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SCIENTIFIC OPINION

Pest categorisation of *Lepidosaphes malicola*

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Abstract

The EFSA Panel on Plant Health performed a pest categorisation of *Lepidosaphes malicola* (Hemiptera: Diaspididae), the Armenian mussel scale, for the territory of the European Union, following commodity risk assessments of *Prunus persica* and *P. dulcis* plants for planting from Türkiye, in which *L. malicola* was identified as a pest of possible concern. *L. malicola* is a polyphagous insect of temperate and arid areas, feeding on more than 60 plant species belonging to 26 families. Important crops significantly affected by *L. malicola* in parts of Asia include stone fruits (*Prunus armeniaca*, *P. persica*), pome fruits (*Malus domestica*, *Pyrus communis*), grapes (*Vitis vinifera*), pomegranate (*Punica granatum*), walnuts (*Juglans regia*) and ornamental plants (*Berberis* spp., *Cornus* spp., *Jasminum* spp., *Ligustrum* spp.). *L. malicola* has two generations annually. The overwintered eggs hatch from late May to early June. First-instar nymphs crawl on the host plant for a short period, then settle to feed. Nymphs reach maturity in late summer or early autumn. Plants for planting, fruits and cut flowers provide potential pathways for entry into the EU. Host availability and climate suitability suggest that southern, central and some parts of northern EU countries would be suitable for the establishment of *L. malicola*. Despite being a pest in Armenia, Iran and Tajikistan, there is no evidence of it being a pest in Türkiye. *L. malicola* was detected in Bulgaria and Greece over 30 years ago, but there have been no records since, and its status is uncertain. Its ability to cause an impact in the EU is also uncertain. It is not listed in Annex II of the Commission Implementing Regulation (EU) 2019/2072. Phytosanitary measures are available to reduce the likelihood of entry. Except for the criterion of having an economic or environmental impact, for which there is great uncertainty, *L. malicola* satisfies all other criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest.

KEYWORDS

apples, Armenian comma hard scale, Diaspididae, Hemiptera, pest risk, plant health, plant pest, quarantine

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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

Lepidosaphes malicola is one of a number of pests relevant to Annex 1C of 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 (MSs) referred to in Article 355(1) of the Treaty on the Functioning of the European Union (TFEU), other than Madeira and the Azores, and so inform EU decision-making as to its appropriateness for potential inclusion in the lists of pests of Commission Implementing Regulation (EU) 2019/2072. If a pest fulfils the criteria to be potentially listed as a Union quarantine pest, risk reduction options will be identified.

1.3 | Additional information

This pest categorisation was initiated following the commodity risk assessments of *Prunus persica* and *P. dulcis* plants from Türkiye (EFSA PLH Panel, 2023), in which *L. malicola* was identified as a relevant non-regulated EU pest of possible concern that could potentially enter the EU on *P. persica* and *P. dulcis*.

2 | DATA AND METHODOLOGIES

2.1 | Data

2.1.1 | Information on pest status from NPPOs

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

2.1.2 | Literature search

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

2.1.3 | Database search

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 (Phytosanitary 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, as well as the intra-EU trade and EU exports of animals and certain animal products. Up until May 2020, the Europhyt database (EUROPHYT, online) 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 MSs 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 *L. malicola*, 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 *L. malicola* 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) are given in Regulation (EU) 2016/2031 Article 3 and Annex I, Section 1 of the Regulation. Table 1 presents the Regulation (EU) 2016/2031 pest categorisation criteria on which the Panel bases its conclusions. In judging whether a criterion is met, the Panel uses its best professional judgement (EFSA Scientific Committee, 2017) by integrating a range of evidence from a variety of sources (as presented above in Section 2.1) to reach an informed conclusion as to whether or not a criterion is satisfied.

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

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

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

3 | PEST CATEGORISATION

3.1 | Identity and biology of the pest

3.1.1 | Identity and taxonomy

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

Yes, the identity of the pest is established, and *Lepidosaphes malicola* (Borchsenius) is the accepted name.

The Armenian mussel scale, *Lepidosaphes malicola* (Borchsenius), is an insect within the order Hemiptera, suborder Sternorrhyncha, family Diaspididae. This insect was first described by Borchsenius in 1947 from *Malus* sp. in Armenia. It was also described by Borchsenius in 1949 as *Lepidosaphes kirgisica* on *Berberis* sp. in Kazakhstan (García Morales et al., 2016). Synonyms are *Mytilococcus malicola* (EFSA PLH Panel, 2023; EPPO, online), *Mytilococcus kirgisica* and *Lepidosaphes kalandadzei* (García Morales et al., 2016). Additional common names are Armenian comma hard scale, Armenian comma scale and Kirgis comma scale (García Morales et al., 2016). The EPPO code (EPPO, 2019; Griessinger & Roy, 2015) for this species is LEPSML (EPPO, online).

