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Pest categorisation of *Paracoccus marginatus*

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Abstract

The EFSA Panel on Plant Health performed a pest categorisation of *Paracoccus marginatus* (Hemiptera: Sternorrhyncha: Pseudococcidae), the papaya scale, for the EU. It is native to Central America and since the 1990s, it has spread rapidly in mainly tropical areas of the Caribbean, islands in the Indian and Pacific Oceans, Africa and southern Asia. Large populations were detected in northern Israel in 2016. It has not been reported within the EU. It is not listed in Annex II of Commission Implementing Regulation (EU) 2019/2072. It reproduces sexually and there are up to 11 generations per year in India. The estimated minimum, optimum and maximum temperature thresholds for the adult females are 13.9, 28.4 and 32.1°C, respectively. First-instar nymphs may move to neighbouring plants by crawling, or be passively dispersed by wind, or hitchhiking on clothing, equipment or animals. It is highly polyphagous, feeding on plants in 172 genera and 54 families. It is an important pest of custard apple (*Annona* spp.), papaya (*Carica papaya*) and *Hibiscus* spp. It also feeds on a wide range of plants cultivated in the EU such as eggplant (*Solanum melongena*), avocado (*Persea americana*), citrus (*Citrus* spp.), cotton (*Gossypium hirsutum*), grapevine (*Vitis vinifera*), guava (*Psidium guajava*), mango (*Mangifera indica*), passionfruit (*Passiflora edulis*), pomegranate (*Punica granatum*), pepper (*Capsicum annuum*) and tomato (*Solanum lycopersicum*). Plants for planting, fruits, vegetables and cut flowers are the main potential pathways for entry of *P. marginatus* into the EU. Climatic conditions in the warmest areas of Cyprus, Greece, Italy and Spain, where host plants occur, would likely allow this species to successfully establish and spread. Reductions in yield and quality of some cultivated hosts including *Annona* spp., *Hibiscus* spp. and papaya are anticipated if establishment occurs. Phytosanitary measures are available to reduce the likelihood of entry and spread. *P. marginatus* meets the criteria that are within the remit of EFSA to assess for this species to be regarded as a potential Union quarantine pest.

Keywords: papaya mealybug, Hemiptera, Pseudococcidae, invasive species, pest risk, plant health, plant pest

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1. Introduction

1.1. Background and terms of reference as provided by the requestor

1.1.1. Background

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

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

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

1.1.2. Terms of reference

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

EFSA is requested to deliver 53 pest categorisations for the pests listed in Annex 1A, 1B, 1D and 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

Paracoccus marginatus is one of a number of pests listed in Annex 1D 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 assessment of jasmine (*Jasminum polyanthum*) unrooted cuttings from Israel performed by EFSA (EFSA PLH Panel, 2020), in which *P. marginatus* was identified as a relevant non-regulated EU pest which could potentially enter the EU on *J. polyanthum*.

2. Data and methodologies

2.1. Data

2.1.1. Literature search

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

2.1.2. Database search

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

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

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

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

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

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

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

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

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 pest is established, and *Paracoccus marginatus* Williams and Granara de Willink is the accepted name.

Paracoccus marginatus Williams and Granara de Willink 1992 (Figure 1) is a mealybug within the order Hemiptera, suborder Sternorrhyncha, family Pseudococcidae. It was originally described from specimens collected in Mexico on *Manihot esculenta* (Williams and Granara de Willink, 1992) and is commonly known as papaya mealybug and marginal mealybug (CABI, online; EPPO, online).

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

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

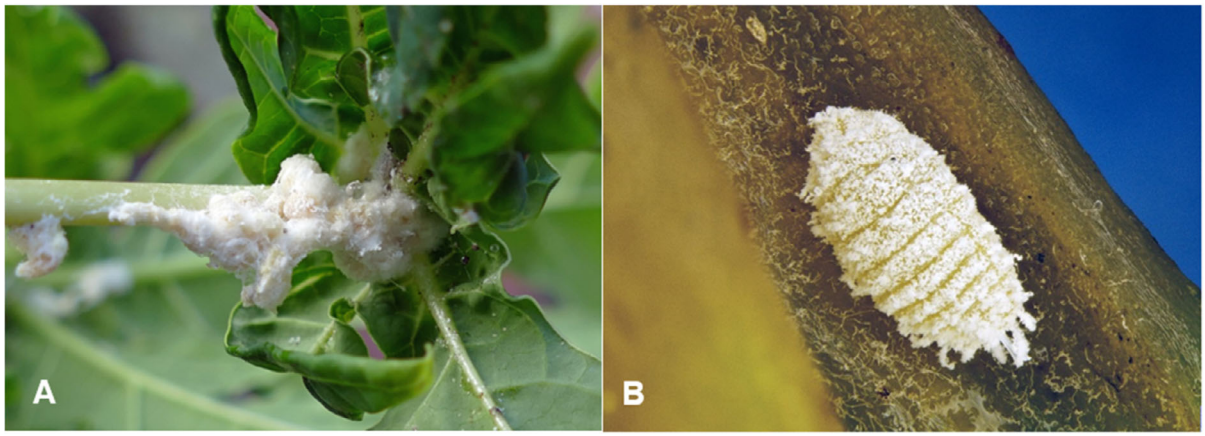

Figure 1: ***Paracoccus marginatus*****:** (A) colony on *Papaya carica,* British Virgin Islands; (B) close-up of adult female (body length about 2.2 mm) intercepted in UK on *Hibiscus sabdariffa* imported from Gambia (Source: Chris Malumphy)

3.1.2. Biology of the pest

P. marginatus reproduces sexually and there are up to 11 generations per year in India (Seni and Sahoo, 2015). Eggs are laid in waxy ovisacs. Females have three nymphal instars, whereas males have two nymphal instars, followed by a pre-pupal and pupal stage. Adult females are larviform and neotenic (they retain the immature external morphology even when sexually mature) (Figure 1B), whereas the adult males have a single pair of wings but are weak fliers. Population build-up is weather dependent as there is a significant positive correlation with increasing temperature between 18°C and 30°C and significantly negative correlation with relative humidity and rainfall (Amarasekare et al., 2008a; Seni and Sahoo, 2015; Kondo and Watson, 2022). Studies of the life history of *P. marginatus* on several host plant species under laboratory conditions have been undertaken in the USA (Amarasekare et al., 2008b) and India (Seni and Sahoo, 2015). Lifes-history parameters, such as developmental time, survival of first- and second-instar nymphs, sex ratio and fecundity, were found to vary with host species (Amarasekare et al., 2008b; Seni and Sahoo, 2015).

The effect of temperature on the life cycle of *P. marginatus* was investigated in a laboratory study in Florida by Amarasekare et al. (2008a). *P. marginatus* was able to develop and complete its life cycle between 18°C and 30°C. At 15, 34 and 35°C, the eggs hatched after 27.5, 5.9 and 5.5 days of incubation, respectively, but further development of the first-instar nymphs was arrested. No eggs hatched at 37°C. The developmental time for egg to adult was the longest at 18°C for both males and females. Approximately 80–90% of the eggs survived between 20°C and 30°C. The highest fecundity was at 25°C with each female producing an average of 300 eggs. Adult longevity, and preoviposition and oviposition periods increased with decreasing temperature below 25°C. The proportion of females in a population was 42% at 25°C and between 70% and 80% at 18, 20 and 30°C. Adult males and females required 303.0 and 294.1 degree-days (DD), respectively, to complete their development. The estimated minimum temperature thresholds for the adult males and females were 14.5°C and 13.9°C, respectively. For adult males, the estimated optimum and maximum temperature thresholds were 28.7°C and 31.9°C; and for adult females, they were 28.4°C and 32.1°C, respectively. The ability of *P. marginatus* to develop, survive and reproduce successfully between 18°C and 30°C suggests that it has the capability to develop and establish in areas within this temperature range.

Key features of the biology of each life stage are summarised in Table 2.

Table 2: Important features of the life-history strategy of *Paracoccus marginatus*

Life stage	Phenology and relation to host	Other relevant information
Egg	Eggs are laid in a small white ovisac of woolly wax, which often occur in dense groups, on the lower leaf surface, stems and fruit (Figure 1A).	In the tropics, *P. marginatus* has multiple, overlapping generations so all stages may be found throughout the year.

Life stage	Phenology and relation to host	Other relevant information
Larva/Nymph	First-instar nymphs are known as crawlers. They prefer to settle on the apical and tender parts of the host including buds, fruits, foliage and petioles. However, large populations of nymphs may also settle on the older plant parts such as the stems.	First-instars disperse by walking to other parts of the same plant or adjacent plants if touching. They are also dispersed by the wind, phoresy (attached to other animals) or incidentally by machinery and workers.
Adult	Adult females feed and oviposit in the same locations as the nymphs. Adult males are usually found in association with the adult females. Adult males and females lived for an average 2.3 and 21.2 days at 25 ± 1°C, respectively. Pre-reproductive and reproductive periods of the females averaged 6.3 and 11.2 days at 25 ± 1°C, respectively (Amarasekare et al., 2008b).	*P. marginatus* reproduces sexually. Adult females are gregarious and usually show limited movement. Adult males are winged and capable of limited flight.

3.1.3. Host range/species affected

The host range of *P. marginatus* is extensive with more than 172 plant genera recorded in 54 plant families (Appendix A provides a full host list). It exhibits a preference for plants assigned to the families Amaranthaceae, Apocynaceae, Asteraceae, Euphorbiaceae, Fabaceae, Malvaceae and Solanaceae, and shows a strong preference for papaya (*Carica papaya*) (Fam. Caricaceae).

Many of the host plants are cultivated in the EU such as eggplant (*Solanum melongena*), avocado (*Persea americana*), basil (*Ocimum basilicum*), kenaf (*Hibiscus cannabinus*), common bean (*Phaseolus vulgaris*), cotton (*Gossypium hirsutum*), cowpea (*Vigna unguiculata*), date palm (*Phoenix dactylifera*), grapefruit (*Citrus paradisi*), grapevine (*Vitis vinifera*), guava (*Psidium guajava*), lemon (*Citrus limon*), maize (*Zea mays*), mango (*Mangifera indica*), marjoram (*Origanum majorana*), sweet orange (*Citrus sinensis*), passionfruit (*Passiflora edulis*), pomegranate (*Punica granatum*), papaya (*Carica papaya*), pepper (*Capsicum annuum*), potato (*Solanum tuberosum*), soybean (*Glycine max*), sunflower (*Helianthus annuus*), tomato (*Solanum lycopersicum*) and white mulberry (*Morus alba*) (CABI, online; EPPO, online, García Morales et al., 2016). Ornamental plants grown in the EU that are hosts include hibiscus (*Hibiscus rosa-sinensis*), oleander (*Nerium oleander*), *Plumeria* spp., poinsettia (*Euphorbia pulcherrima*) and rose (*Rosa spp*.). In the EU, many hosts also occur in the wild.

3.1.4. Intraspecific diversity

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

3.1.5. Detection and identification of the pest

Are detection and identification methods available for the pest?

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

Symptoms

According to Mendel et al. (2016) and Kondo and Watson (2022), the main symptoms of *P. marginatus* infestation are:

- chlorosis
- leaf distortion and crinkling
- leaves withering and premature drop
- young fruit deformation and premature drop
- host plant covered with sticky honeydew egested by the mealybugs
- presence of ants attending the mealybugs and feeding on honeydew
- black sooty mould developing on the honeydew
- thick white mat of waxy deposits
- stunted and bunchy shoots

- dieback of the branches
- mortality of susceptible plants

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

Identification

The identification of *P. marginatus* requires microscopic examination of slide-mounted adult females and verification of the presence of key morphological characteristics. *Paracoccus* is a species-rich genus containing 92 species worldwide and there are no comprehensive keys available. A detailed morphological description and illustration of the adult female is provided by Williams and Granara de Willink (1992). Miller and Miller (2002) provide complete descriptions of all instars (adult female, adult male, nymphs, prepupa and pupa) and diagnostic characteristics to distinguish it from other closely related species. Joshi et al. (2021) provide photographs and keys for the identification of live and slide-mounted adult females of 10 species of mealybug infesting cassava in India. This includes *P. marginatus* and several other polyphagous, widespread species that share many of the same host species.

