection and morphological identification of *C. rubens*.

Symptoms and Detection

Symptoms of infestation include deposition of sugary honeydew, which fouls plant surfaces (usually leaves and fruits). This honeydew provides a medium for the growth of sooty mould fungus on leaves, reducing the active photosynthetic area (Hodges et al., 2001). Heavy infestations of wax scales can cause leaf discoloration and premature drop, branch dieback and even plant death. Therefore, they cause loss of production and reduce the aesthetic value of the crop or the produce (Malumphy, 2014; Vithana et al., 2019). Symptoms on *Pinus* spp. are more distinctive, *C. rubens* affects mainly the upper crown needles leading to sparse and dark foliage covered by sooty-mould and reduced height (Merrifield & Howcroft, 1975). Scales can be detected by visual inspection on leaves by their thick wax layer forming a pentagonal or amorphous shape (CABI, online). Usually, they settle on the upper side along the leaf-veins and stems (Malumphy, 2014).

Identification

The identification of *C. rubens* requires microscopic examination and verification of the presence of key morphological characteristics. Detailed morphological descriptions, illustrations and keys to adult and nymphal instars of *C. rubens*

can be found in Borchsenius (1957), Gimpel et al. (1974), Hodgson (1994), Qin and Gullan (1994), Tang (1991) and Ben-Dov et al. (2000).

Molecular diagnostic protocols for *C. rubens* identification such as sequences from the DNA barcode region of the mitochondrial COI gene have been suggested by Deng et al. (2012), Wang et al. (2015) and Lu et al. (2023).

When Genbank was searched on 22 March 2024, there were 126 gene nucleotide sequences of *C. rubens* (https://www.ncbi.nlm.nih.gov/datasets/taxonomy/536005/).

Description

Eggs

Eggs are pink, usually found in masses in a cavity under the female body, protected by the waxy test (Vithana et al., 2019; Waterhouse & Sands, 2001).

Nymphs

First-instar nymphs are mobile and pink, with three pairs of legs, eyespots and antennae (Prinsloo & Uys, 2015; Vithana et al., 2019). Within 24 h after settling, two pairs of white marginal points of wax appear. Within a week, a thick wax layer covers the general body surface and turns purple. After 15 days from settling, the dorsum appears purple producing small amounts of powdery white wax (Blumberg, 1935). Secretion of clumps of wax also occurs on the second- and third-instar nymphs which appear star-shaped (Vithana et al., 2019). The fourth-instar nymphs usually do not migrate further (Waterhouse & Sands, 2001). A detailed morphological description and illustration of all four instars is provided by Blumberg (1935).

Adults

Adult females are covered in a dense layer of watery wax which varies in colour from white, cream, pink (Figure 1A), reddish or even brownish. It is strongly convex, longer than wide, pentagonal in dorsal view, and with two conspicuous pairs of white bands that extend dorsally from the anterior margin and halfway along the body; female wax cover length 3.5–4.5 mm. Adult *C. rubens* can usually be recognised in life by the presence of these white bands, particularly by the anterior bands which often almost touch each other. Immature males form a whitish translucent, elongate, oval scale (Malumphy & Eyre, 2011; Figure 1B).

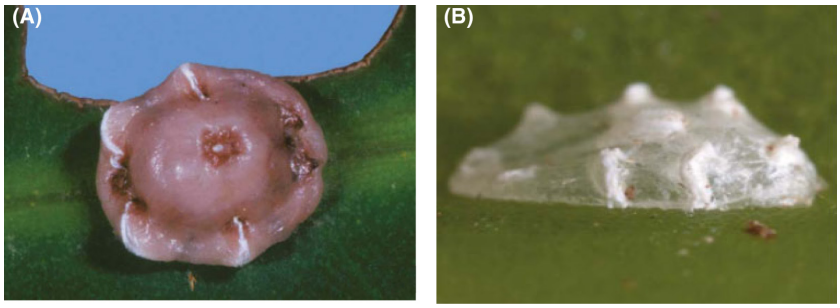

FIGURE 1 *Ceroplastes rubens* (A) Adult female (©Kondo, 2008) and (B) Male cover on *Aglaonema* from Sri Lanka (©Fera).

3.2 | Pest distribution

3.2.1 | Pest distribution outside the EU

C. rubens is of African origin (Waterhouse & Sands, 2001). It is widely distributed in south Asia, Australia (except Tasmania), India, South Pacific, East Africa and the Carribean (Figure 2). It has also been reported from the USA, from Florida and Hawaii. Usually when found in temperate climates, it is present in protected environment, e.g. greenhouses or tropical gardens (Hodgson, 1994). The list of countries where the presence of *C. rubens* is reported is shown in detail in Appendix B.

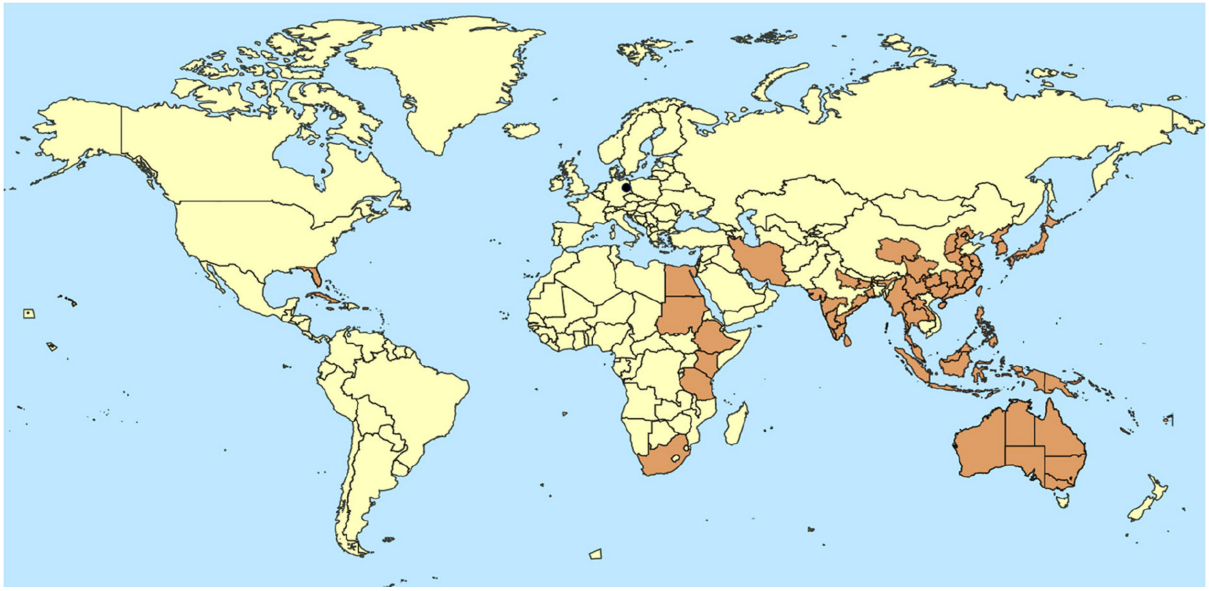

FIGURE 2 Global distribution of *Ceroplastes rubens* (Source: EPPO Global Database (EPPO, online), CABI CPC (CABI, online) and García Morales et al. (2016) accessed on 3 January 2024 and literature; for details, see Appendix B. In EU (Germany) one location point appears in the map, as *C. rubens* was found in a tropical indoor garden and has not been established further.

3.2.2 | Pest distribution in the EU

Is the pest present in the EU territory?

Yes, *C. rubens* is present *at one location* in Germany.

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.

C. rubens has restricted distribution in the EU; It has only been reported in a tropical greenhouse in Germany (Brandenburg) in 2010 and is still considered to be present but has not established further.

In Germany, *C. rubens* was collected from a tropical greenhouse in Brandenburg from *Aglaonema* sp. plants in 2010 (Schönfeld, 2015). According to the official reply by the German NPPO '*The finding of* Ceroplastes rubens *on* Aglaonema *sp. in a Tropical Hall in the federal state of Brandenburg in 2010 has remained unique for Germany and no official measures against this pest have been considered.*' The pest status in Germany has been declared as '*Present, at one location*'.

In Hungary, *C. rubens* was collected from *Schefflera* sp. in a botanical garden in Budapest, in 2012 (Fetyko & Kozar, 2012). The Hungarian NPPO has declared its status as: '*Absent, confirmed by survey*'.

3.3 | Regulatory status

3.3.1 | Commission Implementing Regulation 2019/2072

C. rubens is not listed in Annex II of Commission Implementing Regulation (EU) 2019/2072, an implementing act of Regulation (EU) 2016/2031. It is not known to be in any emergency EU plant health legislation either.

3.3.2 | Hosts or species affected that are prohibited from entering the union from third countries

A number of *C. rubens* hosts are prohibited from entering the EU (Table 3).

TABLE 3 List of plants, plant products and other objects that are *Ceroplastes rubens* 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**
1.	Plants of […]., *Cedrus* Trew, […] *Pinus* L., […] other than fruit and seeds	ex 0602 20 20 ex 0602 20 80 ex 0602 90 41 ex 0602 90 45 ex 0602 90 46 ex 0602 90 47 ex 0602 90 50 ex 0602 90 70 ex 0602 90 99 ex 0604 20 20 ex 0604 20 40	Third countries other than Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canary Islands, Faeroe Islands, Georgia, Iceland, Liechtenstein, Moldova, Monaco, Montenegro, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo- Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Türkiye, Ukraine and the United Kingdom
2.	Plants of […] *Quercus* L., with leaves, other than fruit and seeds	ex 0602 10 90 ex 0602 20 20 ex 0602 20 80 ex 0602 90 41 ex 0602 90 45 ex 0602 90 46 ex 0602 90 48 ex 0602 90 50 ex 0602 90 70 ex 0602 90 99 ex 0604 20 90 ex 1404 90 00	Third countries other than Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canary Islands, Faeroe Islands, Georgia, Iceland, Liechtenstein, Moldova, Monaco, Montenegro, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo- Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Türkiye, Ukraine and the United Kingdom
8.	Plants for planting of *Chaenomeles* Ldl., […] *Malus* Mill., *Prunus* L., *Pyrus* L. […] other than dormant plants free from leaves, flowers and fruits	ex 0602 10 90 ex 0602 20 20 ex 0602 20 80 ex 0602 40 00 ex 0602 90 41 ex 0602 90 45 ex 0602 90 46 ex 0602 90 47 ex 0602 90 48 ex 0602 90 50 ex 0602 90 70 ex 0602 90 91 ex 0602 90 99	Third countries other than Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canary Islands, Faeroe Islands, Georgia, Iceland, Liechtenstein, Moldova, Monaco, Montenegro, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo- Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Türkiye, Ukraine and the United Kingdom
9.	Plants for planting of […] *Malus* Mill., *Prunus* L. and *Pyrus* L. and their hybrids, and […] other than seeds	ex 0602 10 90 ex 0602 20 20 ex 0602 90 30 ex 0602 90 41 ex 0602 90 45 ex 0602 90 46 ex 0602 90 48 ex 0602 90 50 ex 0602 90 70 ex 0602 90 91 ex 0602 90 99	Third countries other than Albania, Algeria, Andorra, Armenia, Australia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canada, Canary Islands, Egypt, Faeroe Islands, Georgia, Iceland, Israel, Jordan, Lebanon, Libya, Liechtenstein, Moldova, Monaco, Montenegro, Morocco, New Zealand, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo-Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo- Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Syria, Tunisia, Türkiye, Ukraine, the United Kingdom (1) and United States other than Hawaii
11.	Plants of *Citrus* L., […] *Poncirus* Raf., and their hybrids, other than fruits and seeds	ex 0602 10 90 ex 0602 20 200,602 20 30 ex 0602 20 80 ex 0602 90 45 ex 0602 90 46 ex 0602 90 47 ex 0602 90 50 ex 0602 90 70 ex 0602 90 91 ex 0602 90 99 ex 0604 20 90 ex 1404 90 00	All third countries