3.1.2 | Biology of the pest

L. malicola is a temperate species, probably of Asian origin. It is reported to have two generations per year in Iran and in the former USSR (EFSA PLH Panel, 2023; Nazari, Poorjavad, & Izadi, 2020; Watson, 2002). Studies on its biology are extremely limited, and therefore, its biology is not known in detail. *L. malicola* overwinters as diapausing eggs under the waxy cover scale of females (Nazari, Poorjavad, & Izadi, 2020). It usually occurs on the trunk and branches of its host plants. The individuals of the summer generation spread also to the leaves and fruits (Biosecurity New Zealand, 2009; Watson, 2002). The damage to walnuts in Armenia decreased with altitude, suggesting that *L. malicola* may not thrive at higher altitudes (EFSA PLH Panel, 2023).

The key biological features of *L. malicola* summarised in Table 2.

TABLE 2 Important features of the life history strategy of *Lepidosaphes malicola*.

Life stage	Phenology and relation to host	Other relevant information
Egg	The eggs are laid under the waxy cover of females (Nazari, Poorjavad, & Izadi, 2020). Each female produces 14–140 eggs (Watson, 2002). The overwintered eggs hatch from late May to early June (Nazari, Poorjavad, & Izadi, 2020)	Dispersal of eggs occurs through human transport of infested plant material (Biosecurity New Zealand, 2009)
Nymph	*L. malicola* males have five nymphal stages while females three (Rosen, 1990). First-instar nymphs, which are known as crawlers, migrate to a suitable site of the host plant to settle, insert their mouthparts into the tissue and begin feeding (Nazari, Poorjavad, & Izadi, 2020) Nymphs reach maturity in late summer or early autumn (Nazari, Poorjavad, & Izadi, 2020)	The crawlers are a mobile stage of the insect and disperse over the host plant to find a suitable place to settle on and feed. They are also dispersed over longer distances by wind or animal contact (Moghaddam & Watson, 2021; Watson, 2002) Crawlers are susceptible to extreme temperatures, desiccation, rain, predation and a lack of suitable settling sites, which can result in high mortality (Biosecurity New Zealand, 2009)
Adult	Adults emerge in late summer or early autumn (Nazari, Poorjavad, & Izadi, 2020) Male adults lack functional mouthparts and have a single pair of wings (Moghaddam & Watson, 2021)	Development lasts 51–57 days in Armenia (EFSA PLH Panel, 2023) Dispersal of adults over long distances occurs through human transport of infested plant material (Biosecurity New Zealand, 2009)

3.1.3 | Host range/Species affected

L. malicola has a relatively wide range of host plants. More than 60 plant species belonging to 26 families have been reported as hosts (EFSA PLH Panel, 2023; García Morales et al., 2016). It is showing a preference for Fabaceae and Rosaceae, and is a pest of deciduous fruit trees, particularly apple. The full list of host plant species is presented in Appendix A. Important crops in the EU may be affected by *L. malicola*, such as stone fruits (*Prunus armeniaca*, *P. persica*), pome fruits (*Malus domestica*, *Pyrus communis*), grapes (*Vitis vinifera*), walnuts (*Juglans regia*), pomegranate (*Punica granatum*) and ornamental plants (*Berberis* spp., *Cornus* spp., *Jasminum* spp., *Ligustrum* spp.). Forest trees with high environmental value, like *Acer* spp., *Quercus* spp. and *Salix* spp., may also be infested by the pest.

3.1.4 | Intraspecific diversity

No intraspecific diversity is reported for this species.

3.1.5 | Detection and identification of the pest

Are detection and identification methods available for the pest?

Yes, there are methods available for the detection and morphological identification of *L. malicola*.

Detection

Careful visual examination of plants is an effective way for the detection of *L. malicola*. The scales occur mainly on trunks and branches, but they might also be on the leaves and fruits (Watson, 2002). The individuals are visible on the trunks, branches and fruits as elongate and mussel-shaped scales (EFSA PLH Panel, 2023). However, the size of the scales is small (less than 3 mm diameter) and if the infestation is small, it may be difficult to detect by visual inspection (Biosecurity New Zealand, 2009). Moreover, crawlers can hide in wounds or on the underside of the leaves (EFSA PLH Panel, 2023).