Molecular techniques based on the nucleotide sequences of the mitochondrial cytochrome oxidase I (CO-I) genes have been developed for species identification (Wu et al., 2014). GenBank contains gene nucleotide sequences for *P. marginatus* (https://www.ncbi.nlm.nih.gov/nuccore/?term=Paracoccus+marginatus).

Description

The main morphological characters are:

- Adult female body elongate oval; somewhat flattened dorso-ventrally; body yellow; legs light yellow; mealy wax covering body, not thick enough to hide yellow body, but segmental lines clearly visible (Figure 1B); with 15–17 short lateral wax filaments, posterior pair of filaments longest. One interesting feature is that the body turns black in 70% alcohol which is unusual for *Paracoccus* species.
- Eggs cream or light yellow.
- Female immature instars are similar to the adult female but smaller.

3.2. Pest distribution

3.2.1. Pest distribution outside the EU

The native range of *P. marginatus* is Central America and since the 1990s, it has spread rapidly in many tropical and subtropical regions across the world due to trade with fresh plant material (Kondo and Watson, 2022). During the 1990s, it began to spread throughout the Caribbean region and reached islands in the Pacific Ocean by 2002, southern Asia by 2008, Africa by 2009, Indian Ocean by 2010 and Israel by 2016 (García Morales et al., 2016; Mendel et al., 2016; Kondo and Watson, 2022). It is currently actively spreading in parts of Africa and Asia (see Section 3.4.1 that discusses evidence that it is more widespread in Africa than currently reported in the literature). For a detailed list of countries where *P. marginatus* is reported from, see Appendix B.

Genetic analysis by Ahmed et al. (2015) revealed only one haplotype (a group of alleles in an organism that are inherited together from a single parent) of *P. marginatus* from samples collected across Asia (Cambodia, China, India, Indonesia, Malaysia and Thailand) reflecting the very recent invasion of *P. marginatus* in Asia. The presence of the same of haplotype across all sampled Asian countries suggests that all specimens stem from the same population resource that initially invaded Asia in 2008. Ahmed et al. (2015) also found that this was the same as the haplotype in Mozambique in southeast Africa. There has not been genetic analysis of *P. marginatus* in its native range (Figure 2).

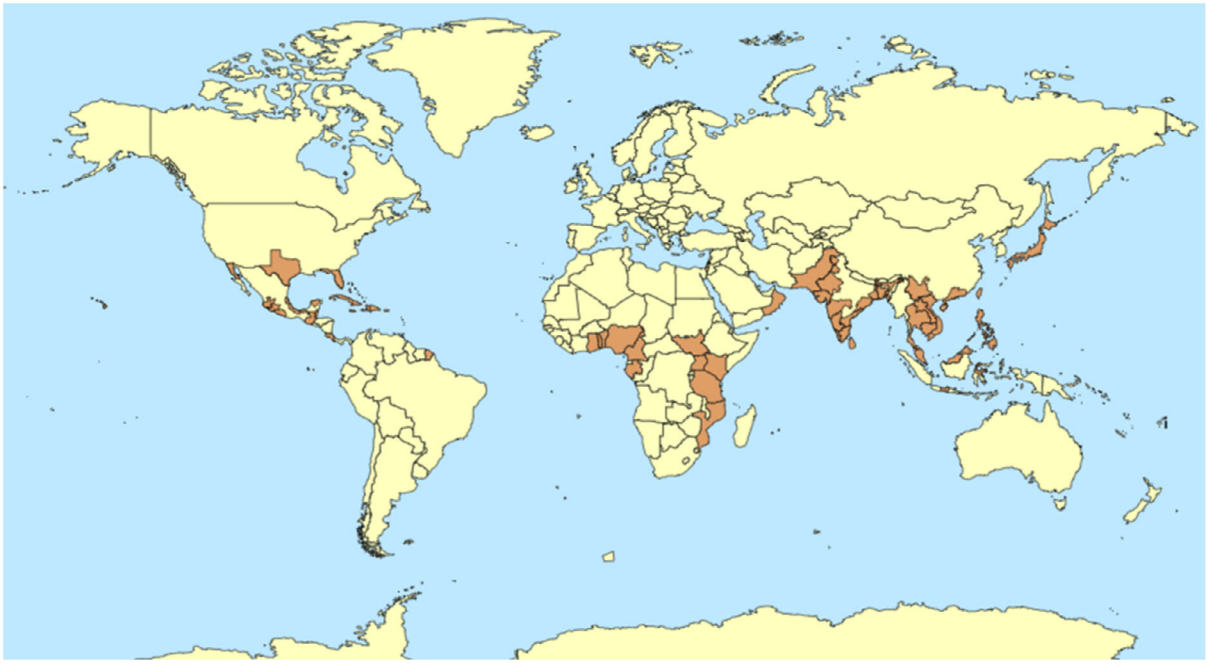

Figure 2: Global distribution of *Paracoccus marginatus* (Source: CABI, online accessed on 17 January 2023 and Garcia Morales et al., 2016)

3.2.2. Pest distribution in the EU

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

No. *P. marginatus* is not known to occur in the EU.

3.3. Regulatory status

3.3.1. Commission implementing regulation 2019/2072

P. marginatus is not listed in Annex II of Commission Implementing Regulation (EU) 2019/2072, an implementing act of Regulation (EU) 2016/2031, or in any emergency plant health legislation. However, the species is included in the list of pests that are regulated by the Commission Implementing Regulation (EU) 2020/1213 (as amended by 2021/1936) as regards certain plants for planting of *Ficus carica* L. and *Persea americana* Mill. originating in Israel.

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

According to the Commission Implementing Regulation (EU) 2019/2072, Annex VI, introduction of several *P. marginatus* hosts in the Union from certain third countries is prohibited (Table 3). Plants for planting of *Acacia* Mill., *Annona* L., *Bauhinia* L., *Cassia* L., *Jasminum* L., *Nerium* L. and *Persea* Mill and fruits of *Momordica* L. which are hosts of *P. marginatus* (Appendix A) are considered high-risk plants for the EU and their import is prohibited pending risk assessment (EU 2018/2019).

Table 3: List of plants, plant products and other objects that are *Paracoccus marginatus* hosts whose introduction into the Union from certain third countries is prohibited (Source: Commission Implementing Regulation (EU) 2019/2072, Annex VI)

List of plants, plant products and other objects whose introduction into the Union from certain third countries is prohibited			
	Description	**CN code**	**Third country, group of third countries or specific area of third country**
8.	Plants for planting of [. . .] *Rosa* 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
10.	Plants of *Vitis* L., other than fruits	0602 10 10 0602 20 10 ex 0604 20 90 ex 1404 90 00	Third countries other than Switzerland
11.	Plants of *Citrus* L., [. . .]., and their hybrids, other than fruits and seeds	ex 0602 10 90 ex 0602 20 20 0602 20 30 ex 0602 20 80 ex 0602 90 45 ex 0602 90 46 ex 0602 90 47 ex 0602 90 50 ex 0602 90 70 ex 0602 90 91 ex 0602 90 99 ex 0604 20 90 ex 1404 90 00	All third countries
13.	Plants of *Phoenix* spp. other than fruit and seeds	ex 0602 20 20 ex 0602 20 80 ex 0602 90 41 ex 0602 90 45 ex 0602 90 46 ex 0602 90 47 ex 0602 90 50 ex 0602 90 70 ex 0602 90 99 ex 0604 20 90 ex 1404 90 0	Algeria, Morocco
14.	Plants for planting of the family Poaceae, other than plants of ornamental perennial grasses of the subfamilies [. . .] and Panicoideae and of the genera [..] *Uniola* L., other than seeds	ex 0602 90 50 ex 0602 90 91 ex 0602 90 99	Third countries other than: Albania, Algeria, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canary Islands, Egypt, Faeroe Islands, Georgia, Iceland, Israel, Jordan, Lebanon, Libya, Liechtenstein, Moldova, Monaco, Montenegro, Morocco, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo-Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Syria, Tunisia, Türkiye, Ukraine, and the United Kingdom

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**
18.	Plants for planting of Solanaceae other than seeds and the plants covered by entries 15, 16 or 17	ex 0602 90 30 ex 0602 90 45 ex 0602 90 46 ex 0602 90 48 ex 0602 90 50 ex 0602 90 70 ex 0602 90 91 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

Jasminum polyanthum, *Persea americana* and *Momordica charantia* are listed in Annex I of EU 2018/2019, as high-risk plants whose introduction into the EU is prohibited pending risk assessment. Following the evaluation of dossiers on *J. polyanthum* from Israel (EFSA PLH Panel, 2020; leading to EU 2021/419) and from Uganda (EFSA PLH Panel, 2022; EU 2022/1942), *P. americana* from Israel (EFSA PLH Panel, 2021a; EU 2021/1936) and *M. charantia* from Mexico, Sri Lanka and Thailand (EFSA PLH Panel, 2021c, 2021d, 2021e; EU 2022/853), these commodity/country combinations have been exempted from the prohibition. *P. marginatus* is present in all five of these countries. *Momordica* from Honduras is also permitted into the EU (EFSA PLH Panel, 2021b; EU 2022/853); however, *P. marginatus* is not known to occur in Honduras although it is present in Central America, and the US report interceptions from Honduras (Miller et al., 2014).

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. *P. marginatus* could enter the EU territory. Possible pathways of entry are plants for planting, fruits, vegetables, and cut flowers.

Comment on plants for planting as a pathway.

Plants for planting provide one of the main pathways for *P. marginatus* to enter the EU.

Plants for planting and fruits, vegetables and cut flowers are the main potential pathways for entry of *P. marginatus* (Table 4). Several host plants are imported into the EU from regions where *P. marginatus* is known to occur (Table 5).

Table 4: Potential pathways for *Paracoccus marginatus* into the EU

Pathways (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	All life stages	Plants for planting that are hosts of *P. marginatus* and are prohibited from third countries (Regulation 2019/2072, Annex VI) are listed in Table 3. Plants for planting from third countries require a phytosanitary certificate (Regulation 2019/2072, Annex XI, Part A). Some hosts are considered high-risk plants (Regulation EU 2018/2019) for the EU and their import is prohibited subject to risk assessment.

Pathways (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]
Fruits, vegetables and cut flowers	All life stages	Fruits, vegetables and cut flowers from third countries require a phytosanitary certificate to be imported into the EU (2019/2072, Annex XI, Part A). However, no requirements are specified for *P. marginatus*.

Table 5: Host plants imported (tonnes) into the EU from regions where *Paracoccus marginatus* is known to occur (Source: Eurostat, accessed on 18 January 2023)

Commodity	CN code	2016	2017	2018	2019	2020
Bananas	0803	1,570,331	1,577,606	1,610,060	1,638,692	1,707,775
Fresh or dried grapefruits	0805 40 00	229,995	247,490	244,420	241,335	234,620
Avocados	0804 40 00	154,517	151,801	201,392	213,727	209,219
Grapes	0806	184,936	189,773	191,929	195,085	204,102
Coconuts, Brazil nuts and cashew nuts	0801	164,163	169,890	171,030	182,685	198,381
Fresh or dried lemons	0805 50 10	47,045	57,207	84,185	95,209	147,342
Guavas, mangoes and mangosteens	0804 50 00	43,081	39,972	42,072	46,801	43,342
Fresh, chilled, frozen or dried roots and tubers of manioc 'cassava', whether or not sliced or in the form of pellets	0714 10 00	21,458	23,989	27,678	31,705	37,306
Cotton, not carded or combed	05201 00	24,007	31,482	32,515	26,559	26,076
Fresh or dried dates	0804 10 00	13,636	16,096	16,041	18,272	18,946
Beans (*Vigna* spp., *Phaseolus* spp.)	0708 20 00	14,709	14,855	15,319	18,018	16,397
Fresh tamarinds, cashew apples, lychees, jackfruit, sapodillo plums, passion fruit, carambola and pitahaya	0810 90 20	11,598	12,351	11,940	12,653	10,193
Roses	0602 40 00	242	105	399	83	3

Notifications of interceptions of harmful organisms began to be compiled in Europhyt in May 1994 and in TRACES in May 2020. As at 12 December 2022, there were no records of interception of *P. marginatus* in the TRACES database. Due to technical issues, it was not possible to access the Europhyt database. However, since *P. marginatus* is not a quarantine pest, EU member states have no formal obligation to notify interceptions of the pest via Europhyt.