TABLE 3 (Continued)

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 ex 0602 90 41 ex 0602 90 45 ex 0602 90 46 ex 0602 90 47 ex 0602 90 48 ex 0602 90 50 ex 0602 90 70 ex 0602 90 91 ex 0602 90 99	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 ex 0602 90 30 ex 0602 90 45 ex 0602 90 46 ex 0602 90 48 ex 0602 90 50 ex 0602 90 70 ex 0602 90 91 ex 0602 90 99	Third countries other than: Albania, Algeria, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canary Islands, Egypt, Faeroe Islands, Georgia, Iceland, Israel, Jordan, Lebanon, Libya, Liechtenstein, Moldova, Monaco, Montenegro, Morocco, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo-Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Syria, Tunisia, Türkiye, Ukraine and the United Kingdom

Points to note from Table 3: Although a number of host genera are prohibited from entering into the EU, some are permitted from the United States and Egypt (i.e. item 9, Plants for planting of *Malus* Mill., *Prunus* L. and *Pyrus* L.) where *C. rubens* occurs. However, *Malus* Mill. and *Prunus* L. fall under the high risk plant legislation (Regulation (EU) 2018/2019; see below), excluding *Pyrus* L. Also, *Photinia* spp. (i.e. item 12) and Solanaceae (i.e. item 18) are permitted from several countries where *C. rubens* is present.

The following *C. rubens* host genera are listed in Commission Implementing Regulation (EU) 2018/2019 as high-risk plants for planting, whose introduction into the Union is prohibited pending risk assessment other than as seeds, in vitro material or naturally or artificially dwarfed woody plants: *Acacia* Mill., *Acer* L., *Annona* L., *Bauhinia* L., *Diospyros* L., *Ficus carica* L., *Ligustrum* L., *Malus* Mill., *Persea* Mill., *Prunus* L., *Quercus* L.

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, *C. rubens* could re-enter the EU via the import of host plants for planting (excluding seed and pollen) or on cut branches and occasionally on fruits.

Comment on plants for planting as a pathway.

Plants for planting provide the most likely pathway for entry into, and spread within, the EU.

Table 4 provides broad descriptions of potential pathways for the entry of *C. rubens* into the EU.

TABLE 4 Potential pathways for *Ceroplastes rubens* into the EU.

Pathways Description (e.g. host/intended use/source)	Life stage	Relevant mitigations [e.g. prohibitions (Annex VI), special requirements (Annex VII) or phytosanitary certificates (Annex XI) within Implementing Regulation 2019/2072]
Plants for planting (dormant/without leaves) (excluding seed)	All life stages	Plants for planting that are hosts of *C. rubens* and are prohibited from third countries (Regulation 2019/2072, Annex VI) are listed in Table 3 Some hosts are considered high-risk plants (Regulation EU 2018/2019) for the EU and their import is prohibited subject to risk assessment
Plants for planting (with buds or leaves; excluding seed)	All life stages	Plants for planting that are hosts of *C. rubens* and are prohibited from third countries (Regulation 2019/2072, Annex VI) are listed in Table 3 Some hosts are considered high-risk plants (Regulation EU 2018/2019) for the EU and their import is prohibited subject to risk assessment

(Continues)

TABLE 4 (Continued)

Pathways Description (e.g. host/intended use/source)	Life stage	Relevant mitigations [e.g. prohibitions (Annex VI), special requirements (Annex VII) or phytosanitary certificates (Annex XI) within Implementing Regulation 2019/2072]
Cut branches	All life stages	Annex XI (Part A) prohibitions apply for several host plants on foliage, branches and other parts of plants without flowers or flower buds, being goods of a kind suitable for bouquets or for ornamental purposes, fresh
Fruits	All life stages	Fruits from third countries require a phytosanitary certificate to be imported into the EU (2019/2072, Annex XI, Part A)

When host plants are heavily infested, fruits can also be affected but considered as a rare pathway. At this level of infestation, the fruit would be highly deteriorated due to sooty mould formation and would be rejected. The most likely pathway for the scale is plants for planting as first instars are found on leaves, buds or twigs, feeding on the phloem. The detection is difficult at this stage, especially when the insect density is low (Malumphy, 2011). Appendix A lists the hosts of *C. rubens*. Some hosts are prohibited from entering the EU (see Section 3.3.2).

Annual imports of *C. rubens* hosts from countries where the pest is known to occur are provided in Table 5 and in details in Appendix C.

TABLE 5 EU annual imports of some *Ceroplastes rubens* host plants from countries where *C. rubens* is present, 2018–2022 (tonnes) Source: Eurostat accessed on 3 April 2024

Commodity	HS code	2018	2019	2020	2021	2022
***Citrus* fruit, fresh or dried**	0805	10,253,519.58	9,715,660.50	11,947,564.03	12,146,801.25	11,022,256.45
Dates, figs, pineapples, avocados, guavas, mangoes and mangosteens, fresh or dried	0804	1,908,286.43	1,770,016.69	2,150,888.07	2,457,622.93	2,275,588.71
Indoor rooted cuttings and young plants (excl. cacti)	06029070	73,129.84	99,021.59	73249.58	85,712.39	41,868.17
Fresh persimmons	081070	212.05	7858.49	4991.91	5596.43	11,192.33

Notifications of interceptions of harmful organisms began to be compiled in Europhyt in May 1994 and in TRACES in May 2020. As of 05 January 2024, there were two interceptions of *Ceroplastes* sp., in 2012 and 2014, on *Ficus macrocarpa* (bonsai plants for planting or already planted) originating from China. In 2018, one interception of *C. rubens* was recorded on bonsai *Ilex* sp. plants for planting also from China. According to Jansen (1995), *C. rubens* was intercepted in the Netherlands in 1978 on *Aglaonema* plants imported from Sri Lanka, and on *Podocarpus* plants from Taiwan.

In the UK, *C. rubens* has been intercepted several times throughout the years, from 1984 until 2007 on various host plants, mainly ornamentals, from Thailand and the USA (Malumphy, 2011). Between 1995 and 2012, *C. rubens* was intercepted 2321 times in the USA (Miller et al., 2014). A summary of the different interceptions recorded in the EU and UK is presented in Table 6.

TABLE 6 Summary of interceptions of *Ceroplastes rubens* and *Ceroplastes* sp. in the EU and the UK in 1978–2018.*

Year	Host plant	Country of entry	Country of origin	Reference
1978	*Aglaonema* sp.	Netherlands	Sri Lanka	Jansen (1995)
1978	*Podocarpus* sp.	Netherlands	Taiwan	Jansen (1995)
1984[1]	*Cycas* sp.	United Kingdom	Thailand	Malumphy (2011)
1999	*Dimocarpus longan*[2]	United Kingdom	Thailand	Malumphy (2010)
2002	*Rhaphidophora* sp.	United Kingdom	USA	Malumphy (2011)
2005	*Citrus hystrix*[2]	United Kingdom	Thailand	Malumphy (2011)
2005	*Aglaonema* sp.	United Kingdom	USA	Malumphy (2011)
2006	Various objects[3]	United Kingdom	New Zealand	Europhyt (online); TRACES (online)
2007	Unspecified aquatic plant	United Kingdom	Thailand	Malumphy (2010)
2012	*Ficus macrocarpa*[3]	Italy	China	Europhyt (online); TRACES (online)
2014	*Ficus macrocarpa*[3]	Spain	China	Europhyt (online); TRACES (online)
2018	*Ilex* sp.	Spain	China	Europhyt (online); TRACES (online)

*No interceptions were reported after this year.

[1]Intercepted eight times that year.

[2]Found on foliage.

[3]*Ceroplastes* sp.

3.4.2 | Establishment

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

Yes, biotic factors (host availability) and abiotic factors (climate suitability) suggest that parts of the EU would be suitable for establishment. Climate types found in countries where *C. rubens* occurs are also found in the EU.

Based on climate matching and host availability, large parts of the EU correspond to climate types that occur in countries where *C. rubens* occurs.

Climatic mapping is the principal method for identifying areas that could provide suitable conditions for the establishment of a pest taking key abiotic factors into account (Baker, 2002; Baker et al., 2000). Availability of hosts is considered in Section 3.4.2.1. Climatic factors are considered in Section 3.4.2.2.

3.4.2.1 | *EU distribution of main host plants*

Many genera and species of *C. rubens* host plants are present or widely grown across the EU (e.g. *Citrus* spp., *Ficus* spp., *Olea* sp., *Pinus* spp. *and Prunus* sp.; Table 7, Figure 3). Its polyphagous nature (Appendix A) and wide host availability in the EU would support establishment in the EU.

TABLE 7 Harvested area (1000 ha) of main host plants of *Ceroplastes rubens* in the EU. Source Eurostat (accessed on 4 January 2024).