L. malicola can easily be confused with other *Lepidosaphes* species (see section Description below), already established in the EU, that share the same hosts. Watson (2002) noted that the appearance of the scale covers of *L. malicola* in life is very similar to that of *L. ulmi*. The latter is widespread and very common in the EU.

Identification

The identification of *L. malicola* requires microscopic examination of slide-mounted female adults and verification of the presence of key morphological characteristics. A detailed morphological description and illustration of the adult female can be found in Moghaddam and Watson (2021) and in Watson (2002). How to separate three closely related species of the genus *Lepidosaphes* from *L. malicola* is also described in Moghaddam and Watson (2021). GenBank contains one gene nucleotide sequence for *L. malicola* (cytochrome oxidase subunit 1 (COI)) (NCBI, 2023) that could be used for molecular ID (EPPO, 2021).

Symptoms

The main symptoms of *L. malicola* infestation are:

- Death of branches (Biosecurity New Zealand, 2009; EFSA PLH Panel, 2023)
- Death of entire trees (Biosecurity New Zealand, 2009; EFSA PLH Panel, 2023)
- Fruit red spotting (Biosecurity New Zealand, 2009; EFSA PLH Panel, 2023)

Note that the above symptoms are common to many other plant-sap-feeding insects and should not be considered as species-specific.

Description

The scale of the female adult is elongate, convex, straight or slightly curved, dark yellow, 2.2–3.0 mm long and 0.9–1.4 mm wide, silvery-grey or light brown initially but becoming purplish to coppery brown with age, sometimes banded with yellow-brown exuviae at the narrow end. The scales may be curved when the population density is high, or plant surface is rough. The scale cover of the male, if present, is light brown, smaller, more slender and more parallel-sided than that of the female, with yellow terminal exuviae (Watson, 2002).

3.2 | Pest distribution

3.2.1 | Pest distribution outside the EU

L. malicola is a species probably of Asian origin, and its distribution is mainly in areas with a temperate climate. Its distribution includes many countries in Asia, as well as some transcontinental countries located between western Asia and eastern Europe (Azerbaijan, Georgia, Kazakhstan and Türkiye) (García Morales et al., 2016) (Figure 1). For a detailed list of countries where *L. malicola* is present, see Appendix B.

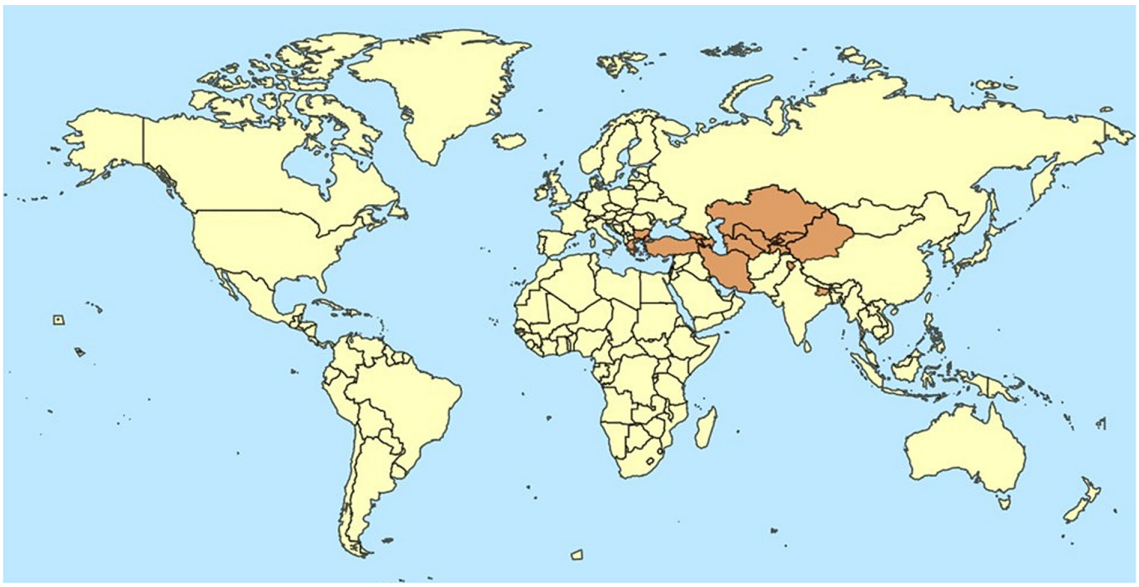

FIGURE 1 Global distribution of *Lepidosaphes malicola* (Source: García Morales et al., 2016; Watson, 2002) (for details, see Appendix B).