Between 2014 and 2021, *P. marginatus* was intercepted 21 times in the UK on fresh fruit and vegetables imported from Africa (Gambia and Sierra Leone) and Asia (Bangladesh, Sri Lanka, Thailand).

Live immature and adult female *P. marginatus* have been intercepted in England on fresh tossa jute (*Corchorus olitorius*) foliage and growing tips and buds of roselle (*Hibiscus sabdariffa*) imported directly from Gambia, and on roselle from Sierra Leone, on multiple occasions. *P. marginatus* has not been reported from these countries and these interceptions indicate that the mealybug is significantly more widespread in West Africa than recorded in the literature.

3.4.2. Establishment

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

Yes, *P. marginatus* could establish in parts of the EU territory as there are climatic conditions that are similar to those in areas where the pest occurs and potential hosts are present.

Limited areas of Cyprus, Greece, Italy, and Spain are parts of the EU which are the most suitable for establishment outdoors. Heated glasshouses may allow establishment more widely.

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

3.4.2.1. EU distribution of main host plants

P. marginatus is a polyphagous pest. The main hosts of the pest cultivated in the EU 27 between 2016 and 2020 are shown in Table 6. Other hosts include eggplant, basil, common bean, cowpea, date palm, guava, maize, mango, marjoram, passionfruit, pomegranate, papaya, pepper, sunflower, tomato, white mulberry and ornamental plants.

Table 6: Harvested area of host plants of *Paracoccus marginatus* in EU 27, 2016–2020 (1,000 ha). Source: Eurostat (accessed on 18 January 2023)

Year	Code	2016	2017	2018	2019	2020
Grapes	W1000	3,136.15	3,133.32	3,135.50	3,155.20	3,145.71
Potatoes (including seed potatoes)	R100	1,550.50	1,601.18	1,562.85	1,603.70	1,462.78
Soya	I1130	831.18	962.39	955.40	907.91	942.50
Cotton fibre	L2300	301.35	326.12	345.64	361.78	344.35
Sweet oranges	T1000	278.67	272.42	273.64	271.97	275.39
Lemons	T3100	72.61	74.16	78.06	76.37	79.77
Avocados	F2300	12.24	12.72	13.22	17.50	19.69
Bananas	F2400	20.30	18.91	17.94	18.27	19.62
Grapefruits	T400*	3.07	3.30	3.49	3.68	3.86

*: This code includes also pomelos (C. maxima), non-hosts of *P. marginatus*.

3.4.2.2. Climatic conditions affecting establishment

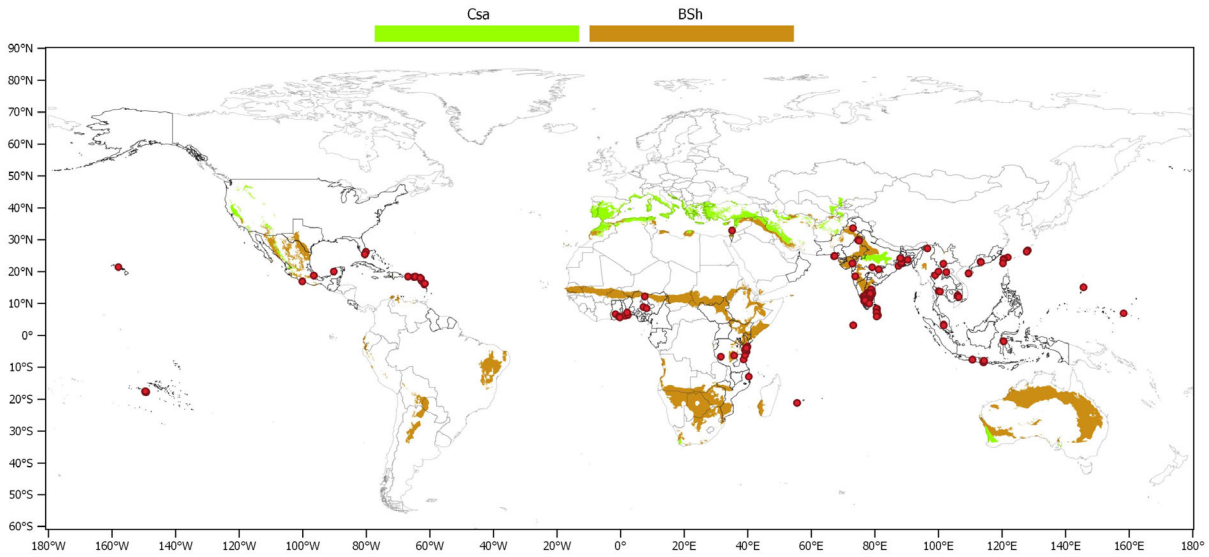

Figure 3: World distribution of selected Köppen–Geiger climate types which occur in the EU and in countries where *Paracoccus marginatus* has been reported. Red dots indicate point locations of *P. marginatus* for which geographical coordinates are available

Finch et al. (2020) modelled the potential global distribution of *P. marginatus* using CLIMEX, a process-oriented, climate-based niche model. They concluded that levels of cold stress were too high over the majority of Europe to be suitable for *P. marginatus* establishment. However, the model did indicate very small areas of land surrounding Seville in Spain and around Sicily in Italy were climatically suitable. Further, positive growth indices did occur over the rest of mainland Europe, and this largely intersected with areas of suitable crop types.

Average high and low temperatures in Larnaca, Cyprus and Rhodes, Greece, are similar to those at Ben Gurion Airport, Tel Aviv, Israel (https://weatherspark.com/), where the mealybug has established, indicating that parts of Cyprus and Greece are likely to be suitable.

3.4.3. Spread

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

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

Comment on plants for planting as a mechanism of spread.

Plants for planting provide the main spread mechanism for *P. marginatus* over long distances.

First-instar nymphs may move to neighbouring plants by crawling or be passively dispersed by wind or hitchhiking on clothing, equipment or animals (Kondo and Watson, 2022).

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

3.5. Impacts

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

Yes, if *P. marginatus* established in the EU, it may have an economic impact in a limited area.

P. marginatus feeds on the phloem and egest sugary honeydew, which fouls plant surfaces and serves as a medium for the growth of sooty moulds. The mould reduces photosynthesis and gas exchange, causing a loss of vigour and yield. Infestations of the mealybug may completely cover the lower surfaces of the foliage, forming a dense mat of waxy secretions. Shoots are stunted and become bunchy. Leaves are distorted, crinkled and fail to expand. Infested leaves and young fruits are dropped. Contaminated fruit and ornamental plants are unmarketable (Kondo and Watson, 2022). *Annona* spp., papaya, cassava and *Hibiscus* spp. are particularly susceptible. Papaya trees are particularly susceptible and may be killed within a few months of being infested (Kondo and Watson, 2022). High populations of *P. marginatus* have been found in papaya orchards along the Mediterranean coast of Northern Israel (Mendel et al., 2016). Papaya cultivation in Spain is mostly focused on the Canary Islands (about 350 ha in 2016 with a production of around 16,000 t) with a few orchards (under protected cultivation) in SE Spain (provinces of Málaga, Granada, Murcia and mostly Almería) covering about 50 ha in total. The Canary Islands are not included in the area considered for this pest categorisation.

P. marginatus has a wide host range including many economically important crops and ornamentals grown in the EU (listed in Section 3.1.3), but there appear to be no published records of harmful impacts to many of these plants.

There are small areas in the warmest part of southern EU where establishment is possible although crops on which impacts have been reported elsewhere are commercially grown in very small areas, e.g. 50 ha of papaya in Spain.

There is uncertainty regarding the magnitude of impact. This will depend on the area of establishment and the size of the populations.

3.6. Available measures and their limitations

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

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

3.6.1. Identification of potential additional measures

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

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

3.6.1.1. Additional potential risk reduction options

Potential additional control measures are listed in Table 7.

Table 7: Selected control measures (a full list is available in EFSA PLH Panel, 2018) for pest entry/establishment/spread/impact in relation to currently unregulated hosts and pathways. Control measures are measures that have a direct effect on pest abundance

Control measure/ Risk reduction option (Blue underline = Zenodo doc, Blue = WIP)	RRO summary	Risk element targeted (entry/establishment/ spread/impact)
Require pest freedom	Pest-free place of production (e.g. place of production and its immediate vicinity is free from pest over an appropriate time period, e.g. since the beginning of the last complete cycle of vegetation, or past 2 or 3 cycles). Pest-free production site.	Entry/Spread/Impact
Growing plants in isolation	Place of production is insect proof Originate in a place of production with complete physical isolation, e.g. a dedicated structure such as glass or plastic greenhouses producing vegetables or flowers.	Entry/Spread
Managed growing conditions	Plants should be grown in officially registered nurseries, which are subject to an officially supervised control regime.	Entry/Spread
Biological control and behavioural manipulation	*P. marginatus* has been successfully controlled by using natural enemies in several countries (Kondo and Watson, 2022). For example, the introduction of three species of parasitoid wasp (Hymenoptera: Encyrtidae) has controlled the mealybug in Sri Lanka and the Republic of Palau. One of them, *Acerophagus papayae* Noyes and Schauff is particularly effective but is not present in the EU; 95–100% control was achieved following the release of *A. papayae* in Sri Lanka in 2009. Kondo and Watson (2022) list other natural enemies.	Spread/Impact
Chemical treatments on crops including reproductive material	Chemical control of *P. marginatus* is discussed by Kondo and Watson (2022). Chemical control is only partially effective due to the waxy coating of the mealybugs, and location in protected niches. Crawlers are most susceptible. Multiple applications are necessary. They suggest spraying neem oil or fish oil rosin soap.	Entry/Establishment/Spread/ Impact

Control measure/ Risk reduction option (Blue underline = Zenodo doc, Blue = WIP)	RRO summary	Risk element targeted (entry/establishment/ spread/impact)
Chemical treatments on consignments or during processing	Use of chemical compounds that may be applied to plants or to plant products after harvest, during process or packaging operations and storage. The treatments addressed in this information sheet are: a) fumigation; b) spraying/dipping pesticides.	Entry/Spread
Physical treatments on consignments or during processing	This information sheet deals with the following categories of physical treatments: irradiation/ ionisation; mechanical cleaning (brushing, washing); sorting and grading; and removal of plant parts.	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, pallets, palox, supports, hand tools). The measures addressed in this information sheet are washing, sweeping and fumigation.	Entry/Spread
Heat and cold treatments	Controlled cold temperature treatments aimed to kill or inactivate pests without causing any unacceptable prejudice to the treated material itself.	Entry/Spread

3.6.1.2. Additional supporting measures

Potential additional supporting measures are listed in Table 8.