Crops	Code	2018	2019	2020	2021	2022
Olives	O1000	5098.62	5071.59	5104	5008	4987
Oranges	T1000	273.64	271.97	275.27	274.88	277
Yellow lemons	T3100	78.06	76.37	80.76	82.17	84.21
Figs	F2100	24.99	25.59	27.64	25.81	26.28
Avocados	F2300	13.22	17.50	19.58	22.86	25.05
Bananas	F2400	17.94	18.27	22.12	22.01	21.26
Satsumas	T2100	8.45	7.69	7.10	7.04	6.30
Pomelos and grapefruit	T4000	3.49	3.68	3.87	4.06	4.49

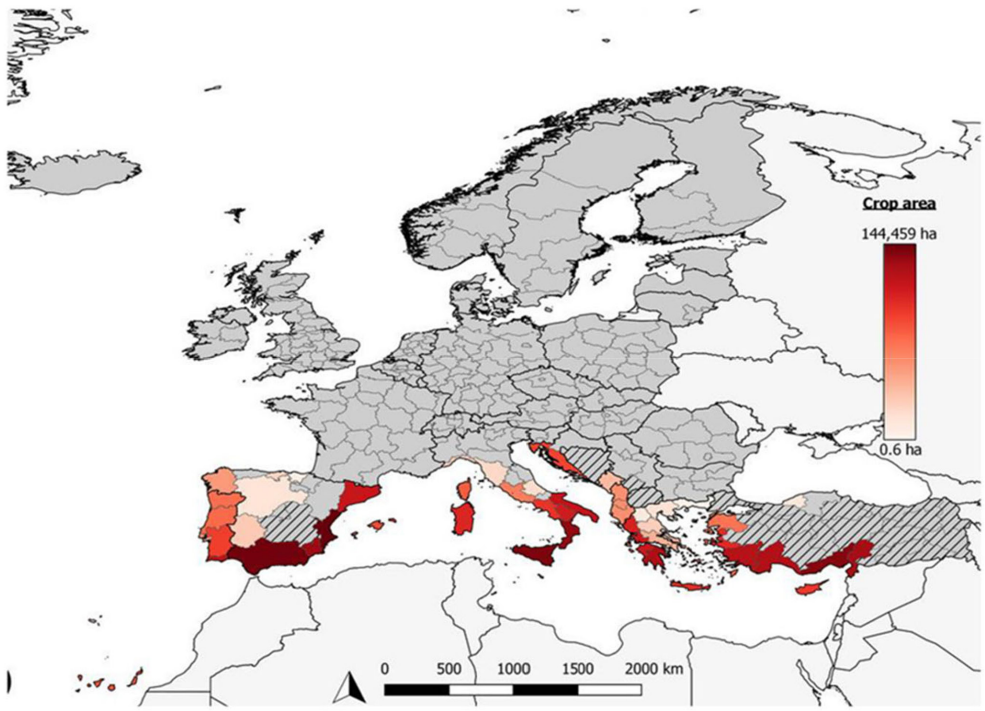

FIGURE 3 European citrus-growing areas based on data of crop area at NUTS 2 level (from EFSA PLH Panel, 2019). Areas with lines indicate regions with no data. Areas in light grey are neighbouring countries not included in the analysis.

3.4.2.2 | *Climatic conditions affecting establishment*

C. rubens is most frequently reported from tropical and subtropical areas of Asia, the Caribbean, Africa and Oceania. Figure 4 shows the world distribution of seven Köppen–Geiger climate types (Kottek et al., 2006) that occur in the EU and in countries where *C. rubens* has been reported. In northern EU, establishment may be possible in greenhouses, especially where heated.

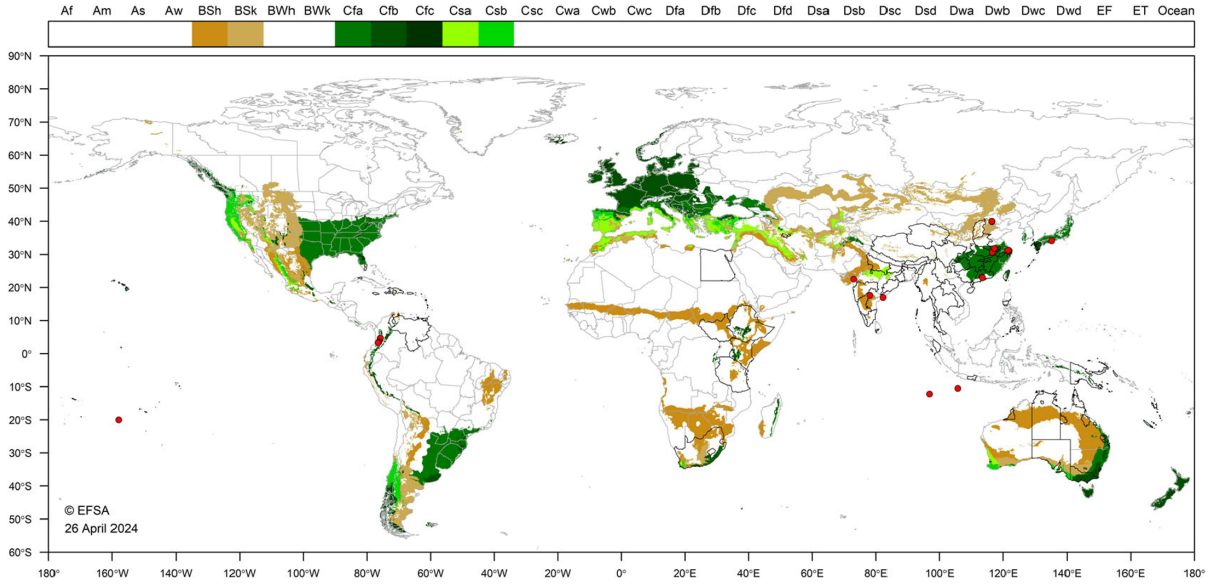

FIGURE 4 World distribution of the seven Köppen–Geiger climate types that occur in the EU and in countries where *Ceroplastes rubens* occurs (Red dots represent specific coordinate locations where *C. rubens* was reported).

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, or by hitchhiking on other animals, humans or machinery, will occur locally. All stages may be moved over long distances in trade of infested plant material specifically plants for planting, cut branches and fruits.

Comment on plants for planting as a mechanism of spread.

C. rubens could be dispersed more rapidly and over long-distances via infested plants for planting for trade.

In Japan, adult females usually overwinter in the lower parts of twigs and branches and can spread over long distances via infested plants for trade. Newly hatched nymphs usually settle on green parts of the tree and few of them disperse through the wind (Noda et al., 1982). *C. rubens* crawlers can spread in shorter distances through human movements, ants and animals. As they barely move naturally, they have limited dispersal activity (Malumphy, 2014). All stages are likely to disperse more rapidly and over longer distances with the movement of infested plants via trade (Malumphy et al., 2018). Dispersal can be increased by waste material, e.g. discarding whole rotten fruits via household compost (MAF Biosecurity NZ, 2007).

3.5 | Impacts

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

Yes, the introduction of *C. rubens* into the EU could most probably have an economic impact on orchards, amenity ornamental trees and shrubs.

C. rubens is regarded as one of the major coccid pests in tropical and subtropical areas of the world (Gill & Kosztarab, 1997). It attacks many plant species, but it is a particularly damaging pest of *Citrus* spp. in Australia, Hawaii, Korea, China and Japan (Malumphy, 2014). In Japan, *C. rubens* became a serious pest of citrus and persimmons (*Diospyros kaki*) following its introduction in about 1897; however, it was controlled effectively after the release of the parasitoid *Anicetus beneficus* Ishii & Yamumatsu (Hymenopetra: Encyrtidae) in 1948–1952 (Swirski et al., 1997). Nowadays, *C. rubens* may be found on citrus trees along roads which are covered with dust that protects it from parasitoid attacks (Swirski et al., 1997). Recently, *C. rubens* is reported as a major pest of tea plantations in northeast India, West Bengal and Sri Lanka (Kakoti et al., 2023; Sammani et al., 2023). In a recent outbreak of the pest in Sri Lanka, it was recorded infesting plant species belonging to 28 families with higher infestation densities recorded for plant species in the families Araceae (mean infestation level 9.74 ± 2.6 insects/10 cm^2) and Myrtaceae (mean infestation level 9.29 ± 1.5 insects/10 cm^2) (Vithana et al., 2019). It has also been reported as a pest on *Pinus caribaea* and *P. taeda* in Australia and Papua New Guinea (Merrifield & Howcroft, 1975). Adult females and nymphs feed on phloem sap causing direct damage. The production of sugary honeydew causes indirect damage on leaves and twigs, developing a layer of sooty mould fungus (*Capnophaeum fuliginoides* in Japan; Itioka & Inoue, 1991). This leads to low photosynthetic ability and diminished growth. Heavy infestations can result to leaf loss, necrosis of foliage, leaf discoloration, dieback and even death of susceptible host plants (Malumphy et al., 2018; Vithana et al., 2019). Fruits are also affected leading to reduced marketing value (Malumphy, 2014).

C. rubens has been recorded in the EU, in Germany (2010) in a tropical greenhouse on *Aglaonema* sp. (Kozár et al., 2013; Schönfeld, 2015). No impact has been officially reported after this record.

3.6 | Available measures and their limitations

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

Yes, some hosts are already prohibited from entering the EU (see Section 3.3.2). Hosts that are permitted entry require a phytosanitary certificate and a proportion of consignments is inspected. Additional options are available to reduce the likelihood of pest entry, establishment and spread into the EU (Section 3.6.1).

3.6.1 | Identification of potential additional measures

Phytosanitary measures are currently applied to several host genera (e.g. prohibitions – 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 risk reduction and control measures are listed in Table 8.