3.2.2 | Pest distribution in the EU

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

Yes, *L. malicola* is present in the EU territory, specifically in Greece (Kozar et al., 1991) and Bulgaria (Trenchev, 1987).

The Bulgarian NPPO considers the status of the pest in Bulgaria as 'present, no details'. According to the Bulgarian NPPO: 'In 1987, *L. malicola* was first reported by Trenchev during a study of the pest species composition in the "Kraishte" – region in

Western Bulgaria on the border between Bulgaria and Serbia (Trenchev, 1987). During monitoring studies in the last 20 years on fruits and forests, conducted by the Central Laboratory for Plant Quarantine, *L. malicola* was not identified. No problems or economic losses have been reported by producers of fruit plants and fruit production'. The finding in 1987 was later reported by Trencheva and Tomov (2014), with no additional occurrences during that time period. Similarly, the insect was detected in Greece in 1991 (Kozar et al., 1991), and this unique finding was reported by Milonas et al. (2008), with no additional findings ever since.

3.3 | Regulatory status

3.3.1 | Commission Implementing Regulation 2019/2072

L. malicola is not listed in Annex II of Commission Implementing Regulation (EU) 2019/2072, an implementing act of Regulation (EU) 2016/2031, or amendments to high-risk plants Regulation (EU) 2018/2019, or in any emergency plant health legislation.

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

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

Plants for planting of *Acer* L., *Fraxinus* L., *Juglans* L., *Malus* L., *Rosa* L., *Prunus* L., *Salix* L. and *Ulmus* L., which are hosts of *L. malicola* (Appendix A), are considered High-Risk Plants for the EU, and their import is prohibited pending risk assessment (EU 2018/2019).

3.4 | Entry, establishment and spread in the EU

3.4.1 | Entry

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

Yes, the pest has already entered the EU territory. It could enter the EU territory again with plants for planting, fruits and cut flowers.

Comment on plants for planting as a pathway.

Plants for planting are the main pathway for *L. malicola* to enter the EU (Table 4).

Potential pathways for *L. malicola* to enter the EU territory are presented in Table 4.

TABLE 4 Potential pathways for *Lepidosaphes malicola* into the EU.

Pathways	Life stage	Relevant mitigations (e.g. prohibitions [Annex VI], special requirements [Annex VII] or phytosanitary certificates [Annex XI] within Implementing Regulation 2019/2072)
Plants for planting	Eggs, nymphs and adults	Plants for planting that are hosts of *L. malicola* and are prohibited from being imported 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)
Fruits and cut flowers	Eggs, nymphs and adults	Fruits and cut flowers from third countries require a phytosanitary certificate to import into the EU (2019/2072, Annex XI, Part A)

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

Imported fruits and cut flowers may carry insects, and this pathway cannot be excluded. Detailed data of the annual imports of host plant commodities into the EU from countries where the pest occurs, and which provide potential pathways of introduction are provided in Appendix C. Fruits and cut flowers that are imported into the EU must have a phytosanitary certificate.

Notifications of interceptions of harmful organisms began to be compiled in Europhyt in May 1994 and in TRACES in May 2020. As of 23 November 2023, there were no records of interception of *L. malicola* in the Europhyt and TRACES databases.

3.4.2 | Establishment

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

Yes, the pest is already established in the EU (Bulgaria and Greece). Further establishment could occur in southern and central EU countries, where the climate is suitable and there are many available hosts.

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). The 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*

L. malicola is a polyphagous pest feeding on a wide range of plants (crops and ornamentals). The main hosts of the pest cultivated in the EU between 2018 and 2022 are shown in Table 5. The main cultivated host plants of the pest, which are economically important in the EU, are apples, pears, peaches, apricots, cherries, walnuts and grapes.

TABLE 5 Crop area of *Lepidosaphes malicola* hosts in the EU in 1000 ha (Eurostat accessed on 10 November 2023).