Table 8: Selected supporting measures (a full list is available in EFSA PLH Panel, 2018) in relation to currently unregulated hosts and pathways. Supporting measures are organisational measures or procedures supporting the choice of appropriate risk reduction options that do not directly affect pest abundance

Supporting measure (Blue underline = Zenodo doc, Blue = WIP)	Summary	Risk element targeted (entry/establishment/ spread/impact)
Inspection and trapping	Inspection is defined as the official visual examination of plants, plant products or other regulated articles to determine if pests are present or to determine compliance with phytosanitary regulations (ISPM 5). The effectiveness of sampling and subsequent inspection to detect pests may be enhanced by including trapping and luring techniques.	Entry/Establishment/Spread/ Impact
Laboratory testing	Examination, other than visual, to determine if pests are present using official diagnostic protocols. Diagnostic protocols describe the minimum requirements for reliable diagnosis of regulated pests.	Entry/Spread
Sampling	According to ISPM 31, it is usually not feasible to inspect entire consignments, so phytosanitary inspection is performed mainly on samples obtained from a consignment. It is noted that the sampling concepts presented in this standard may	Entry

Supporting measure (Blue underline = Zenodo doc, Blue = WIP)	Summary	Risk element targeted (entry/establishment/ spread/impact)
	also apply to other phytosanitary procedures, notably selection of units for testing. For inspection, testing and/or surveillance purposes, the sample may be taken according to a statistically based or a non-statistical sampling methodology.	
Phytosanitary certificate and plant passport	An official paper document or its official electronic equivalent, consistent with the model certificates of the IPPC, attesting that a consignment meets phytosanitary import requirements (ISPM 5) a) Export certificate (import) b) Plant passport (EU internal trade)	Entry/Spread
Certified and approved premises	Mandatory/voluntary certification/approval of premises is a process including a set of procedures and of actions implemented by producers, conditioners and traders contributing to ensure the phytosanitary compliance of consignments. It can be a part of a larger system maintained by the NPPO in order to guarantee the fulfilment of plant health requirements of plants and plant products intended for trade. Key property of certified or approved premises is the traceability of activities and tasks (and their components) inherent the pursued phytosanitary objective. Traceability aims to provide access to all trustful pieces of information that may help to prove the compliance of consignments with phytosanitary requirements of importing countries.	Entry/ Spread
Certification of reproductive material (voluntary/official)	Plants come from within an approved propagation scheme and are certified pest free (level of infestation) following testing; used to mitigate against pests that are included in a certification scheme.	Entry/Spread
Delimitation of Buffer zones	ISPM 5 defines a buffer zone as 'an area surrounding or adjacent to an area officially delimited for phytosanitary purposes in order to minimize 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

- *P. marginatus* is polyphagous, making the inspections of all consignments containing hosts from countries where the pest occurs difficult.
- Limited effectiveness of contact insecticides due to the presence of protective wax cover.
- Difficulty in detecting early infestations.
- Confusion with other mealybugs already present in the EU.

3.7. Uncertainty

No key uncertainties of the assessment have been identified.

4. Conclusions

P. marginatus satisfies with no key uncertainties the criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest (Table 9).

Table 9: The Panel's conclusions on the pest categorisation criteria defined in Regulation (EU) 2016/2031 on protective measures against pests of plants (the number of the relevant sections of the pest categorisation is shown in brackets in the first column)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of *P. marginatus* is established. Taxonomic keys based on morphology of adults exist. There are also molecular techniques for species identification.	None
Absence/presence of the pest in the EU (Section 3.2)	No, *P. marginatus* is not known to occur in the EU.	None
Pest potential for entry, establishment and spread in the EU (Section 3.4)	*P. marginatus* is able to enter, become established and spread within the EU territory especially in the warmest areas of Cyprus, Greece, Italy and Spain (it has recently established in Israel). The main pathways for entry of *P. marginatus* are plants for planting, cut flowers, fruits and vegetables.	None
Potential for consequences in the EU (Section 3.5)	If *P. marginatus* established in the EU, it may have an economic impact in a limited area.	None
Available measures (Section 3.6)	There are measures available to prevent entry, establishment and spread of *P. marginatus* in the EU. Risk reduction options include inspections, chemical and physical treatments on consignments of fresh plant material from infested countries and the production of plants for import in the EU in pest-free areas.	None
Conclusion (Section 4)	*P. marginatus* satisfies all the criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest	
Aspects of assessment to focus on/ scenarios to address in future if appropriate:		

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Abbreviations

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

Glossary

Containment (of a pest)	Application of phytosanitary measures in and around an infested area to prevent spread of a pest (FAO, 2021)
Control (of a pest)	Suppression, containment or eradication of a pest population (FAO, 2021)
Entry (of a pest)	Movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled (FAO, 2021)
Eradication (of a pest)	Application of phytosanitary measures to eliminate a pest from an area (FAO, 2021)
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2021)
Greenhouse	A walk-in, static, closed place of crop production with a usually translucent outer shell, which allows controlled exchange of material and energy with the surroundings and prevents release of plant protection products (PPPs) into the environment
Hitchhiker	An organism sheltering or transported accidentally via inanimate pathways including with machinery, shipping containers and vehicles; such organisms are also known as contaminating pests or stowaways (Toy and Newfield, 2010)
Impact (of a pest)	The impact of the pest on the crop output and quality and on the environment in the occupied spatial units
Introduction (of a pest)	The entry of a pest resulting in its establishment (FAO, 2021)
Pathway	Any means that allows the entry or spread of a pest (FAO, 2021)
Phytosanitary measures	Any legislation, regulation or official procedure having the purpose to prevent the introduction or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests (FAO, 2021)

Quarantine pest	A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (FAO, 2021)
Risk reduction option (RRO)	A measure acting on pest introduction and/or pest spread and/or the magnitude of the biological impact of the pest should the pest be present. A RRO may become a phytosanitary measure, action or procedure according to the decision of the risk manager
Spread (of a pest)	Expansion of the geographical distribution of a pest within an area (FAO, 2021)

Appendix A – *Paracoccus marginatus* host plants/species affected

Host status	Host name	Plant family	Common name	Reference
Cultivated hosts	*Abelmoschus esculentus*	Malvaceae	Okra	CABI (online)
	Abelmoschus moschatus	Malvaceae	Musk okra	Garcia Morales et al. (2016)
	Abrus precatorius	Fabaceae	Rosary pea	CABI (online)
	Abutilon hirtum	Malvaceae	Florida Keys Indian mallow	Garcia Morales et al. (2016)
	Abutilon indicum	Malvaceae	Country mallow	CABI (online)
	Abutilon pannosum	Malvaceae	Ragged mallow	Garcia Morales et al. (2016)
	Acacia	Fabaceae	Wattles	CABI (online)
	Acacia ferruginea	Fabaceae	–	Garcia Morales et al. (2016)
	Acacia leucophloea	Fabaceae	White-barked Acacia	CABI (online)
	Acalypha	Euphorbiaceae	Copperleaf	CABI (online)
	Acalypha indica	Euphorbiaceae	Indian copperleaf	CABI (online)
	Acalypha wilkesiana	Euphorbiaceae	copperleaf	CABI (online)
	Achyranthes aspera	Amaranthaceae	Devil's horsewhip	CABI (online)
	Adansonia digitata	Malvaceae	Baobab	Garcia Morales et al. (2016)
	Adenium	Apocynaceae	–	CABI (online)
	Aerva javanica	Amaranthaceae	Desert cotton	CABI (online)
	Aerva lanata	Amaranthaceae	Mountain knotgrass	Garcia Morales et al. (2016)
	Ageratum conyzoides	Asteraceae	Billy goat weed	CABI (online)
	Aglaonema	Araceae	–	CABI (online)
	Ailanthus excelsa	Simaroubaceae	–	CABI (online)
	Alchornea cordifolia	Acalyphoideae	–	Garcia Morales et al. (2016)
	Allamanda blanchetii	Apocynaceae	Purple allamanda	Garcia Morales et al. (2016)
	Alpinia purpurata	Alpinioideae	Red ginger	CABI (online)
	Alstonia macrophylla	Apocynaceae	Match-stick tree	CABI (online)
	Alternanthera sessilis	Amaranthaceae	Sessile joyweed	CABI (online)
	Amaranthus spinosus	Amaranthaceae	Needle burr	Garcia Morales et al. (2016)
	Amaranthus viridis	Amaranthaceae	Slender amaranth	CABI (online)
	Ambrosia peruviana	Asteraceae	–	Garcia Morales et al. (2016)
	Ambrosia psilostachya	Asteraceae	Perennial ragweed	CABI (online)
	Anacardium occidentale	Anacardiaceae	Cashew nut	CABI (online)
	Ananas comosus	Bromeliaceae	Pineapple	CABI (online)
	Andrographis paniculata	Acanthaceae	Creat	CABI (online)
	Anisomeles malabarica	Lamiaceae	–	Garcia Morales et al. (2016)
	Annona	Annonaceae		CABI (online)
	Annona muricata	Annonaceae	Soursop	CABI (online)
	Annona reticulata	Annonaceae	Bullock's heart	CABI (online)
	Annona squamosa	Annonaceae	Sugar apple	CABI (online)
	Arachis hypogaea	Fabaceae	Groundnut	CABI (online)

Host status	Host name	Plant family	Common name	Reference
	Artocarpus altilis	Moraceae	Breadfruit	CABI (online)
	Artocarpus heterophyllus	Moraceae	Jackfruit	CABI (online)
	Aspilia africana	Asteraceae	–	Garcia Morales et al. (2016)
	Averrhoa carambola	Oxalidaceae	Carambola	CABI (online)
	Azadirachta indica	Meliaceae	Neem tree	CABI (online)
	Bauhinia purpurea	Fabaceae	Purple bauhinia	CABI (online)
	Bernardia corensis	Euphorbiaceae	–	CABI (online)
	Bidens	Asteraceae	Bur marigold	CABI (online)
	Bidens pilosa	Asteraceae	Blackjack	CABI (online)
	Boerhavia diffusa	Nyctaginaceae	Red spiderling	CABI (online)
	Boerhavia erecta	Nyctaginaceae		CABI (online)
	Breonia chinensis	Rubiaceae	–	Garcia Morales et al. (2016)
	Cadaba farinosa	Capparaceae	–	Garcia Morales et al. (2016)
	Cajanus cajan	Fabaceae	Pigeon pea	CABI (online)
	Calliandra surinamensis	Fabaceae	Pink powderpuff	Garcia Morales et al. (2016)
	Calopogonium mucunoides	Fabaceae	Calopo	Garcia Morales et al. (2016)
	Calotropis gigantea	Apocynaceae	Yercum fibre	CABI (online)
	Calotropis procera	Apocynaceae	apple of Sodom	Garcia Morales et al. (2016)
	Capsicum annuum	Solanaceae	Bell pepper	CABI (online)
	Carica	Caricaceae	–	CABI (online)
	Carica papaya	Caricaceae	Pawpaw (papaya)	CABI (online)
	Cassia fistula	Fabaceae	Indian laburnum	CABI (online)
	Catharanthus roseus	Apocynaceae	Madagascar periwinkle	CABI (online)
	Ceiba pentandra	Malvaceae	Kapok	CABI (online)
	Celosia	Amaranthaceae	–	CABI (online)
	Celosia argentea	Amaranthaceae	Celosia	CABI (online)
	Centella asiatica	Apiaceae	Asiatic pennywort	CABI (online)
	Cestrum nocturnum	Solanaceae	Night jessamine	CABI (online)
	Cheilocostus speciosus	Costaceae	Crepe ginger	CABI (online)
	Chromolaena odorata	Asteraceae	Archangel	Garcia Morales et al. (2016)
	Cissus quadrangularis	Vitaceae	Adamant creeper	Garcia Morales et al. (2016)
	Citrus	Rutaceae	–	CABI (online)
	Citrus limon	Rutaceae	Lemon	Garcia Morales et al. (2016)
	Citrus paradisi	Rutaceae	Grapefruit	Garcia Morales et al. (2016)
	Citrus sinensis	Rutaceae	Sweet orange	CABI (online)
	Clerodendrum paniculatum	Lamiaceae	Pagoda flower	Garcia Morales et al. (2016)
	Cleome viscosa	Cleomaceae	Asian spiderflower	CABI (online)
	Clitoria ternatea	Fabaceae	Butterfly-pea	CABI (online)
	Cnidoscolus aconitifolius	Euphorbiaceae	Chaya	Garcia Morales et al. (2016)
	Cocos nucifera	Arecaceae	Coconut	CABI (online)
	Codiaeum variegatum	Euphorbiaceae	Croton	Garcia Morales et al. (2016)