TABLE 8 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 two or three cycles)	Entry/Spread
Growing plants in isolation	Place of production is insect proof originate in a place of production with complete physical isolation	Entry/Spread
Managed growing conditions	Plants should be grown in officially registered nurseries, which are subject to an officially supervised control regime	Entry/Spread
Crop rotation, associations and density, weed/volunteer control	Removal of weeds around host plants is a great cultural control, as weeds are usually colonised by ants, which disturb parasitoid populations (Kabashima & Drelstadt, 2014). Crop rotation is not applicable to *C. rubens* host plants	Establishment/Impact

(Continues)

TABLE 8 (Continued)

Control measure/risk reduction option (**blue underline** = Zenodo doc, Blue = WIP)	RRO summary	Risk element targeted (entry/establishment/spread/impact)
Use of resistant and tolerant plant species/varieties	A study by Hodges et al. (2001) showed that certain species of hollies (*Illex* spp.) have demonstrated a degree of resistance to Florida wax scales *(C. floridensis)*. No studies are available targeting specifically *C. rubens*	Establishment/Impact
Roguing and pruning	Roguing (removal of infested plants) and pruning (removal of infested plant parts only without affecting the viability of the plant) can reduce the population density of the pest. During nursery inspections, any symptoms on twigs or branches of plants detected could be pruned, when feasible	Entry/Establishment/Spread/Impact
Biological control and behavioural manipulation	The encyrtid parasitoid, *Anicetus beneficus*, a parasitoid of *C. rubens* with high host specificity, was released in Japan in 1948 (Yasumatsu, 1951) Successful control of *C. rubens* was achieved ~2.5 years after release of *A. beneficus*, reaching 60%–80% parasitism in Queensland (Smith, 1986). Noda et al. (1982) give a detailed description on the parasitisation of *A. beneficus* on *C. rubens* Apart from *A. beneficus*, several parasitoids have been reported In Japan, *C. rubens* was found on *Citrus* to be parasitised by *Microterys speciosus*, Ishii, and *Coccophagus japonicus*, Comp. (Smith, 1986) According to Prinsloo and Uys (2015), in South Africa, six parasitic wasps have been recorded from *C. rubens* on mango trees: *Aprostocetus* sp. prob. ceroplastae (Girault) (Eulophidae), *Cheiloneurus* sp. prob. *cyanonotus* Waterston, *Metaphycus* sp., *Metaphycus* sp. near *capensis* Annecke & Mynhard (all Encyrtidae), *Coccophagus flaviceps* Compere (Aphelinidae), *Scutellista* sp. (Pteromalidae) and a predatory thrip; *Aleurodothrips fasciapennis* (Franklin) (Daneel et al., 1994) In Florida, *Scutellista cyanea* is recorded as a parasite of *C. rubens* while in Bermuda, *Microterys kotinskyi* (Hamon & Williams, 1984). While using parasitoids, the control of ants is crucial, as ants are attracted by honeydew, and might suppress the number of parasitoids. *Lasuis niger* (common black ant) is known to attack *A. beneficus* in Japan (Encyrtidae, Hymenoptera) (Itioka & Inoue, 1996)	Establishment/Spread/Impact
Chemical treatments on crops including reproductive material	The effectiveness of contact insecticide applications against *C. rubens* may be reduced by the protective wax cover over the scale. Most vulnerable is the crawler-stage. Systemic pesticides could be effective, while contact wide range pesticides might disrupt natural enemies (Talhouk, 1978). Lu and Jiang (2015) have tested spraying with various active substances against larvae at the initial nymph stage resulting to more than 80% control (Kabashima & Drelstadt, 2014)	Entry/Establishment/Spread/Impact
Physical treatments on consignments or during processing	This control measure deals with the following categories of physical treatments: irradiation/ionisation; mechanical cleaning (brushing, washing); sorting and grading, and removal of plant parts Irradiation against *C. rubens* is reported as postharvest control on fruits by Follett et al. (2007)	Entry/Spread
Cleaning and disinfection of facilities, tools and machinery	The physical and chemical cleaning and disinfection of facilities, tools, machinery, transport means, facilities and other accessories (e.g. boxes, pots, hand tools)	Entry/Spread
Waste management	Treatment of the waste (deep burial, composting, incineration, chipping, production of bio-energy…) in authorised facilities and official restriction on the movement of waste	Establishment/Spread
Heat and cold treatments	Controlled temperature treatments aimed to kill or inactivate pests without causing any unacceptable prejudice to the treated material itself. Vapour heat treatment, specifically, 45.2°C for 2 h is proposed by MAF Biosecurity New Zealand (2017) on imported *Litchi chinensis* (Litchi) fresh fruits	Entry/Spread
Post-entry quarantine and other restrictions of movement in the importing country	Plants in PEQ are held in conditions that prevent the escape of pests; they can be carefully inspected and tested to verify they are of sufficient plant health status to be released, or may be treated, re-exported or destroyed. Tests on plants are likely to include laboratory diagnostic assays and bioassays on indicator hosts to check whether the plant material is infected with pests	Entry/Spread

3.6.1.2 | *Additional supporting measures*

Potential additional supporting measures are listed in Table 9.

TABLE 9 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	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; FAO, 2023) For *Ceroplastes* spp., female scales, nymphs, honeydew, sooty mould and ants can be detected during visual inspections Honeydew drippings from plants can be efficiently monitored using water-sensitive paper, which is commonly used for monitoring insecticide droplets and calibrating (Kabashima & Drelstadt, 2014)	Entry/Spread/Establishment
Laboratory testing	Required to confirm diagnosis and identification of the pest 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 For inspection, testing and/or surveillance purposes the sample may be taken according to a statistically based or a non-statistical based sampling methodology	Entry/Spread
Phytosanitary certificate and plant passport	Required to attest that a consignment meets phytosanitary import requirements a) phytosanitary certificate (imports) b) plant passport (EU internal trade)	Entry/Spread
Certified and approved premises	Certification of premises to ensure the phytosanitary compliance of consignments; for example, to enable traceability and provide access to information that can help prove the compliance of consignments with phytosanitary requirements of importing countries	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
Surveillance	Surveillance for early detection of outbreaks	Entry/Establishment/Spread

3.6.1.3 | *Biological or technical factors limiting the effectiveness of measures*

- Wide range of host plants (e.g. making inspection of buffer zones very difficult).
- Limited effectiveness of contact insecticides due to the presence of protective wax cover.
- *C. rubens* may not be easily detected at low densities.

3.7 | Uncertainty

No key uncertainties have been identified in the assessment.

4 | CONCLUSIONS

Ceroplastes rubens satisfies all the criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest (Table 10).

TABLE 10 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 (casting doubt on the conclusion)
Identity of the pest (Section 3.1)	The identity of the species is established and *Ceroplastes rubens* Maskell is the accepted name	None

(Continues)

TABLE 10 (Continued)

Criterion of pest categorisation	Panel's conclusions against criterion in regulation (EU) 2016/2031 regarding union quarantine pest	Key uncertainties (casting doubt on the conclusion)
Absence/presence of the pest in the EU (Section 3.2)	*C. rubens* has been recorded in Germany, but only in a protected indoor environment (tropical greenhouse)	None
Pest potential for entry, establishment and spread in the EU (Section 3.4)	*C. rubens* could further enter the EU mainly via the import of host plants for planting (excluding seed) or on cut branches. Biotic factors (host availability) and abiotic factors (climate suitability) suggest that large parts of the EU would be suitable for establishment. Natural spread by first instar nymphs crawling or being carried by wind, or by hitchhiking on other animals, humans or machinery, will occur locally. *C. rubens* could be dispersed more rapidly and over long-distances via infested plants for planting for trade	None
Potential for consequences in the EU (Section 3.5)	Further introduction of *C. rubens* into the EU could lead to outbreaks causing damage to orchard, forest, amenity ornamental trees and shrubs	None
Available measures (Section 3.6)	Some hosts are already prohibited from entering the EU. There are measures available to prevent entry, establishment and spread of *C. rubens* in the EU	None
Conclusion (Section 4)	*C. rubens* satisfies all the criteria assessed by EFSA for consideration as a potential Union quarantine pest	None
Aspects of assessment to focus on/scenarios to address in future if appropriate:		

GLOSSARY

Containment (of a pest)	Application of phytosanitary measures in and around an infested area to prevent spread of a pest (FAO, 2023).
Control (of a pest)	Suppression, containment or eradication of a pest population (FAO, 2023).
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, 2023).
Eradication (of a pest)	Application of phytosanitary measures to eliminate a pest from an area (FAO, 2023).
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2023).
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, 2023).
Pathway	Any means that allows the entry or spread of a pest (FAO, 2023).
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, 2023).
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, 2023).
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, 2023).

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

CONFLICT OF INTEREST

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PANEL MEMBERS

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How to cite this article: EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Baptista, P., Chatzivassiliou, E., Di Serio, F., Gonthier, P., Jaques Miret, J. A., Justesen, A. F., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., Parnell, S., Potting, R., Reignault, P. L., Stefani, E., Thulke, H.-H., Van der Werf, W., Vicent Civera, A., Yuen, J., … MacLeod, A. (2024). Pest categorisation of *Ceroplastes rubens*. EFSA Journal, *22*(7), e8888. https://doi.org/10.2903/j.efsa.2024.8888

APPENDIX A

Ceroplastes rubens host plants/species affected

Source: CABI CPC (CABI, online), García Morales et al. (2016) and literature.

Scientific name	Family	Common name	Reference
Acacia	Fabaceae	–	Qin and Gullan (1994)
Acca sellowiana	Myrtaceae	Pineapple guava	García Morales et al. (2016)
Acer buergerianum	Sapindaceae	Trident maple	García Morales et al. (2016)
Acer palmatum	Sapindaceae	Japanese maple	García Morales et al. (2016)
Acer tataricum	Sapindaceae	Tartar maple	García Morales et al. (2016)
Acrostichum aureum	Pteridaceae	Golden leather fern; heart fern; leather fern; mangrove fern; swamp fern	CABI (online)
Agathis lanceolata	Araucariaceae	Koghis kauri	CABI (online)
Aglaonema commutatum	Araceae	Chinese evergreen; silver queen aglaonema	Moghaddam and Nematian (2021)
Aglaonema costatum	Araceae	Chinese evergreen; Fox's aglaonema; spotted evergreen	CABI (online)
Aglaonema crispum	Araceae	Painted droptongue	CABI (online)
Aglaonema marantifolium	Araceae	–	Vithana et al. (2019)
Aglaonema modestum	Araceae	–	Nakahara (1981)
Aglaonema nitidum	Araceae	Burmese evergreen	Vithana et al. (2019)
Aglaonema pictum	Araceae	Indonesian evergreen	Gimpel et al. (1974)
Aglaonema tricolor	Araceae	–	Hamon and Williams (1984)
Agonis flexuosa	Myrtaceae	Sweet willow myrtle	García Morales et al. (2016)
Allamanda cathartica	Apocynaceae	Butter cup; common trumpetvine	Nakahara (1981)
Alpinia purpurata	Zingiberaceae	Red ginger	CABI (online)
Alstonia scholaris	Apocynaceae	Devil tree; dita bark; Indian pulai; milk wood; scholar tree	Gimpel et al. (1974)
Alternanthera dentata	Amaranthaceae	Purple-leaved chaff flower	Vithana et al. (2019)
Alyxia gynopogon	Apocynaceae	–	CABI (online)
Alyxia stellata	Apocynaceae	–	CABI (online)
Anacardium occidentale	Anacardiaceae	Cashew; cashew apple; cashew nut	CABI (online)
Annona squamosa	Annonaceae	Cuban sugar apple	García Morales et al. (2016)
Anthurium andraeanum	Araceae	Flamingo flower	Nakahara (1981)
Antidesma bunius	Phyllanthaceae	China laurel	Vithana et al. (2019)
Aralia	Araliaceae	–	Qin and Gullan (1994)
Ardisia humilis	Primulaceae	Low shoebutton	CABI (online)
Ardisia japonica	Primulaceae	Japanese ardisia	García Morales et al. (2016)
Arillastrum gummiferum	Lithomyrtus	–	CABI (online)
Artemisia vulgaris	Asteraceae	Common mugwort	García Morales et al. (2016)
Arthropteris palisotii	Tectariaceae	Lesser creeping fern	CABI (online)
Artocarpus altilis	Moraceae	Breadfruit	CABI (online)
Artocarpus heterophyllus	Moraceae	Jackfruit	García Morales et al. (2016)
Artocarpus integer	Moraceae	Champedak	CABI (online)
Aspidotis	Pteridaceae	–	Qin and Gullan (1994)
Asplenium australasicum	Aspleniaceae	–	Qin and Gullan (1994)
Asplenium nidus	Aspleniaceae	Bird's-nest fern	CABI (online)
Astronidium robustum	Melastomataceae	–	García Morales et al. (2016)
Asystasia gangetica	Acanthaceae	Chinese violet; coromandel; creeping foxglove	CABI (online)
Atractocarpus fitzalanii	Rubiaceae	–	García Morales et al. (2016)
Atractocarpus tahitiensis	Rubiaceae	–	CABI (online)
Barringtonia asiatica	Lecythidaceae	Barringtonia; bishop's cap; fish poison tree	CABI (online)
Barringtonia racemosa	Lecythidaceae	Cassowary pine; China pine; common putat	CABI (online)