Crop	2018	2019	2020	2021	2022
Apples	506.27	491.08	489.19	492.56	477.97
Pears	113.54	110.66	108.29	106.96	103.07
Peaches	150.00	144.78	138.31	133.06	129.36
Apricots	72.57	73.22	76.13	73.48	72.04
Cherries	175.49	176.30	178.61	175.71	175.30
Walnuts	80.60	87.62	99.21	97.00	102.05
Grapes	3135.50	3155.20	3146.24	3120.22	3109.62

3.4.2.2 | *Climatic conditions affecting establishment*

L. malicola occurs mainly in temperate and arid regions of Asia (García Morales et al., 2016). Figure 2 shows the world distribution of selected Köppen – Geiger climate types (Kottek et al., 2006) that occur in the EU, and which occur in countries where *L. malicola* has been reported (BSh, BSk, Cfa, Cfb, Csa and Csb). Southern, central and some parts of northern EU countries provide suitable climatic conditions for the establishment of *L. malicola* outdoors. Based on current distribution, establishment outdoors is unlikely only in Finland, Estonia and in parts of Sweden, Latvia, Lithuania and Slovakia. Nevertheless, *L. malicola* could survive in protected environments, such as nurseries or in heated greenhouses in those colder areas of the EU.

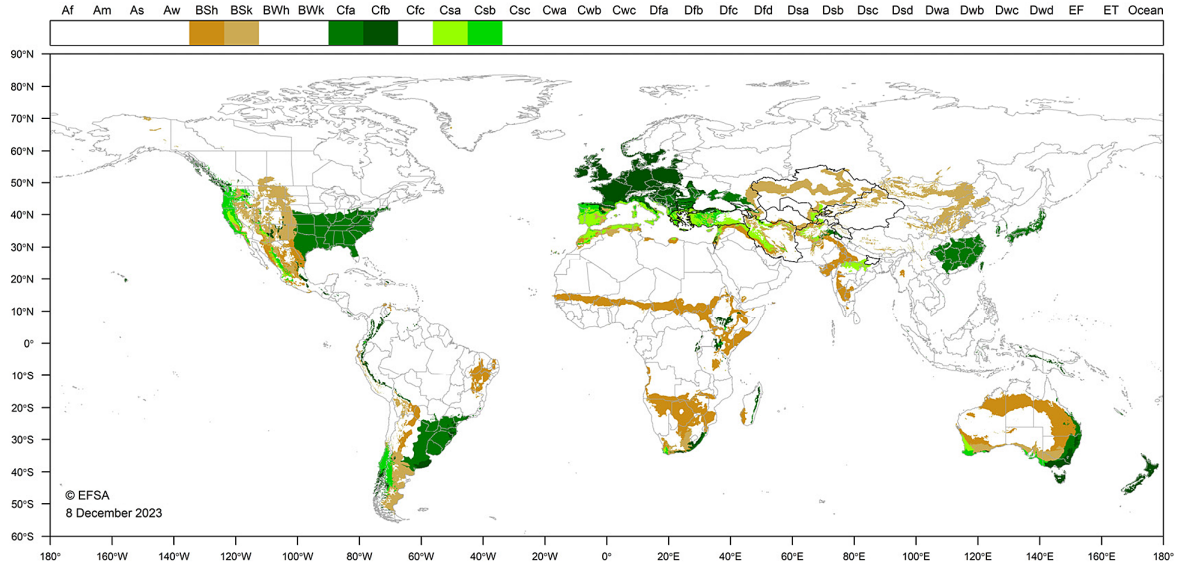

FIGURE 2 World distribution of Köppen – Geiger climate types that occur in the EU and which occur in countries where *Lepidosaphes malicola* has been reported. Cfb exists in the Northern part of Türkiye and in Jammu & Kashmir territory (India), near Tadjikistan, as well as in Bulgaria. Dfb and Dfc were excluded as are considered too cold for the pest.

Scale insects are cryptic, difficult to identify to species and under recorded in most EU countries. Recognising that there have been no finds of *L. malicola* in Bulgaria over the past 30 years and no recent literature reporting *L. malicola* in Greece (see Section 3.2.2), it is possible that populations of *L. malicola* died out naturally, although the lack of records may be due to the lack of surveys for the insect. Figure 2 shows that most of the EU has climatic conditions that may be suitable for establishment.

3.4.3 | Spread

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

The scale insect could spread naturally and via infested hosts moved in trade.

Comment on plants for planting as a mechanism of spread.

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

The pest is able to spread naturally by crawlers, which can move to new areas of the plant, or may be dispersed by wind or animal contact (EFSA PLH Panel, 2023; Nazari, Poorjavad, & Izadi, 2020). Pathways for long-distance spread are primarily the trade of infested plants for planting, fruits and cut flowers.