Host status	Host name	Plant family	Common name	Reference
	Coffea	Rubiaceae	Coffee	CABI (online)
	Coffea canephora	Rubiaceae	Robusta coffee	Garcia Morales et al. (2016)
	Coleus forskohlii	Lamiaceae	–	CABI (online)
	Coleus monostachyus	Lamiaceae	–	Garcia Morales et al. (2016)
	Commelina benghalensis	Commelinaceae	Bengal day flower	Garcia Morales et al. (2016)
	Commiphora caudata	Burseraceae	–	Garcia Morales et al. (2016)
	Corchorus capsularis	Malvaceae	White jute	CABI (online)
	Corchorus olitorius	Malvaceae	Bush okra	Garcia Morales et al. (2016)
	Crossandra undulifolia	Acanthaceae	Firecracker flower	CABI (online)
	Crotalaria juncea	Fabaceae	Sunn hemp	CABI (online)
	Croton	Euphorbiaceae		CABI (online)
	Cucumis maderaspatanus	Cucurbitaceae	Bristly bryony	Garcia Morales et al. (2016)
	Cyanthillium cinereum	Asteraceae	Purple fleabane	Garcia Morales et al. (2016)
	Dacryodes edulis	Burseraceae	African pear	Garcia Morales et al. (2016)
	Dahlia pinnata	Asteraceae	Garden dahlia	CABI (online)
	Daphnopsis americana subsp. caribaea	Thymelaeaceae	–	CABI (online)
	Datura	Solanaceae	Thorn-apple	CABI (online)
	Datura metel	Solanaceae	Hindu datura	CABI (online)
	Datura stramonium	Solanaceae	Thorn apple	Garcia Morales et al. (2016)
	Desmanthus virgatus	Fabaceae	Dwarf koa	Garcia Morales et al. (2016)
	Digera muricata	Amaranthaceae	False amaranth	Garcia Morales et al. (2016)
	Duranta erecta	Verbenaceae	Golden dewdrop	CABI (online)
	Durio	Malvaceae		CABI (online)
	Eclipta prostrata	Asteraceae	Eclipta	CABI (online)
	Erythrina	Fabaceae		CABI (online)
	Erythrina abyssinica	Fabaceae	Red-hot-poker tree	Garcia Morales et al. (2016)
	Erythrina variegata	Fabaceae	Indian coral tree	CABI (online)
	Eugenia uniflora	Myrtaceae	Surinam cherry	CABI (online)
	Eupatorium cannabinum	Asteraceae	Water hemp agrimony	Garcia Morales et al. (2016)
	Eupatorium perfoliatum	Asteraceae	Boneset	Garcia Morales et al. (2016)
	Euphorbia	Euphorbiaceae	Spurges	CABI (online)
	Euphorbia hirta	Euphorbiaceae	Garden spurge	CABI (online)
	Euphorbia pulcherrima	Euphorbiaceae	Christmas flower	Garcia Morales et al. (2016)
	Euphorbia tithymaloides	Euphorbiaceae	Jacob's ladder	Garcia Morales et al. (2016)
	Ficus	Moraceae	–	CABI (online)
	Ficus exasperata	Moraceae	–	Garcia Morales et al. (2016)
	Ficus preussii	Moraceae	–	Garcia Morales et al. (2016)
	Gardenia	Rubiaceae	–	CABI (online)
	Gliricidia sepium	Fabaceae	Gliricidia	CABI (online)
	Glycine max	Fabaceae	Soybean	CABI (online)
	Gossypium	Malvaceae	Cotton	CABI (online)

Host status	Host name	Plant family	Common name	Reference
	Gossypium hirsutum	Malvaceae	Bourbon cotton	CABI (online)
	Guazuma ulmifolia	Malvaceae	Bastard cedar	CABI (online)
	Gymnema sylvestre	Apocynaceae	Australian cowplant	Garcia Morales et al. (2016)
	Hamelia patens	Rubiaceae		CABI (online)
	Helianthus annuus	Asteraceae	Sunflower	CABI (online)
	Heliconia	Heliconiaceae	–	CABI (online)
	Hevea brasiliensis	Euphorbiaceae	Rubber	CABI (online)
	Hibiscus	Malvaceae	Rosemallows	CABI (online)
	Hibiscus acetosella	Malvaceae	false roselle	Garcia Morales et al. (2016)
	Hibiscus cannabinus	Malvaceae	Bombay hemp	Garcia Morales et al. (2016)
	Hibiscus mutabilis	Malvaceae	Confederate rose	Garcia Morales et al. (2016)
	Hibiscus rosa-sinensis	Malvaceae	China rose	CABI (online)
	Hibiscus sabdariffa	Malvaceae	Roselle	CABI (online)
	Ipomoea	Convolvulaceae	Morning glory	CABI (online)
	Ipomoea aquatica	Convolvulaceae	Swamp morning-glory	CABI (online)
	Ipomoea batatas	Convolvulaceae	Sweet potato	Garcia Morales et al. (2016)
	Ipomoea carnea	Convolvulaceae	Bush morning glory	Garcia Morales et al. (2016)
	Ipomoea involucrata	Convolvulaceae	–	Garcia Morales et al. (2016)
	Ipomoea pes-tigridis	Convolvulaceae	Tiger-foot morning glory	Garcia Morales et al. (2016)
	Ixora	Rubiaceae		CABI (online)
	Ixora coccinea	Rubiaceae	Flame-of-the-woods	CABI (online)
	Jasminum	Oleaceae	Jasmine	CABI (online)
	Jatropha	Euphorbiaceae		CABI (online)
	Jatropha curcas	Euphorbiaceae	Jatropha	CABI (online)
	Jatropha glandulifera	Euphorbiaceae		Garcia Morales et al. (2016)
	Jatropha gossypiifolia	Euphorbiaceae	Bellyache bush	CABI (online)
	Jatropha integerrima	Euphorbiaceae	Peregrina	CABI (online)
	Jatropha multifida	Euphorbiaceae	Bellyache bush	CABI (online)
	Jatropha podagrica	Euphorbiaceae	Gout plant	CABI (online)
	Jatropha tanjorensis	Euphorbiaceae	–	Garcia Morales et al. (2016)
	Lablab purpureus	Fabaceae	Hyacinth bean	CABI (online)
	Lantana camara	Verbenaceae	Lantana	CABI (online)
	Laportea aestuans	Urticaceae	Scratchbush	Garcia Morales et al. (2016)
	Laportea ovalifolia	Urticaceae	–	Garcia Morales et al. (2016)
	Lawsonia inermis	Lythraceae	Henna	Garcia Morales et al. (2016)
	Leucaena leucocephala	Fabaceae	Leucaena	CABI (online)
	Leonotis ocymifolia	Lamiaceae	Lion's tail	Garcia Morales et al. (2016)
	Leucas aspera	Lamiaceae		CABI (online)
	Ligustrum	Oleaceae	Privet	CABI (online)
	Lobelia			
	Luffa acutangula	Cucurbitaceae	Angled luffa	CABI (online)
	Luffa cylindrica			

Host status	Host name	Plant family	Common name	Reference
	Macroptilium atropurpureum	Fabaceae	Siratro	CABI (online)
	Malpighia emarginata	Malpighiaceae	Acerola	CABI (online)
	Malpighia glabra	Malpighiaceae	Acerola	CABI (online)
	Malvaviscus arboreus	Malvaceae	Wax mallow	CABI (online)
	Mangifera indica	Anacardiaceae	Mango	CABI (online)
	Manihot chlorosticta	Euphorbiaceae	–	Garcia Morales et al. (2016)
	Manihot dichotoma	Euphorbiaceae	–	Garcia Morales et al. (2016)
	Manihot esculenta	Euphorbiaceae	Cassava	CABI (online)
	Manilkara zapota	Sapotaceae	Sapodilla	CABI (online)
	Melia azedarach	Meliaceae	Bead tree	Garcia Morales et al. (2016)
	Mentha arvensis	Lamiaceae	Corn mint	CABI (online)
	Mimosa pigra	Fabaceae	Giant sensitive plant	CABI (online)
	Mimosa pudica	Fabaceae	Sensitive plant	CABI (online)
	Momordica charantia	Cucurbitaceae	Bitter gourd	CABI (online)
	Morinda citrifolia	Rubiaceae	Indian mulberry	CABI (online)
	Morus	Moraceae	Mulberry tree	CABI (online)
	Morus alba	Moraceae	Mora	CABI (online)
	Morus nigra	Moraceae	Black mulberry	CABI (online)
	Mukia maderaspatana	Cucurbitaceae	Bristly bryony	Garcia Morales et al. (2016)
	Murraya koenigii	Rutaceae	Curry leaf tree	CABI (online)
	Musa	Musaceae	Banana	CABI (online)
	Musa paradisiaca	Musaceae	Banana	CABI (online)
	Mussaenda	Rubiaceae	–	CABI (online)
	Mussaenda erythrophylla	Rubiaceae	Ashanti blood	Garcia Morales et al. (2016)
	Mussaenda frondosa	Rubiaceae	–	CABI (online)
	Neonauclea purpurea	Rubiaceae	–	Garcia Morales et al. (2016)
	Nephelium lappaceum	Sapindaceae	Rambutan	CABI (online)
	Nerium oleander	Apocynaceae	Oleander	CABI (online)
	Nicotiana tabacum	Solanaceae	Tobacco	CABI (online)
	Ocimum basilicum	Lamiaceae	Basil	Garcia Morales et al. (2016)
	Origanum majorana	Lamiaceae	Sweet marjoram	CABI (online)
	Pachystachys lutea	Acanthaceae	Lollypops	CABI (online)
	Parthenium hysterophorus	Asteraceae	Parthenium weed	CABI (online)
	Passiflora edulis	Passifloraceae	Common passion fruit	Garcia Morales et al. (2016)
	Periploca nigrescens	Apocynaceae	–	Garcia Morales et al. (2016)
	Persea americana	Lauraceae	Avocado	CABI (online)
	Phaseolus	Fabaceae	Beans	CABI (online)
	Phaseolus vulgaris	Fabaceae	Common bean	CABI (online)
	Philodendron lacerum	Araceae	–	Garcia Morales et al. (2016)
	Phoenix dactylifera	Arecaceae	Date-palm	CABI (online)
	Phyllanthus emblica	Phyllanthaceae	Indian gooseberry	CABI (online)
	Phyllanthus maderaspatensis	Phyllanthaceae	Canoeweed	Garcia Morales et al. (2016)