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Scientific name	Family	Common name	Reference
Bauhinia	Fabaceae	Camel's foot	Suh and Bombay (2015)
Belvisia	Pteridaceae	–	CABI (online)
Bischofia javanica	Phyllanthaceae	Java bishopwood	García Morales et al. (2016)
Bixa orellana	Bixaceae	Lipstick tree	Nakahara (1981)
Blechnum orientale	Blechnaceae	Centipede fern	García Morales et al. (2016)
Bougainvillea	Nyctaginaceae	–	Nakahara (1981)
Bruguiera sexangula	Rhizophoraceae	Six-angled orange mangrove; upriver orange mangrove	CABI (online)
Buxus microphylla	Buxaceae	Little-leaf box	Gimpel et al. (1974)
Cajanus cajan	Fabaceae	Bengal pea; cajan pea; Congo pea	CABI (online)
Callistemon viminalis	Myrtaceae	Weeping bottlebrush	Qin and Gullan (1994)
Calophyllum inophyllum	Clusiaceae	Alexandrian laurel; beach calophyllum; beauty leaf	CABI (online)
Calophyllum tomentosum	Calophyllaceae	–	García Morales et al. (2016)
Calyptranthes kiaerskovii	Myrtaceae	–	Malumphy et al. (2019)
Calyptranthes thomasiana	Myrtaceae	–	Malumphy et al. (2019)
Camellia japonica	Theaceae	Japanese camellia	Gimpel et al. (1974)
Camellia sasanqua	Theaceae	Christmas camellia	Gimpel et al. (1974)
Camellia sinensis	Theaceae	Tea; tea plant	CABI (online)
Carissa macrocarpa	Apocynaceae	Natal plum	Vithana et al. (2019)
Cascabela thevetia	Apocynaceae	Trumpet flower	Qin and Gullan (1994)
Cedrus deodara	Pinaceae	Himalayan cedar	Vithana et al. (2019)
Ceiba pentandra	Bombacaceae	Giant kapok; God's tree; kapok tree	CABI (online)
Celosia argentea	Amaranthaceae	Celosia; cock's-comb; crimson cockscomb; fireweed	García Morales et al. (2016)
Celtis	Ulmaceae	Nettle tree	Gimpel et al. (1974)
Centipeda minima	Asteraceae	Spreading sneezeweed	Suh (2020)
Cephalotaxus	Cephalotaxaceae	–	Gimpel et al. (1974)
Chaenomeles	Rosaceae	–	Gimpel et al. (1974)
Chrysanthemum morifolium	Asteraceae	Chrysanthemum	García Morales et al. (2016)
Chrysophyllum caniote	Sapotaceae	Star apple	Vithana et al. (2019)
Cibotium	Cibotiaceae	–	Nakahara (1981)
Cinnamomum camphora	Lauraceae	Camphor; camphor laurel; camphor tree; Japanese camphor tree	Deng et al. (2012)
Cinnamomum japonicum	Lauraceae	Japanese cinnamon	García Morales et al. (2016)
Cinnamomum loureiroi	Lauraceae	–	Suh (2020)
Cinnamomum verum	Lauraceae	Ceylon cinnamon; cinnamon bark tree	CABI (online)
Citrus aurantiifolia	Rutaceae	Key lime	García Morales et al. (2016)
Citrus deliciosa	Rutaceae	Mediterranean mandarin	Gimpel et al. (1974)
Citrus glauca	Rutaceae	Australian desert lime	García Morales et al. (2016)
Citrus junos	Rutaceae	Yuzu	CABI (online)
Citrus limon	Rutaceae	Lemon	CABI (online)
Citrus maxima	Rutaceae	Bali lemon; pummelo	CABI (online)
Citrus paradisi	Rutaceae	Grapefruit	García Morales et al. (2016)
Citrus reticulata	Rutaceae	Clementine; mandarin; tangerine	CABI (online)
Citrus sinensis	Rutaceae	Sweet orange	CABI (online)
Citrus trifoliata	Rutaceae	Golden apple	García Morales et al. (2016)
Citrus unshiu	Rutaceae	Satsuma	CABI (online)
Citrus x paradisi	Rutaceae	Grapefruit	CABI (online)
Cleyera japonica	Pentaphylacaceae	Japanese cleyera	García Morales et al. (2016)

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Scientific name	Family	Common name	Reference
Coccoloba uvifera	Polygonaceae	Common sea grape; Jamaica kino; platter leaf; sea grape	CABI (online)
Cocos nucifera	Arecaceae	Coconut; coco palm; common coconut palm	CABI (online)
Coffea arabica	Rubiaceae	Arabian coffee; coffee tree	CABI (online)
Coffea liberica	Rubiaceae	Liberian coffee	CABI (online)
Coprosma laevigata	Rubiaceae	–	CABI (online)
Cryptocarya triplinervis	Lauraceae	–	Qin and Gullan (1994)
Cupaniopsis serrata	Sapindaceae	–	García Morales et al. (2016)
Cycas circinalis	Cycadaceae	Fern palm	Vithana et al. (2019)
Cycas media	Cycadaceae	Australian nut palm	Vithana et al. (2019)
Cycas revoluta	Cycadaceae	Japanese fern palm	García Morales et al. (2016)
Cycas thouarsii	Cycadaceae	–	CABI (online)
Cytisus scoparius	Fabaceae	Scottish broom	García Morales et al. (2016)
Daphne odora	Thymelaeaceae	Winter daphne	García Morales et al. (2016)
Davallia	Polypodiaceae	–	CABI (online)
Denhamia cunninghamii	Celastraceae	–	Qin and Gullan (1994)
Dicranopteris flexuosa	Gleicheniaceae	Forked fern	Nakahara and Miller (1981)
Dicranopteris linearis	Gleicheniaceae	Old World forked fern; scrambling fern	CABI (online)
Dieffenbachia seguine	Araceae	Dumb cane; mother-in-law plant; poison arum	CABI (online)
Dieffenbachia	Araceae	–	Nakahara (1981)
Dimocarpus longan	Sapindaceae	Dragon's eye; longan	Wen et al. (2002)
Dioclea violacea	Fabaceae		Nakahara (1981)
Diospyros digyna	Ebenaceae	–	Qin and Gullan (1994)
Diospyros kaki	Ebenaceae	Chinese date plum; Chinese persimmon; Japanese persimmon; kaki	CABI (online)
Distylium racemosum	Hamamelidaceae	Isu tree	Suh (2020)
Dizygotheca elegantissima	Araliaceae	False aralia	CABI (online)
Dracaena	Agavaceae	–	Suh and Bombay (2015)
Elaeocarpus bifidus	Elaeocarpaceae	–	Nakahara (1981)
Elaeocarpus sylvestris	Elaeocarpaceae	–	Suh (2020)
Elaeodendron	Celastraceae	–	Qin and Gullan (1994)
Elaphoglossum crassifolium	Dryopteridaceae	–	Nakahara (1981)
Epipremnum pinnatum	Araceae	Centipede tonga vine; devil's ivy; golden pothos; hunter's robe; marble queen	CABI (online)
Eriobotrya japonica	Rosaceae	Japanese medlar	García Morales et al. (2016)
Eucalyptus globulus	Myrtaceae	Southern blue gum	García Morales et al. (2016)
Eugenia uniflora	Myrtaceae	Surinam cherry	García Morales et al. (2016)
Eugenia luehmanni	Myrtaceae	Lillipilly	Hackman and Trikojus (1952)
Euonymus alatus	Celastraceae	Burning bush	García Morales et al. (2016)
Euonymus europaeus	Celastraceae	Common spindle	García Morales et al. (2016)
Euonymus japonicus	Celastraceae	Japanese spindle	García Morales et al. (2016)
Euphorbia heterophylla	Euphorbiaceae	Mexican fire plant	García Morales et al. (2016)
Euphorbia pulcherrima	Euphorbiaceae	Christmas flower; Christmas star; common poinsettia	CABI (online)
Euphorbia pulcherrima	Euphorbiaceae	Mexican fire plant	García Morales et al. (2016)
Eurya emarginata	Pentaphylacaceae	–	García Morales et al. (2016)
Eurya japonica	Pentaphylacaceae	–	García Morales et al. (2016)
Exocarpos phyllanthoides	Santalaceae	–	García Morales et al. (2016)
Fatsia japonica	Araliaceae	Fatsia; Formosa rice tree	Deng et al. (2012)
Feijoa	Myrtaceae	–	CABI (online)
Ficus amplissima	Moraceae	–	García Morales et al. (2016)
Ficus benjamina	Moraceae	Benjamin's fig	García Morales et al. (2016)