Host status	Host name	Plant family	Common name	Reference
	Piper betle	Piperaceae	Betel pepper	CABI (online)
	Piper longum	Piperaceae	Indian long pepper	CABI (online)
	Pithecellobium dulce	Fabaceae	Blackbead	Garcia Morales et al. (2016)
	Plumeria	Apocynaceae	Frangipani	CABI (online)
	Plumeria alba	Apocynaceae		CABI (online)
	Plumeria rubra	Apocynaceae	Red frangipani	CABI (online)
	Polianthes tuberosa	Asparagaceae	Tuberose	CABI (online)
	Prosopis	Fabaceae	–	CABI (online)
	Prosopis juliflora	Fabaceae	Mesquite	CABI (online)
	Pseudocydonia sinensis	Rosaceae	Chinese quince	Garcia Morales et al. (2016)
	Psidium guajava	Myrtaceae	Guava	CABI (online)
	Punica granatum	Lythraceae	Pomegranate	CABI (online)
	Rauvolfia serpentina	Apocynaceae	Snakewood	CABI (online)
	Rhaphiolepis indica	Rosaceae	Indian hawthorn	Garcia Morales et al. (2016)
	Rhynchosia minima	Fabaceae	Burn-mouth vine	CABI (online)
	Ricinus communis	Euphorbiaceae	Castor-oil plant	Garcia Morales et al. (2016)
	Rosa	Rosaceae	Roses	CABI (online)
	Roystonea regia	Arecaceae	Cuban royal palm	Garcia Morales et al. (2016)
	Saccharum	Poaceae	–	CABI (online)
	Senna alexandrina	Fabaceae	Alexandrian senna	Garcia Morales et al. (2016)
	Senna auriculata	Fabaceae	Tanner's cassia	CABI (online)
	Senna multijuga	Fabaceae	November shower	CABI (online)
	Senna siamea	Fabaceae	Cassia tree	Garcia Morales et al. (2016)
	Senna tora	Fabaceae	Coffee pod	Garcia Morales et al. (2016)
	Sesamum indicum	Pedaliaceae	Sesame	CABI (online)
	Sesbania grandiflora	Fabaceae	Sesbania	CABI (online)
	Sesbania punicea	Fabaceae	Brazilian glory pea	Garcia Morales et al. (2016)
	Sida	Malvaceae	–	CABI (online)
	Sida acuta	Malvaceae	Sida	CABI (online)
	Sida rhombifolia	Malvaceae	Broomweed	Garcia Morales et al. (2016)
	Sida spinosa	Malvaceae	Prickly mallow	Garcia Morales et al. (2016)
	Solanum americanum	Solanaceae	Eastern black nightshade	CABI (online)
	Solanum lycopersicum	Solanaceae	Tomato	CABI (online)
	Solanum macrocarpon	Solanaceae	African eggplant	Garcia Morales et al. (2016)
	Solanum melongena	Solanaceae	Eggplant	CABI (online)
	Solanum nigrum	Solanaceae	Black nightshade	CABI (online)
	Solanum torvum	Solanaceae	Turkey berry	CABI (online)
	Solanum trilobatum	Solanaceae	–	Garcia Morales et al. (2016)
	Solanum tuberosum	Solanaceae	Potato	CABI (online)
	Solanum virginianum	Solanaceae	Thai eggplant	CABI (online)
	Spathodea campanulata	Bignoniaceae	African tulip tree	CABI (online)

Host status	Host name	Plant family	Common name	Reference
	Spermacoce articularis	Rubiaceae	False buttonweed	Garcia Morales et al. (2016)
	Sphagneticola calendulacea	Asteraceae	–	Garcia Morales et al. (2016)
	Spondias dulcis	Anacardiaceae	Otaheite apple	CABI (online)
	Spondias mombin	Anacardiaceae	Golden apple	Garcia Morales et al. (2016)
	Spondias pinnata	Anacardiaceae	Andaman mombin	CABI (online)
	Stachytarpheta cayennensis	Verbenaceae	Blue rat's tail	Garcia Morales et al. (2016)
	Tagetes erecta	Asteraceae	Mexican marigold	CABI (online)
	Tamarindus indica	Fabaceae	Tamarind	CABI (online)
	Tecoma stans	Bignoniaceae	Yellow bells	CABI (online)
	Tectona grandis	Lamiaceae	Teak	CABI (online)
	Tephrosia noctiflora	Fabaceae	–	Garcia Morales et al. (2016)
	Tephrosia purpurea	Fabaceae	Purple tephrosia	CABI (online)
	Teramnus labialis	Fabaceae	Blue wiss	CABI (online)
	Terminalia catappa	Combretaceae	Singapore almond	CABI (online)
	Theobroma cacao	Malvaceae	Cocoa	CABI (online)
	Tithonia diversifolia	Asteraceae	Mexican bush-daisy	Garcia Morales et al. (2016)
	Trianthema portulacastrum	Aizoaceae	Horse purslane	CABI (online)
	Tribulus terrestris	Zygophyllaceae	Puncture vine	CABI (online)
	Tridax procumbens	Asteraceae	Coat buttons	CABI (online)
	Triumfetta pentandra	Malvaceae	–	Garcia Morales et al. (2016)
	Uniola paniculata	Poaceae	Spikegrass	Garcia Morales et al. (2016)
	Verbesina gigantea	Asteraceae	–	CABI (online)
	Vernonia amygdalina	Asteraceae	Bitterleaf	Garcia Morales et al. (2016)
	Vernonia cinerea	Asteraceae	Purple fleabane	CABI (online)
	Vicia faba	Fabaceae	Faba bean	CABI (online)
	Vigna		Cowpea	CABI (online)
	Vigna mungo	Fabaceae	Black gram	CABI (online)
	Vigna radiata	Fabaceae	Mung bean	CABI (online)
	Vigna unguiculata	Fabaceae	Cowpea	CABI (online)
	Vigna unguiculata subsp. sesquipedalis	Fabaceae	Asparagus bean	CABI (online)
	Vitis vinifera	Vitaceae	European grape	Garcia Morales et al. (2016)
	Voacanga africana	Apocynaceae	Voacanga	Garcia Morales et al. (2016)
	Withania somnifera	Solanaceae	Poisonous gooseberry	CABI (online)
	Xanthium strumarium	Asteraceae	Beach cocklebur	Garcia Morales et al. (2016)
	Xanthosoma sagittifolium	Araceae	Yellow ocumo	Garcia Morales et al. (2016)
	Zinnia elegans	Asteraceae	Zinnia	CABI (online)
	Ziziphus mauritiana	Rhamnaceae	Jujube	CABI (online)
	Ziziphus spina-christi	Rhamnaceae	Christ's thorn jujube	Garcia Morales et al. (2016)

Appendix B – Distribution of *Paracoccus marginatus*

Distribution records based on CABI CPC (CABI, online) and Garcia Morales et al. (2016)

Region	Country	Subnational (e.g. State)	Status	Reference
North America	Antigua and Barbuda		Present, no details	CABI (online)
	Bahamas		Present, no details	CABI (online)
	Barbados		Present, no details	CABI (online)
	Belize		Present, no details	CABI (online)
	British Virgin Islands		Present, no details	CABI (online)
	Cayman Islands		Present, no details	CABI (online)
	Costa Rica		Present, no details	CABI (online)
	Cuba		Present, no details	CABI (online)
	Dominican Republic		Present, no details	CABI (online)
	Grenada		Present, no details	CABI (online)
	Guadeloupe		Present, no details	CABI (online)
	Guatemala		Present, no details	CABI (online)
	Haiti		Present, no details	CABI (online)
	Jamaica		Present, no details	CABI (online)
	Martinique		Present, no details	CABI (online)
	Mexico		Present, no details	CABI (online)
		Baja California Norte	Present, no details	Garcia Morales et al. (2016)
		Colima	Present, no details	Garcia Morales et al. (2016)
		Guerrero	Present, no details	Garcia Morales et al. (2016)
		Jalisco	Present, no details	Garcia Morales et al. (2016)
		Michoacan	Present, no details	Garcia Morales et al. (2016)
		Tabasco	Present, no details	Garcia Morales et al. (2016)
		Veracruz	Present, no details	Garcia Morales et al. (2016)
		Yucatan	Present, no details	Garcia Morales et al. (2016)
	Montserrat		Present, no details	CABI (online)
	Netherlands Antilles		Present, no details	CABI (online)
	Puerto Rico		Present, no details	CABI (online)
	Saint Barthélemy		Present, no details	CABI (online)
	Saint Kitts and Nevis		Present, no details	CABI (online)
	Saint Lucia		Present, no details	CABI (online)
	Saint Martin		Present, no details	CABI (online)
	Sint Maarten		Present, no details	CABI (online)
	U.S. Virgin Islands		Present, no details	CABI (online)
	United States		Present, localised	CABI (online)
		Florida	Present, no details	CABI (online)
		Texas	Present, no details	CABI (online)
South America	French Guiana		Present, no details	CABI (online)
Africa	Benin		Present, no details	CABI (online)
	Cameroon		Present, no details	CABI (online)
	Gabon		Present, under eradication	CABI (online)
	Ghana		Present, no details	CABI (online)
	Kenya		Present, no details	CABI (online)
	Mauritius		Present, no details	CABI (online)
	Mozambique		Present, no details	CABI (online)
	Nigeria		Present, no details	CABI (online)
	Réunion		Present, no details	CABI (online)

Region	Country	Subnational (e.g. State)	Status	Reference
	South Sudan		Present, no details	CABI (online)
	Tanzania		Present, no details	CABI (online)
	Togo		Present, no details	CABI (online)
	Uganda		Present, no details	CABI (online)
Asia	Bangladesh		Present, no details	CABI (online)
	Cambodia		Present, no details	CABI (online)
	China		Present, no details	CABI (online)
		Guangdong	Present, no details	CABI (online)
		Hainan	Present, no details	CABI (online)
		Yunnan	Present, no details	CABI (online)
	India		Present, no details	CABI (online)
		Andhra Pradesh	Present, no details	CABI (online)
		Arunachal Pradesh	Present, no details	CABI (online)
		Assam	Present, no details	CABI (online)
		Gujarat	Present, no details	CABI (online)
		Jammu and Kashmir	Present, no details	CABI (online)
		Karnataka	Present, no details	CABI (online)
		Kerala	Present, no details	CABI (online)
		Maharashtra	Present, no details	CABI (online)
		Odisha	Present, no details	CABI (online)
		Punjab	Present, no details	CABI (online)
		Rajasthan	Present, no details	CABI (online)
		Sikkim	Present, no details	CABI (online)
		Tamil Nadu	Present, no details	CABI (online)
		Tripura	Present, no details	CABI (online)
		West Bengal	Present, no details	CABI (online)
	Indonesia		Present, no details	CABI (online)
		Bali	Present, no details	Garcia Morales et al. (2016)
		Java	Present, no details	CABI (online)
		Sulawesi	Present, no details	CABI (online)
	Israel		Present, no details	CABI (online)
	Japan		Present, no details	Garcia Morales et al. (2016)
	Laos		Present, no details	CABI (online)
	Malaysia		Present, no details	CABI (online)
	Maldives		Present, no details	CABI (online)
	Oman		Present, no details	CABI (online)
	Pakistan		Present, no details	CABI (online)
	Philippines		Present, no details	CABI (online)
	Sri Lanka		Present, no details	CABI (online)
	Taiwan		Present, no details	CABI (online)
	Thailand		Present, no details	CABI (online)
	Vietnam		Present, no details	Garcia Morales et al. (2016)
Oceania	Federated States of Micronesia		Present, no details	CABI (online)
		Pohnpei	Present, no details	CABI (online)
	French Polynesia		Present, no details	CABI (online)
	Guam		Present, no details	CABI (online)
	Northern Mariana Islands		Present, no details	CABI (online)

Region	Country	Subnational (e.g. State)	Status	Reference
	Palau		Present, no details	CABI (online)
	United States	Hawaiian Islands	Present, no details	CABI (online)

Appendix C – EU 27 annual imports of commodities of main hosts from countries where *Paracoccus marginatus* is present, 2016–2020 (in 100 kg)

Source: Eurostat accessed on 18 January 2023.

C.1.

		2016	2017	2018	2019	2020
Bananas, incl. plantains, fresh or dried	Sri Lanka	1,187.82	2,177.81	2,087.47	2,760.36	2,512.84
	Malaysia	:	:	8.02	:	:
	Philippines	2,480.90	11,415.47	1,674.92	2,160.35	1,240.80
	Thailand	550.44	674.34	603.32	526.15	334.58
	Taiwan	0.15	:	:	:	:
	Pakistan	:	:	2.60	49.70	:
	Israel	2.10	:	:	:	0.75
	Vietnam	276.26	178.84	190.96	210.11	142.71
	Laos	81.44	65.75	69.83	45.51	20.40
	Mexico	516,367.97	558,896.47	348,905.62	239,173.11	141,492.44
	Indonesia	:	0.01	37.27	14.72	64.17
	Bangladesh	174.66	79.85	72.75	38.05	35.64
	Cambodia	17.46	45.59	35.02	42.28	26.91
	China	252.64	188.73	390.56	545.74	854.93
	Cameroon	2,521,882.41	2,341,539.74	1,791,447.01	1,520,648.04	1,579,456.86
	Kenya	1.90	0.72	6.15	11.23	14.95
	Mozambique	:	:	2,010.72	664.56	:
	Uganda	11,334.28	6,614.39	7,443.04	9,553.75	11,215.41
	Ghana	265,276.97	352,600.18	457,496.70	607,924.58	515,067.32
	Nigeria	0.72	2.04	2.50	0.84	6.35
	Togo	4.61	11.78	10.61	23.41	18.22
	Sudan	:	:	0.20	:	:
	Tanzania	28.02	11.93	33.68	34.24	34.74
	South Korea	:	:	:	0.01	:
	South Africa	132.75	46.24	36.96	353.09	128.54
	Costa Rica	9,662,138.79	9,663,219.69	10,125,330.57	9,405,488.40	10,359,546.09
	Cuba	:	:	:	:	1.28
	Jamaica	:	:	0.13	:	:
	Haiti	1,536.55	1.00	0.70	:	:
	Belize	278,722.11	314,581.88	375,147.32	442,448.45	431,354.53
	Dominican Republic	1,568,451.36	1,453,568.63	1,617,838.21	2,309,348.78	2,296,268.32
	Guatemala	872,404.39	1,070,129.12	1,369,714.72	1,844,844.47	1,737,902.89
	United States	7.00	6.37	1.54	6.32	10.37
	French Polynesia	0.04	0.04	2.41	0.02	0.38
	Sum	15,703,313.74	15,776,056.61	16,100,601.51	16,386,916.27	17,077,752.42

C.2.

		2016	2017	2018	2019	2020
Fresh or dried grapefruit	Malaysia	:	:	7.82		
	Thailand	376.42	1,224.53	484.17	548.33	149.62
	Israel	257,904.61	208,679.65	218,945.84	141,834.58	230,981.55
	Vietnam	3,411.58	5,931.71	14,490.01	17,583.82	11,307.23
	Mexico	132,997.10	128,233.11	77,846.41	89,037.20	55,247.60
	Indonesia	:	:	0.03	:	:
	Bangladesh	:	171.60	:	:	:
	China	827,310.17	1,084,839.19	1,023,348.37	1,108,528.93	1,092,246.65
	Uganda	:	:	:	:	2.11
	Sudan	:	:	:	:	0.5
	Tanzania	9.90	:	3.40	9.78	:
	South Africa	818,033.13	851,594.34	978,681.31	921,280.18	:
	Costa Rica	208.00	16.50	:	:	:
	Cuba	77.24	77.25	:	:	:
	Dominican Republic		65.30	79.43	:	:
	United States	259,620.77	194,063.68	130,312.27	134,522.83	:
	French Polynesia	0.28	0.28	0.42	:	:
Sum	2,299,949	2,474,897.1	2,444,199.5	2,413,345.7	2,346,202	

C.3.

		2016	2017	2018	2019	2020
Fresh or dried avocados	Sri Lanka	7.03	4.88	5.63	2.00	11.95
	Malaysia	0.03	:	47.04	:	:
	Philippines	:	:	:	:	0.05
	Thailand	3.68	9.76	9.66	9.06	3.39
	Israel	301,123.91	424,267.97	370,378.23	437,318.01	345,664.24
	Vietnam	1.00	:	:	0.05	:
	Mexico	503,687.52	445,611.06	463,741.28	767,878.48	716,113.14
	China	193.97	35.28	:	1.23	0.04
	Cameroon	133.50	173.54	221.30	259.38	205.93
	Kenya	228,426.16	243,947.31	404,593.87	346,231.90	435,308.72
	Mauritius	124.44	36.13	42.27	24.28	15.23
	Mozambique	:	559.80	1,294.13	7,134.23	8,014.81
	Uganda	1,912.57	2,195.25	2,233.81	3,364.25	3,583.95
	Ghana	18.48	134.58	22.64	40.45	21.88
	Nigeria	1.06	3.15	3.18	0.51	:
	Togo	11.76	7.87	12.89	1.42	57.15
	Tanzania	26,823.05	25,773.58	55,517.16	60,480.96	50,769.74
	South Africa	419,768.89	315,854.56	652,817.98	401,352.79	416,290.22
	Costa Rica	:	21.56	9.98	428.45	686.40
	Cuba	109.09	73.94	41.53	131.08	34.33
	Dominican Republic	53,962.41	55,001.50	52,897.18	95,531.91	100,024.05
	Guatemala	46.60	4291.98	7,487.42	17,084.09	15,383.92
	United States	8,819.53	1.19	2,546.86	0.02	4.66

		2016	2017	2018	2019	2020
	French Polynesia	0.10	0.11	0.27	0.14	:
	Sum	1,545,174.78	1,518,005.00	2,013,924.31	2,137,274.69	2,092,193.80

C.4.

		2016	2017	2018	2019	2020
Grapes, fresh or dried	Philippines	0.48	:	:	:	:
	Thailand	1.63	92.32	4.46	0.87	1.38
	Pakistan	6,148.97	10,762.89	14,655.68	13,385.60	11,092.98
	Japan	6.03	4.37	1.52	1.19	21.09
	Israel	13,171.80	7,365.66	6,433.57	320.43	1,083.52
	Vietnam	:	0.00	:	0.00	10.14
	Mexico	:	358.96	:	186.71	184.66
	Indonesia	:	:	:	:	1.92
	Bangladesh	1.05	:	0.50	:	:
	China	125,769.00	47,957.90	87,690.22	191,986.55	156,789.04
	Kenya	:	:	186.96	:	:
	Mauritius	0.02	0.14	:	:	2.22
	South Korea	0.02	2.88	6.33	0.09	0.06
	Yemen	:	0.01	:	:	:
	South Africa	1,512,476.18	1,620,130.63	1,703,622.95	1,649,404.49	1,757,286.13
	Dominican Republic	:	:	:	:	218.75
	United States	191,784.90	211,054.06	106,691.73	95,559.91	114,325.38
	Sum	1,849,360.1	1,897,729.8	1,919,293.9	1,950,845.8	2,041,017.3

C.5.

		2016	2017	2018	2019	2020
Coconuts, Brazil nuts and cashew nuts, fresh or dried, whether or not shelled or peeled	Sri Lanka	129,125.94	70,924.94	57,516.21	76,430.04	60,597.36
	Malaysia	5,507.22	8,394.49	4,041.78	2,329.06	4,411.77
	Philippines	368,573.57	419,893.07	419,609.28	398,109.92	395,721.76
	Thailand	79,261.58	78,956.34	68,012.09	59,013.35	35,161.02
	Taiwan	14.36	:	3.40	:	0.01
	Oman	:	:	0.02	:	0.01
	Pakistan	63.15	11.50	22.53	24.60	25.70
	Israel	2.40	12.32	4.95	2.36	11.16
	Vietnam	761,279.37	798,319.82	818,389.73	967,893.87	1,177,974.48
	Laos	:	0.09	280.00	0.23	
	Mexico	15.38	0.48	0.05	0.25	0.10
	Indonesia	255,797.58	287,011.09	302,686.51	259,644.02	238,720.48
	Bangladesh	56.95	:	:	:	:
	Cambodia	:	0.61	:	0.95	3.77
	China	1,409.93	1,078.20	995.67	1,091.95	3,073.07
	Cameroon	26.36	82.93	17.74	9.36	35.57
	Kenya	17.01	696.35	57.73	244.49	1,191.89
	Mauritius	:	:	8.15	1.76	0.02
	Mozambique	15,031.71	7,490.17	10,508.99	16,038.30	12,972.32
	Uganda		2.07	2.99	3.61	1.90

		2016	2017	2018	2019	2020
	Ghana	10,890.16	11,671.46	9,733.90	15,089.42	20,769.02
	Nigeria	420.98	907.20	1,694.57	3,833.89	5,440.62
	Togo	1,793.96	1,514.05	2,688.34	5,714.47	6,346.80
	Tanzania	1,889.75	2,570.78	1,197.66	1,931.29	1,800.05
	Benin	3,230.85	2,034.22	2,584.36	8,774.77	11,418.80
	South Korea	10.00	:	0.06	:	:
	South Africa	1.24	103.64	0.50	0.79	205.46
	Costa Rica	3,409.86	3,497.03	6,550.77	9,557.16	6,499.74
	Cuba	:	:	:	:	117.00
	Jamaica	:	:	:	0.26	:
	Dominican Republic	1,350.04	1,731.11	2,313.84	594.68	467.96
	Guatemala	:	:	:	:	0.22
	United States	2,447.78	1,994.95	1,377.75	511.55	845.58
	French Polynesia	:	:	0.19	1.05	:
	Sum	1,641,627.13	1,698,898.91	1,710,299.76	1,826,847.45	1,983,813.64

C.6.

		2016	2017	2018	2019	2020
Fresh or dried lemons '*Citrus limon, Citrus limonum*'	Sri Lanka	:	:	0.02	0.20	:
	Malaysia	3.58	2.42	2.46	0.81	:
	Philippines	:	:	:	2.09	:
	Thailand	:	8.10	33.80	4.36	2.40
	Pakistan		:	2.25	0.59	:
	Japan	161.03	256.25	114.53	215.60	67.19
	Israel	15,911.18	2,079.32	13,600.66	779.16	259.96
	Vietnam	:	0.10	0.46	0.12	0.02
	Mexico	1,904.56	:	51.84	376.52	210.24
	Indonesia	7.40	:	:	3.00	5.55
	Bangladesh	67.05	30.22	35.80	53.64	169.62
	China	260.72	:	1.02	44.48	6,397.14
	Cameroon	2.00	0.20	:	:	:
	Uganda	1.02	:	:	:	:
	Nigeria	:	:	0.03	:	:
	Togo	:	:	6.24	0.42	:
	Sudan	:	:	:	:	20.05
	South Africa	442,956.45	561,372.93	819,548.63	944,497.78	1,448,266.86
	Antigua and Barbuda	:	:	:	19.83	:
	Dominican Republic	7,127.74	8,190.48	8,440.13	5,867.50	12,144.62
	Guatemala	:	:	:	:	5.00
	United States	2,051.11	128.03	7.35	223.76	5,871.31
	Sum	470,453.8	572,068.1	841,845.2	952,089.9	1,473,420

C.7.

		2016	2017	2018	2019	2020
Fresh or dried guavas, mangoes and mangosteens	Sri Lanka	1,254.27	1,003.35	765.31	813.83	423.16
	Malaysia	289.86	197.22	170.64	72.72	44.56
	Philippines	1,028.05	519.88	795.56	368.97	128.10
	Thailand	6,460.81	7,401.80	6,911.89	6,743.91	5,260.84
	Taiwan	:	:	3.48	17.34	0.92
	Oman	:	:	:	223.93	:
	Pakistan	17,149.78	15,912.58	21,867.43	29,207.33	16,196.50
	Japan	0.66	:	:	:	0.01
	Israel	143,726.08	140,551.30	108,353.48	121,875.16	98,143.59
	Vietnam	794.89	950.37	1,346.64	1,546.69	965.31
	Laos	753.34	620.36	603.14	806.50	525.32
	Mexico	35,095.07	40,848.36	46,001.68	50,935.79	51,841.89
	Indonesia	1,981.20	2,004.36	2,926.64	2,386.27	1,406.94
	Bangladesh	438.53	256.66	331.27	310.73	323.91
	Cambodia	883.47	2,098.02	2,164.17	1,533.79	904.49
	China	38.95	51.87	180.81	78.23	104.34
	South Sudan	9.40	:	:	:	:
	Cameroon	4,769.65	4,884.80	2,502.54	1,800.84	489.96
	Kenya	232.06	4.08	65.09	10.30	66.53
	Mozambique	:	:	122.61	126.65	134.13
	Uganda	257.30	452.71	360.01	662.25	389.56
	Ghana	8,896.27	9,114.51	10,672.35	11,138.06	30,296.55
	Nigeria	0.78	0.10	1.13	1.95	0.03
	Togo	39.19	58.16	57.86	221.65	40.00
	Sudan	34.71	43.30	215.93	29.99	10.00
	Tanzania	:	:	0.50	1.14	:
	Benin	:	26.40	:	:	226.79
	South Africa	8,550.13	13,015.45	9,739.99	12,116.95	8,656.28
	Antigua and Barbuda	:	:	193.61	:	:
	Costa Rica	17,281.13	19,119.58	18,368.68	12,830.62	14,950.59
	Cuba	117.98	216.57	14.36	103.34	230.60
	Haiti	:	:	4.87	:	:
	Dominican Republic	96,728.22	85,119.28	105,553.46	118,508.00	110,481.33
	Guatemala	5,124.01	9,771.98	25,768.70	10,953.40	8,099.52
	United States	78,874.11	45,478.21	54,660.34	82,580.54	82,852.21
	French Polynesia	0.11	1.30	0.47	:	:
	Guam	:	:	:	:	224.00
	Sum	430,810.01	399,722.56	420,724.64	468,006.87	433,417.96

C.8.