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Scientific name	Family	Common name	Reference
Ficus carica	Moraceae	Common fig; fig	García Morales et al. (2016)
Ficus citrifolia	Moraceae		García Morales et al. (2016)
Ficus elastica	Moraceae	Assam rubber tree; Indian rubber fig	CABI (online)
Ficus glandifera	Moraceae	–	CABI (online)
Ficus microcarpa	Moraceae	Indian laurel	García Morales et al. (2016)
Ficus montana	Moraceae	–	Williams and Miller (2010)
Ficus prolixa	Moraceae	–	CABI (online)
Fitchia	Asteraceae	–	CABI (online)
Flindersia australis	Rutaceae	Australian teak	García Morales et al. (2016)
Flindersia bennettii	Rutaceae	–	García Morales et al. (2016)
Flindersia bourjotiana	Rutaceae	Queensland silver ash	García Morales et al. (2016)
Flindersia brayleyana	Rutaceae	Queensland maple	García Morales et al. (2016)
Flindersia schottiana	Rutaceae	Cudgerie	García Morales et al. (2016)
Garcinia amplexicaulis	Clusiaceae	–	CABI (online)
Garcinia gummi-gutta	Clusiaceae		Basavaraju et al. (2021)
Garcinia indica	Clusiaceae		Basavaraju et al. (2021)
Garcinia mangostana	Clusiaceae	Mangosteen	Vithana et al. (2019)
Garcinia morella	Clusiaceae	Ceylon gamboge	Vithana et al. (2019)
Garcinia myrtifolia	Clusiaceae	–	CABI (online)
Garcinia spicata	Clusiaceae	–	García Morales et al. (2016)
Garcinia subelliptica	Clusiaceae	–	García Morales et al. (2016)
Gardenia jasminoides	Rubiaceae	Cape jasmine; Cape jessamine; common gardenia	CABI (online)
Gardenia taitensis	Rubiaceae	Tahitian gardenia	Nakahara (1981)
Gerbera jamesonii	Asteraceae	African daisy	García Morales et al. (2016)
Gleichenia	Gleicheniaceae	–	CABI (online)
Grammatophyllum	Orchidaceae	–	Gimpel et al. (1974)
Hedera helix	Araliaceae	Common ivy; English ivy	CABI (online)
Hedera rhombea	Araliaceae	Japanese ivy	Suh (2020)
Helianthus	Asteraceae	Sunflower	CABI (online)
Heliconia	Heliconiaceae		CABI (online)
Heptapleurum actinophyllum	Araliaceae	–	Nakahara (1981)
Hernandia nymphaeifolia	Hernandiaceae	Sea hearse	CABI (online)
Hibiscus mutabilis	Malvaceae	Confederate rose mallow	Vithana et al. (2019)
Hibiscus rosa-sinensis	Malvaceae	China rose; Chinese hibiscus; Chinese rose; Hawaiian hibiscus	CABI (online)
Hibiscus tiliaceus	Malvaceae	Coast hibiscus; cottonwood; hau tree; linden hibiscus	CABI (online)
Hydrangea paniculata	Hydrangeaceae	Panicle hydrangea	Vithana et al. (2019)
Ilex aquifolium	Aquifoliaceae	Panicle hydrangea	Nakahara (1981)
Ilex chinensis	Aquifoliaceae	Kashi holly	García Morales et al. (2016)
Ilex cornuta	Aquifoliaceae	Chinese holly; horned holly	Deng et al. (2012)
Ilex crenata	Aquifoliaceae	Japanese holly	Suh (2020)
Ilex integra	Aquifoliaceae	Mochi	García Morales et al. (2016)
Ilex latifolia	Aquifoliaceae	Tarajo	García Morales et al. (2016)
Ilex pedunculosa	Aquifoliaceae	Long-stalk holly	García Morales et al. (2016)
Ilex rotunda	Aquifoliaceae	Round-leaf holly	García Morales et al. (2016)
Ilex serrata	Aquifoliaceae	Japanese winterberry	García Morales et al. (2016)
Illicium anisatum	Schisandraceae	Japanese star anise	García Morales et al. (2016)
Impatiens balsamina	Balsaminaceae	Garden balsam	Vithana et al. (2019)

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Scientific name	Family	Common name	Reference
Inocarpus fagifer	Fabaceae	Otaheite chestnut; Polynesian chestnut; Tahiti chestnut	CABI (online)
Iris domestica	Iridaceae	Blackberry lily	Vithana et al. (2019)
Ixora chinensis	Rubiaceae	Flame of the woods	Vithana et al. (2019)
Ixora coccinea	Rubiaceae	Jungle flame	García Morales et al. (2016)
Kadsura japonica	Schisandraceae	Evergreen magnolia vine	Gimpel et al. (1974)
Lagerstroemia indica	Lythraceae	Cannonball; carrion tree; crepe myrtle	CABI (online)
Laurus nobilis	Lauraceae	Apollo laurel; bay; Greek laurel	CABI (online)
Leucopogon	Ericaceae	–	CABI (online)
Ligustrum japonicum	Oleaceae	Japanese privet	García Morales et al. (2016)
Ligustrum obtusifolium	Oleaceae	Border privet	CABI (online)
Lindera citriodora	Lauraceae	–	García Morales et al. (2016)
Litchi chinensis	Sapindaceae	Litchee; litchi	Malumphy et al. (2018)
Lophostemon confertus	Myrtaceae	Brisbane box	Qin and Gullan (1994)
Loranthus	Loranthaceae	–	Gimpel et al. (1974)
Machilus thunbergii	Lauraceae	Makko	García Morales et al. (2016)
Maclura cochinchinensis	Moraceae	Cockspur-thorn	Gimpel et al. (1974)
Macropiper excelsum	Piperaceae	Kawakawa	García Morales et al. (2016)
Magnolia denudata	Magnoliaceae	Magnolia yulan; yulan	CABI (online)
Magnolia salicifolia	Magnoliaceae	Willow-leaved magnolia	Gimpel et al. (1974)
Mallotus japonicus	Euphorbiaceae	Food wrapper plant	Suh (2020)
Malus sylvestris	Rosaceae	Wild apple	García Morales et al. (2016)
Mangifera indica	Anacardiaceae	Mango	Vithana et al. (2019)
Manilkara bidentata	Sapotaceae	Bullet tree; bulletwood; cherry mahogany	Merrifield and Howcroft (1975)
Melaleuca bracteata	Myrtaceae	Black tea tree	Qin and Gullan (1994)
Melaleuca leucadendra	Myrtaceae	Weeping paperbark	Qin and Gullan (1994)
Melaleuca nodosa	Myrtaceae	–	García Morales et al. (2016)
Melaleuca quinquenervia	Myrtaceae	Paperbark tea tree	Qin and Gullan (1994)
Melaleuca viridiflora	Myrtaceae	Broad-leaved paperbark	Qin and Gullan (1994)
Melampodium leucanthum	Asteraceae	Blackfoot daisy	Vithana et al. (2019)
Melicope littoralis	Rutaceae	–	García Morales et al. (2016)
Melodinus baueri	Apocynaceae	–	CABI (online)
Meryta angustifolia	Araliaceae	–	CABI (online)
Meryta latifolia	Araliaceae	–	CABI (online)
Mesua ferrea	Calophyllaceae	Indian rose chestnut	Vithana et al. (2019)
Metrosideros collina	Myrtaceae	–	Nakahara (1981)
Miconia gigantea	Melastomataceae	–	Gimpel et al. (1974)
Miconia prasina	Melastomataceae	–	Merrifield and Howcroft (1975)
Microsorum scolopendria	Polypodiaceae	Green wave	García Morales et al. (2016)
Mimusops	Sapotaceae	–	CABI (online)
Molineria capitulata	Hypoxidaceae	Palm-grass	CABI (online)
Monstera deliciosa	Araceae	Breadfruit vine; ceriman; hurricane plant	CABI (online)
Montrouziera cauliflora	Clusiaceae	–	CABI (online)
Morus alba	Moraceae	Silkworm mulberry; white mulberry	García Morales et al. (2016)
Musa acuminata	Musaceae	Dwarf banana	García Morales et al. (2016)
Musa x paradisiaca	Musaceae	Common banana; plantain	CABI (online)
Myristica cagayanensis	Myristicaceae	–	García Morales et al. (2016)
Myristica fragrans	Myristicaceae	Mace; nutmeg	CABI (online)
Myrsine ralstoniae	Primulaceae	–	García Morales et al. (2016)
Nageia nagi	Podocarpaceae	Broad-leaf podocarpus	García Morales et al. (2016)
Nandina domestica	Berberidaceae	Heavenly bamboo; sacred bamboo	García Morales et al. (2016)