		2016	2017	2018	2019	2020
Fresh, chilled, frozen or dried roots and tubers of manioc 'cassava', whether or not sliced or in the form of pellets	Sri Lanka	:	:	:	0.48	1.83
	Malaysia	453.80	226.88	:	455.62	:
	Philippines	:	:	:	52.14	1.20
	Thailand	6,852.06	4,035.52	15,350.09	38,201.30	58,322.74

		2016	2017	2018	2019	2020
	Pakistan	:	:	2.05	:	:
	Japan	0.60	:	1.40	:	:
	Vietnam	3,636.02	4,109.10	3,335.76	4,128.32	5,028.66
	Mexico	:	:	0.01	:	:
	Indonesia	23.10	883.30	1,287.56	1,433.28	2,629.75
	Bangladesh	0.80	:	:	:	:
	China	1,645.78	530.60	234.00	3457.80	3,594.54
	Cameroon	7,556.84	12,406.55	16,852.39	19,496.19	29,257.50
	Kenya	45.95	:	:	:	1.28
	Uganda	24.32	32.88	29.28	77.85	40.66
	Ghana	911.19	2,495.98	844.73	955.19	1,408.68
	Nigeria	319.50	443.65	862.92	880.46	745.73
	Togo	335.71	478.45	913.66	1,701.90	1,251.02
	Benin	128.55	204.89	35.60	57.00	:
	Costa Rica	192,340.70	214,045.37	236,975.96	245,355.48	270,498.47
	Dominican Republic	303.22	:	52.26	793.75	276.05
	French Polynesia	:	:	0.05		0.55
	Sum	214,578.14	239,893.17	276,777.72	317,046.76	373,058.66

C.9.

		2016	2017	2018	2019	2020
Cotton, neither carded nor combed	Sri Lanka	0.04	2.30	0.51	:	0.01
	Malaysia	0.27	3.21	1.16	:	3.37
	Philippines	:	:	0.09	0.01	:
	Thailand	249.11	57.73	3.99	1.26	0.68
	Taiwan	20.19	4.32	4.99	1.14	0.74
	Pakistan	42,071.50	37,890.71	51,936.33	42,634.82	48,562.12
	Japan	282.56	63.14	135.53	14.31	31.69
	Israel	40,331.10	24,949.87	24,121.07	17,991.66	4,842.36
	Vietnam	1.85	1.29	5.79	3.01	43.50
	Laos	:	:	:	:	0.04
	Mexico	:	:	16,317.04	28,940.45	17,969.90
	Indonesia	3,874.47	6,021.62	2,407.74	4.32	30.09
	Bangladesh	10.90	217.05	348.59	655.67	4.42
	Cambodia	0.02	:	:	:	:
	China	1,135.57	1,411.93	757.31	1,509.01	800.73
	Cameroon	18,221.26	29,656.55	2,239.69	3,067.47	9,019.33
	Kenya	1,505.48	0.02	:	:	:
	Mauritius	759.35	148.12	:	:	0.25
	Mozambique	838.23	2,395.93	4,560.50	4,017.77	3,301.40
	Uganda	19,215.10	40,457.38	42,558.97	31,386.66	52,826.10
	Ghana	:	:	:	746.85	:
	Nigeria	:	:	:	0.01	:
	Togo	24,628.41	39,884.52	58,984.20	17,000.70	10,110.84
	Sudan	4,986.46	23,930.29	5,968.33	:	:
	Tanzania, United Republic of	10,579.76	13,483.24	17,502.72	20,113.72	22,315.19

		2016	2017	2018	2019	2020
	Benin	32,001.14	9,861.27	6,918.04	12,568.46	4,255.41
	South Korea	23.69	111.22	4.61	7.84	55.87
	South Africa	260.13	4,545.10	6,856.09	971.61	3,005.72
	Costa Rica	:	:	357.76	:	:
	Jamaica	52.64	19.70	:	455.27	153.86
	Guatemala	:	816.56	2,079.66	:	0.00
	United States	39,019.72	78,881.96	81,076.26	83,499.79	83,428.16
	Sum	240,068.95	314,815.03	325,146.97	265,591.81	260,761.78

C.10.

		2016	2017	2018	2019	2020
Fresh or dried dates	Sri Lanka	0.02	:	:	:	0.11
	Malaysia	:	0.02	0.08	:	0.04
	Philippines	:	0.01	0.10	0.36	:
	Thailand	1.22	0.28	3.26	:	1.70
	Oman	130.21	1.44	0.61	0.42	60.75
	Pakistan	32,463.21	57,259.78	49,000.28	63,628.44	60,576.00
	Japan	:	:	:	:	0.04
	Israel	94,300.18	93,271.59	97,575.45	108,305.94	111,367.75
	Vietnam	27.84	:	0.45	:	0.14
	Mexico	180.00	720.87	375.20	796.42	826.38
	Indonesia	:	:	:	0.04	:
	Bangladesh	0.80	:	:	:	0.01
	Cambodia	:	0.02	:	:	:
	China	1,315.67	1,257.46	1,342.43	1,363.55	3,301.92
	Kenya	:	:	188.00	:	0.01
	Mauritius	14.60	17.70	:	:	0.06
	Uganda	:	:	:	49.10	:
	Ghana	:	:	:	0.01	:
	Nigeria	:	:	0.00	0.11	0.13
	Togo	:	0.10	:	:	:
	Sudan	:	:	35.07	78.91	58.93
	Tanzania	:	:	:	0.01	:
	Benin	:	:	:	0.02	:
	South Korea	1.06	0.38	:	0.45	0.71
	Yemen	:	:	:	:	2.20
	South Africa	4,571.08	5,689.19	9,539.05	6,282.63	10,486.82
	Costa Rica	350.70	:	:	:	:
	United States	3,003.08	2,744.51	2,351.77	2,215.25	2,775.89
	Sum	136,359.67	160,963.35	160,411.75	182,721.66	189,459.59

C.11.

		2016	2017	2018	2019	2020
Fresh or chilled beans '*Vigna* spp., *Phaseolus* spp.', shelled or unshelled	Sri Lanka	65.09	80.93	89.58	71.23	18.02
	Malaysia	131.01	182.18	104.11	72.37	267.16
	Philippines	:	:	:	0.26	:
	Thailand	299.48	362.84	380.58	370.81	291.66
	Oman	58.96	28.00	206.74	3979.03	694.75

		2016	2017	2018	2019	2020
	Pakistan	14.93	12.01	12.08	21.50	1.74
	Japan	0.24	0.08	0.02	:	:
	Israel	:	:	:	6.90	27.44
	Vietnam	171.56	97.89	83.80	71.75	43.74
	Laos	48.48	37.40	40.25	37.23	29.96
	Mexico	26.30	53.28	3.52	154.72	317.69
	Indonesia	4.46	0.56	1.11	88.86	17.34
	Bangladesh	60.75	126.06	181.91	38.19	19.35
	Cambodia	0.43	:	:	1.43	:
	China	1,772.30	2,288.18	2,260.37	2,841.09	2,115.28
	Cameroon	14.03	54.04	110.96	120.79	253.96
	Kenya	134,462.94	135,486.54	142,688.90	166,739.38	157,284.18
	Mauritius	:	8.75	10.08	15.12	:
	Mozambique	0.58	0.02	:	:	:
	Uganda	121.23	193.58	112.23	236.81	253.10
	Ghana	0.20	0.15	1.20	1.82	3.88
	Nigeria	0.01	13.82	284.03	260.78	0.39
	Togo	83.46	13.06	53.23	16.04	5.71
	Sudan	:	:	7.40	34.08	:
	Tanzania, United Republic of	3,245.32	2,246.54	747.92	887.08	1,043.53
	South Korea	:	5.64	:	:	:
	South Africa	0.05	:	41.64	38.70	24.30
	Dominican Republic	4,764.65	4,641.65	4,045.39	2,904.82	528.41
	Guatemala	1,747.12	2,609.36	1,719.77	1,174.07	728.83
	United States	0.09	5.45	7.37	0.01	0.02
	Sum	147,093.67	148,548.01	153,194.19	180,184.87	163,970.44

C.12.

		2016	2017	2018	2019	2020
Fresh tamarinds, cashew apples, lychees, jackfruit, sapodillo plums, passion fruit, carambola and pitahaya	Sri Lanka	347.84	392.81	104.84	104.62	85.24
	Malaysia	15,348.23	14,205.33	13,879.92	14,235.96	7,849.58
	Philippines	9.78	14.26	:	0.88	:
	Thailand	9,774.93	10,279.68	12,461.38	14,900.21	10,138.75
	Taiwan	11.92	:	10.59	25.97	8.97
	Pakistan	2.22	3.34	8.17	:	:
	Japan	:	:	0.07	0.02	:
	Israel	2,943.37	2,919.30	1,061.09	1,125.92	594.86
	Vietnam	33,078.82	38,428.61	44,070.83	52,846.33	45,652.67
	Laos	1,269.84	847.10	542.10	469.73	238.57
	Mexico	543.90	212.78	1,295.08	669.87	2,331.91
	Indonesia	103.20	333.37	297.72	246.67	441.64
	Bangladesh	140.15	222.55	291.61	206.12	382.00
	Cambodia	84.38	546.37	806.76	1,101.17	712.82
	China	314.75	287.38	1,112.11	1,014.77	823.41
	Cameroon	41.84	100.53	38.52	92.00	46.11
	Kenya	714.44	221.45	603.11	481.00	697.14

		2016	2017	2018	2019	2020
	Mauritius	2,707.68	787.16	2,685.52	1,167.15	1,145.97
	Mozambique	2,113.71	2,390.50	4,047.22	3,827.41	2,844.70
	Uganda	500.68	682.07	698.61	666.57	571.89
	Ghana	5,483.94	4,541.86	3,793.19	5,268.03	6,779.25
	Nigeria	:	:	:	1.91	3.09
	Togo	7.44	2.66	3.86	6.36	12.44
	Tanzania	0.35	:	1.27	8.77	4.52
	Benin	:	:	:	0.80	:
	South Africa	39,656.26	45,282.45	30,643.15	27,215.68	19,903.15
	Costa Rica	9.11	3.52	0.13	18.62	:
	Dominican Republic	763.58	797.00	933.63	823.48	604.84
	Guatemala	:	:	9.99	8.56	60.88
	United States	3.97	3.00	0.07	:	0.02
	Sum	115,976.33	123,505.08	119,400.54	126,534.58	101,934.42

C.13.

		2016	2017	2018	2019	2020
Roses, whether or not grafted	Sri Lanka	46.16	:	:	:	:
	Thailand	:	0.08	1.80	0.38	:
	Taiwan	:	:	:	0.02	:
	Japan	0.03	19.97	0.01	0.15	0.85
	Israel	:	4.06	0.04	150.01	
	Indonesia	:	:	:	:	0.04
	China	2,318.97	1,019.42	2,510.23	623.75	3.01
	Kenya	35.87		9.57	6.92	15.70
	South Korea	3.44	0.79	4.13	29.14	2.28
	South Africa	12.93	2.22	1,456.90	14.29	7.64
	United States	6.32	5.15	5.28	1.34	0.61
	Sum	2,423.72	1,051.69	3,987.96	826.00	30.13