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Scientific name	Family	Common name	Reference
Neolitsea sericea	Lauraceae	–	Suh (2020)
Nephelium lappaceum	Sapindaceae	Rambutan	CABI (online)
Nephelium ramboutan-ake	Sapindaceae	Pulasan	García Morales et al. (2016)
Nephrolepis exaltata	Nephrolepidaceae	Boston fern; common sword fern	Qin and Gullan (1994)
Nephthytis afzelii	Araceae	–	CABI (online)
Nerium oleander	Apocynaceae	Common oleander; oleander; rose bay	CABI (online)
Olea europaea subsp. cuspidata	Oleaceae	Wild olive	CABI (online)
Olea europaea	Oleaceae	Common olive	García Morales et al. (2016)
Osmanthus fragrans	Oleaceae	Fragrant olive; sweet olive	Li et al. (2014)
Paederia foetida	Rubiaceae	Skunk vine	García Morales et al. (2016)
Palaquium formosanum	Sapotaceae	–	García Morales et al. (2016)
Pellaea	Pteridaceae	–	Gimpel et al. (1974)
Peperomia	Piperaceae	–	Nakahara (1981)
Persea americana	Lauraceae	Alligator pear; avocado	CABI (online)
Philodendron giganteum	Araceae	–	Gimpel et al. (1974)
Photinia glabra	Rosaceae	–	García Morales et al. (2016)
Pimenta dioica	Lithomyrtus	Allspice; Jamaican sweet pepper	CABI (online)
Pinus caribaea	Pinaceae	Caribbean pine; Cuban pine	Merrifield and Howcroft (1975)
Pinus cubensis	Pinaceae	–	Merrifield and Howcroft (1975)
Pinus densiflora	Pinaceae	Japanese red pine	García Morales et al. (2016)
Pinus elliottii	Pinaceae	American pitch pine	García Morales et al. (2016)
Pinus kesiya	Pinaceae	Benguet pine	Merrifield and Howcroft (1975)
Pinus michoacana	Pinaceae	Michoacan pine	Merrifield and Howcroft (1975)
Pinus montezumae	Pinaceae	Montezuma pine	García Morales et al. (2016)
Pinus oocarpa	Pinaceae	Nicaraguan pitch pine; ocote pine	Merrifield and Howcroft (1975)
Pinus parviflora	Pinaceae	Japanese white pine	Gimpel et al. (1974)
Pinus patula	Pinaceae	Mexican weeping pine; Mexican yellow pine	Merrifield and Howcroft (1975)
Pinus pseudostrobus	Pinaceae	False Weymouth pine; smooth-bark Mexican pine	Merrifield and Howcroft (1975)
Pinus radiata	Pinaceae	Insignis pine; Monterey pine	Merrifield and Howcroft (1975)
Pinus tabuliformis	Pinaceae	Chinese red pine	García Morales et al. (2016)
Pinus taeda	Pinaceae	Loblolly pine	Merrifield and Howcroft (1975)
Pinus thunbergii	Pinaceae	Japanese black pine	García Morales et al. (2016)
Piper excelsum	Piperaceae	Kawakawa	CABI (online)
Pittosporum bracteolatum	Pittosporaceae	–	CABI (online)
Pittosporum tobira	Pittosporaceae	Japanese pittosporum	García Morales et al. (2016)
Pittosporum undulatum	Pittosporaceae	Australian boxwood	García Morales et al. (2016)
Platycerium	Polypodiaceae	Staghorn-fern	CABI (online)
Platycerium bifurcatum	Polypodiaceae	Common staghorn fern	García Morales et al. (2016)
Plerandra elegantissima	Araliaceae	False aralia	Hamon and Williams (1984)
Plumeria alba	Apocynaceae	White frangipani	CABI (online)
Plumeria rubra	Apocynaceae	Frangipani; red frangipani; temple tree	CABI (online)
Plumeria rubra var. acutifolia	Apocynaceae	Mexican frangipani	CABI (online)
Podocarpus macrophyllus	Podocarpaceae	Big-leaf podocarp; Buddhist pine; Japanese yew	Li et al. (2014)
Polypodium	Polypodiaceae	Plantae	CABI (online)
Polyscias guilfoylei	Araliaceae	Geranium-leaf aralia	CABI (online)
Poncirus	Rutaceae		CABI (online)
Pouteria caimito	Sapotaceae	–	Qin and Gullan (1994)
Premna serratifolia	Lamiaceae	Buas-buas	CABI (online)

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Scientific name	Family	Common name	Reference
Prunus domestica	Rosaceae	European plum; garden plum	García Morales et al. (2016)
Prunus mume	Rosaceae	Japanese apricot	García Morales et al. (2016)
Prunus salicina	Rosaceae	Chinese plum; Japanese plum	CABI (online)
Psidium cattleianum	Lithomyrtus	Strawberry guava	CABI (online)
Psidium guajava	Lithomyrtus	Common guava; guava; yellow guava	CABI (online)
Psidium guineense	Myrtaceae	Brazilian guava	Qin and Gullan (1994)
Psychotria	Rubiaceae	-	García Morales et al. (2016)
Punica granatum	Lythraceae	Pomegranate	García Morales et al. (2016)
Pyrus communis	Rosaceae	Common pear	CABI (online)
Pyrus pyrifolia	Rosaceae	Japanese/Chinese pear	García Morales et al. (2016)
Quercus myrsinifolia	Fagaceae	Japanese white oak	Suh (2020)
Randia	Rubiaceae	–	García Morales et al. (2016)
Rapanea crassifolia	Primulaceae	–	CABI (online)
Rhaphidophora	Araceae	–	Hodgson and Lagowska (2011).
Rhizophora	Rhizophoraceae	–	Gimpel et al. (1974)
Rhododendron indicum	Ericaceae	Satsuki azalea	García Morales et al. (2016)
Rhodomyrtus tomentosa	Myrtaceae	Hill gooseberry	Qin and Gullan (1994)
Rhus	Anacardiaceae	Sumach	CABI (online)
Rosa chinensis	Rosaceae	Bengal rose; China rose; monthly rose	Li et al. (2014)
Ruellia tuberosa	Acanthaceae	Poppingseed	Vithana et al. (2019)
Saintpaulia ionantha	Gesneriaceae	African violet	Vithana et al. (2019)
Salacia chinensis	Celastraceae	–	Vithana et al. (2019)
Salvia coccinea	Lamiaceae	Crimson sage; scarlet sage; Texas sage	Li et al. (2014)
Santalum album	Santalaceae	Indian sandalwood	Vithana et al. (2019)
Schefflera actinophylla	Araliaceae	Octopus tree; Queensland umbrella tree	Doane and Ferris (1916)
Schefflera arboricola	Araliaceae	Dwarf umbrella tree	Vithana et al. (2019)
Schinus terebinthifolia	Anacardiaceae	Christmas berry	García Morales et al. (2016)
Schinus terebinthifolius	Anacardiaceae	Brazilian pepper tree	CABI (online)
Sersalisia sericea	Sapotaceae	–	Qin and Gullan (1994)
Siphonodon	Celastraceae	–	Qin and Gullan (1994)
Solanum macrocarpon	Solanaceae	African eggplant	Vithana et al. (2019)
Spartium junceum	Fabaceae	Rush broom; Spanish broom	García Morales et al. (2016)
Spiraea thunbergii	Rosaceae	–	García Morales et al. (2016)
Spondias dulcis	Anacardiaceae	Golden apple	Vithana et al. (2019)
Stanhopea	Orchidaceae	–	Nakahara (1981)
Strobilanthes japonicus	Acanthaceae	–	García Morales et al. (2016)
Symplocos japonica	Symplocaceae	–	García Morales et al. (2016)
Syngonium	Araceae	–	Nakahara (1981)
Syzygium aqueum	Myrtaceae	Watery rose apple	Nakahara (1981)
Syzygium australe	Myrtaceae	Brush cherry	Qin and Gullan (1994)
Syzygium cumini	Myrtaceae	Black plum; jambolan; jamun; Java plum	CABI (online)
Syzygium floribundum	Myrtaceae	Weeping lily pilly	García Morales et al. (2016)
Syzygium jambos	Myrtaceae	Malabar plum; Malay apple	CABI (online)
Syzygium malaccense	Myrtaceae	Kelat oil; long-fruited rose apple	CABI (online)
Syzygium moorei	Myrtaceae	–	Qin and Gullan (1994)
Syzygium oleosum	Myrtaceae	–	García Morales et al. (2016)
Syzygium samarangense	Myrtaceae	Java apple	García Morales et al. (2016)
Syzygium smithii	Myrtaceae	Lilli pilly	Qin and Gullan (1994)
Tagetes erecta	Asteraceae	African marigold; Aztec marigold	Li et al. (2014)
Tamarix chinensis	Tamaricaceae	Chinese tamarisk	García Morales et al. (2016)

(Continued)

Scientific name	Family	Common name	Reference
Ternstroemia japonica	Pentaphylacaceae	Japanese ternstroemia	García Morales et al. (2016)
Theobroma	Malvaceae	–	Suh and Bombay (2015)
Thevetia peruviana	Apocynaceae	Trumpet flower	Suh and Bombay (2015)
Thunbergia erecta	Acanthaceae	Bush clockvine; king's mantle	CABI (online)
Thunbergia fragrans	Acanthaceae	Angel wings; fragrant thunbergia	CABI (online)
Toxicodendron succedaneum	Anacardiaceae	Japanese wax tree	García Morales et al. (2016)
Viburnum odoratissimum	Caprifoliaceae	Awabuki viburnum; sweet viburnum	Deng et al. (2012)
Weinmannia samoensis	Cunoniaceae	–	García Morales et al. (2016)
Wilkiea macrophylla	Monimiaceae	–	García Morales et al. (2016)
Zantedeschia	Araceae	–	Nakahara (1981)
Zingiber officinale	Zingiberaceae	Common ginger; garden ginger	Nakahara (1981)

APPENDIX B

Distribution of *Ceroplastes rubens*

Distribution records based on EPPO Global Database (EPPO, online), CABI CPC (CABI, online), García Morales et al. (2016) and literature.

Region	Country	Sub-national (e.g. state)	Status	References
Central America	British Virgin Islands (UK)		Present, no details	Malumphy et al. (2019)
	Cuba		Present, no details	Yanes and Campos (2021)
	Dominican Republic		Present, no details	Berry (2014)
	Guadeloupe (France)		Present, no details	EPPO (online)
	Haiti		Present, no details	Berry (2014)
	Jamaica		Present, no details	García Morales et al. (2016)
	Martinique (FR)		Present, no details	EPPO (online)
	Puerto Rico		Present, no details	Schowalter et al. (2014)
	St Lucia		Present, no details	Malumphy (2011)
	Trinidad and Tobago		Present, no details	García Morales et al. (2016)
	Virgin Islands (USA)		Present, no details	Malumphy (2011)
North America	United States of America		Present, restricted distribution	García Morales et al. (2016)
		Florida	Present, no details	Miller et al. (2005)
South America	Colombia		Present, no details	Kondo (2008)
	Venezuela		Present, no details	Berry (2014)
Africa	Egypt		Present, no details	García Morales et al. (2016)
	Ethiopia		Present, no details	García Morales et al. (2016)
	Kenya		Present, no details	CABI (online)
	Reunion (FR)		Present, no details	Germain et al. (2014)
	Seychelles		Present, no details	CABI (online)
	South Africa		Present, no details	CABI (online)
	Sudan		Present, no details	García Morales et al. (2016)
	Tanzania		Present, no details	CABI (online)
Asia	China		Present, restricted distribution	Deng et al. (2012)
		Anhui	Present, no details	Deng et al. (2012)
		Beijing	Present, no details	Li et al. (2014)
		Fujian	Present, no details	García Morales et al. (2016)
		Guangdong	Present, no details	Li et al. (2014)
		Guangxi (=Kwangsi)	Present, no details	García Morales et al. (2016)
		Guizhou (=Kweichow)	Present, no details	CABI (online)
		Hainan	Present, no details	Xiao and Huang (2001)
		Hebei (=Hopei)	Present, no details	García Morales et al. (2016)
		Henan (=Honan)	Present, no details	García Morales et al. (2016)
		Hubei	Present, no details	Deng et al. (2012)
		Hunan	Present, no details	García Morales et al. (2016)
		Jiangsu	Present, no details	García Morales et al. (2016)
		Jiangxi (=Kiangsi)	Present, no details	García Morales et al. (2016)
		Qinghai (=Chinghai)	Present, no details	García Morales et al. (2016)
		Shanghai	Present, no details	García Morales et al. (2016)
		Shanxi (=Shansi)	Present, no details	García Morales et al. (2016)
		Sichuan (=Szechwan)	Present, no details	García Morales et al. (2016)
		Xianggang (Hong Kong)	Present, no details	Martin and Lau (2011)
		Yunnan	Present, no details	García Morales et al. (2016)
		Zhejiang	Present, no details	García Morales et al. (2016)

(Continued)

Region	Country	Sub-national (e.g. state)	Status	References
		Xizang (=Tibet)	Present, no details	Fetyko & Kozar, 2012
	India		Present, widespread	García Morales et al. (2016)
		Andaman Islands	Present, no details	García Morales et al. (2016)
		Andhra Pradesh	Present, no details	García Morales et al. (2016)
		Assam	Present, no details	García Morales et al. (2016)
		Bihar	Present, no details	García Morales et al. (2016)
		Gujarat	Present, no details	Italiya et al. (2023)
		Karnataka	Present, no details	Prakash and Patil (2015)
		Kerala	Present, no details	García Morales et al. (2016)
		Maharashtra	Present, no details	García Morales et al. (2016)
		Nicobar Islands	Present, no details	García Morales et al. (2016)
		Odisha	Present, no details	García Morales et al. (2016)
		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)
	Indonesia	Java	Present, no details	Hamon and Williams (1984)
		Sumatra	Present, no details	García Morales et al. (2016)
	Iran		Present, no details	Moghaddam and Nematian (2021)
	Japan		Present, no details	García Morales et al. (2016)
		Honshu	Present, no details	García Morales et al. (2016)
		Kyushu	Present, no details	García Morales et al. (2016)
	Korea Dem. People's Republic		Present, no details	García Morales et al. (2016)
	Korea, Republic		Present, no details	García Morales et al. (2016)
	Laos		Present, no details	Suh and Bombay (2015)
	Malaysia		Present, no details	García Morales et al. (2016)
	Maldives		Present, no details	García Morales et al. (2016)
	Myanmar		Present, no details	García Morales et al. (2016)
	Philippines		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		Present, no details	Qin and Gullan (1994)
		Australian Capital Territory	Present, no details	Qin and Gullan (1994)
		New South Wales	Present, no details	García Morales et al. (2016)
		Norfolk Island	Present, no details	Qin and Gullan (1994)
		Northern Territory	Present, no details	Qin and Gullan (1994)
		Queensland	Present, no details	Ben-Dov et al. (2000)
		South Australia	Present, no details	Qin & Gullan, 1994
		Victoria	Present, no details	Qin and Gullan (1994)
		Western Australia	Present, no details	Qin and Gullan (1994)
		Christmas Islands	Present, no details	Neumann et al. (2016)
		Cocos (=Keeling) Islands	Present, no details	García Morales et al. (2016)
	Cook Islands		Present, no details	García Morales et al. (2016)
	Fiji		Present, no details	García Morales et al. (2016)
	French Polynesia (FR)		Present, restricted distribution	Hamon and Williams (1984)
	New Caledonia (FR)		Present, widespread	García Morales et al. (2016)
	Kiribati		Present, no details	García Morales et al. (2016)

(Continues)

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Region	Country	Sub-national (e.g. state)	Status	References
	Niue		Present, no details	García Morales et al. (2016)
	Northern Mariana Islands		Present, no details	García Morales et al. (2016)
		Rota Island	Present, no details	Hamon and Williams (1984)
		Saipan Island	Present, no details	Hamon and Williams (1984)
	Palau		Present, no details	García Morales et al. (2016)
	Papua New Guinea		Present, no details	García Morales et al. (2016)
	Samoa		Present, no details	CABI (online)
	Solomon Islands		Present, restricted distribution	CABI (online)
	Guam (USA)		Present, no details	Hamon and Williams (1984)
	Hawaii (USA)		Present, no details	EPPO (online)
	Vanuatu		Present, no details	García Morales et al. (2016)
EU (27)	Germany	Brandenburg (Tropical Hall)	Present, at one location	Schönfeld (2015), confirmed by German NPPO
	Hungary	Budapest (botanical garden)	Absent, confirmed by survey	Fetyko and Kozar (2012), confirmed by Hungarian NPPO

APPENDIX C

Import data

TABLE C.1 *Citrus* fruits (fresh or dried) imported in 100 kg into the EU from regions where *Ceroplastes rubens* is known to occur (Source: Eurostat accessed on 9 May 2024).

Country	2018	2019	2020	2021	2022
South Africa	6,381,124.73	6,196,837.96	7,830,147.60	7,950,857.87	7,909,065.90
Egypt	2,643,272.02	2,206,932.71	2,850,745.77	3,413,157.09	2,394,906.95
China	1,024,163.15	1,108,595.22	1,098,689.98	648,408.59	637,703.46
United States	185,706.99	177,755.45	148,608.92	114,110.50	64,510.65
Dominican Republic	10,426.97	7355.36	12,886.58	12,780.40	8464.22
Iran	1208.01	2174.22	1882.74	1910.39	2394.22
Australia	644.97	10,645.40	2343.47	4097.42	3784.45
Indonesia	779.35	836.73	864.54	872.68	890.40
Thailand	659.74	624.93	194.87	245.31	126.73
India	449.63	88.51	254.95	22.37	164.83
Japan	270.73	319.24	162.50	184.26	184.49
Tanzania	144.12	35.95	75.50	132.27	32.67
Sri Lanka	135.62	0.20	60.10	0.03	26.85
Kenya	8.80		34.56	0.02	0.01
Malaysia	83.45	7.71			
Republic of Korea		21.09	15.00		0.54
Taiwan			0.01		
Cuba	4438.14	3422.11	556.03	18.70	
Laos			20.23	0.95	
Sudan	2.10		20.58		
Yemen				2.40	
Philippines	0.20	7.71	0.10		0.08
French Polynesia	0.86				

TABLE C.2 Dates, figs, pineapples, avocados, guavas, mangoes and mangosteens, fresh or dried (fresh or dried) imported in 100 kg into the EU from regions where *Ceroplastes rubens* is known to occur (Source: Eurostat accessed on 09 May 2024).

Country	2018	2019	2020	2021	2022
Colombia	345338.25	447916.62	709451.31	915313.83	599585.86
Kenya	405592.15	348390.17	459175.07	518871.48	595907.69
South Africa	678554.82	427676.85	441946.37	436785.29	513365.05
Dominican Republic	178174.01	234606.26	231031.29	292009.09	234848.04
Iran	130988.00	116963.02	121443.51	126879.99	105362.24
Tanzania	55708.96	60632.94	50957.11	58505.42	96322.45
United States	59589.94	84834.69	85992.19	54683.28	65981.50
Egypt	8901.82	10527.73	17790.91	11697.99	21806.99
Thailand	16735.29	14879.86	14235.10	14071.54	16231.85
India	9653.73	9489.46	7381.33	16743.40	13065.18
China	1873.45	1698.63	3504.25	4605.40	4264.06
Indonesia	2926.73	2386.31	1409.44	1630.43	3937.95
Sri Lanka	4896.51	3584.89	3071.24	2212.79	2945.68
Ethiopia	310.64	11.78	35.86	971.92	520.59
Venezuela	2512.75	2010.44	282.69	522.30	488.17
Philippines	979.51	455.36	694.19	158.87	273.26
Cuba	3894.39	2232.84	1241.78	1060.66	242.05
Sudan	251.00	108.90	68.93	48.29	224.97
Laos	603.14	806.50	525.32	285.98	174.67

(Continues)

TABLE C.2 (Continued)

Country	2018	2019	2020	2021	2022
United States				103.68	17.28
Taiwan	3.48	17.41	0.97	14.94	10.40
Republic of Korea		0.45	0.71		6.12
Malaysia	217.76	75.12	44.60	29.93	2.33
Japan		0.00	0.05	7.66	2.18
Jamaica					1.23
Myanmar (Burma)	511.12	707.74	379.60	408.27	0.58
Australia	62.92	0.01	0.01	0.32	0.31
French Polynesia	1.19	0.62	0.24	0.17	0.03
Trinidad and Tobago				0.01	
Haiti	4.87				
New Caledonia		2.09			
Guam			224.00		

TABLE C.3 Indoor rooted cuttings and young plants (excl. cacti) imported in 100 kg into the EU from regions where *Ceroplastes rubens* is known to occur (Source: Eurostat accessed on 09 May 2024).

Country	2018	2019	2020	2021	2022
China	13,466.13	14,163.88	19,018.51	28,947.05	19,547.08
Thailand	5186.67	5025.07	5508.39	7909.60	6454.23
Kenya	11,131.71	9428.58	9507.31	11655.13	3682.32
Tanzania	26,386.95	52,854.67	26,873.49	13,607.49	2921.29
India	4428.20	4581.08	4284.74	14115.76	2215.66
United States	201.85	398.31	114.98	252.68	2130.24
Ethiopia	3894.61	3990.22	1095.38	506.66	1416.13
Taiwan	815.69	842.29	480.22	1435.10	997.59
Sri Lanka	1445.74	1403.22	1119.29	1300.52	931.37
Malaysia	208.38	692.96	481.63	233.65	430.01
South Africa	3726.06	3245.41	2856.00	3309.81	395.79
Australia	354.52	369.02	384.96	398.73	281.04
Egypt	84.34	51.13	33.11	37.27	179.91
Colombia	241.38	484.53	211.31	199.61	115.54
Indonesia	901.69	985.39	888.74	1492.86	111.48
Philippines	17.61	113.19	114.45	161.14	28.62
Norfolk Island	273.89	224.90	187.63	126.24	20.87
Japan	11.20	13.28	12.09	10.47	6.34
Iran					1.93
Republic of Korea	18.06	0.32	6.81	12.62	0.65
Dominican Republic	335.16	154.14	70.54		0.08

TABLE C.4 Fresh persimmons imported in 100 kg into the EU from regions where *Ceroplastes rubens* is known to occur (Source: Eurostat accessed on 09 May 2024).

Country	2018	2019	2020	2021	2022
South Africa	206.08	7857.42	4974.49	5551.00	11,143.58
China	5.09		17.40	42.85	46.10
Kenya					2.25
Republic of Korea	0.05	0.80			0.28
Japan	0.76	0.27	0.02	0.32	0.11
Thailand	0.07			2.26	0.01