3.5 | Impacts

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

This is a key uncertainty. *L. malicola* is a recognised pest in Armenia, Iran and Tajikistan. It also occurs in Türkiye, but there is a lack of evidence of it being regarded as a pest there. It may have been present in Bulgaria for 37 years and in Greece for at least 33 years, with no evidence of damage. It is possible that economic or environmental impacts could occur in the future, but there is no strong evidence to indicate this is likely in the near term.

Several hosts of *L. malicola* are cultivated plants with economic importance in the EU, including apples (*M. domestica*), pears (*P. communis*), peaches (*Prunus persica*), apricots (*Prunus armeniaca*), cherries (*P. cerasus*), walnuts (*Juglans regia*), grapes (*Vitis vinifera*) and ornamental plants such as roses (*Rosa* spp.) and jasmine (*Jasminum* spp.) (García Morales et al., 2016). The damage caused by *L. malicola* is due to direct feeding on the content of the cells. The commercial value of the fruits is reduced by the red spots on the infested ones. Heavy infestations may result in death of branches or even of the entire trees (Biosecurity New Zealand, 2009; Danzig, 1993). *L. malicola* is reported to have an impact on ornamental plants and crops in Armenia, Iran and Tajikistan. It is considered as one of the most important and widespread apple pests in Iran, very damaging to apple in Armenia and to *Ribes* and *Salix* in Tajikistan. The species is polyphagous, infesting all parts of apple, pear, peach, apricot, plum, cherry and many other fruit, walnuts and other trees and bushes (Biosecurity New Zealand, 2009; Watson, 2002). Interestingly there is a lack of evidence of impacts in Türkiye. No damage is reported by *L. malicola* in Bulgaria (Trencheva & Tomov, 2014, citing Trenchev, 1987) and Greece where the pest was detected more than 30 years ago (Milonas et al., 2008, citing Kozar et al., 1991). No evidence of economic or environmental damage in these EU countries was found in the literature. The NPPO of Bulgaria informed EFSA that 'no problems or economic losses have been reported by producers of fruit plants and fruit production'. There is uncertainty as to whether introduction of the species elsewhere in the EU would cause any notable impact.

It is possible that lack of impacts in Bulgaria and Greece could be due to populations of *L. malicola* dying out naturally, although this is unlikely (see Section 3.4.2.2).

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, for example plants of the genera *Acer*, *Malus*, *Prunus*, *Pyrus*, *Quercus* and *Rosa* are prohibited as high risk plants for planting from third countries, pending risk assessment (Section 3.3.2), while other species as well as fruits and cut flowers require a phytosanitary certificate to import into the EU territory (Section 3.4.1). There are also additional measures (Section 3.6.1) to mitigate the likelihood of *L. malicola* entry, establishment and spread within the EU.

3.6.1 | Identification of potential additional measures

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

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

3.6.1.1 | *Additional potential risk reduction options*

Potential additional control measures are listed in Table 6.

TABLE 6 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	As a pest with low mobility, a risk reduction option could be to source plants from a pest free area, or place of production or production site	Entry/Spread
Growing plants in isolation	Growing plants in insect proof place of production or in a place with complete physical isolation could be an effective measure to mitigate the likelihood of entry and spread of *L. malicola*	Entry/Spread/Impact
Roguing and pruning	The scale insect *L. malicola* occurs commonly on the trunk and branches and also on the leaves and fruits (Biosecurity New Zealand, 2009; Watson, 2002). Roguing (removal of infested plants) and pruning (removal of infested plant parts only without affecting the viability of the plant) can reduce the population density of the pest	Entry/Spread/Impact
Biological control and behavioural manipulation	Several parasitoids, such as *Aphytis mytilaspidis*, *A. libanicus*, *Physcus testaceus* and *Coccobius testaceus* attack the pest and also the parasitic mite *Hemisarcoptes malus* (Hemisarcoptidae). As predators have been reported the species *Chilocorus bipustulatus*, *Hemisarcoptes malus* and *Scymnus* sp. (Plant pest of Middle East, 2023; Watson, 2002)	Spread/Impact
Chemical treatments on crops including reproductive material	Spirotetramat and flupyradifurone showed a significant effect on the *L. malicola* nymph's control (Nazari, Poorjavad, Izadi, & Sahhafi, 2020). The effectiveness of insecticide against *L. malicola* may be reduced due to the protective cover of the scale	Entry/Establishment/Spread/Impact
Chemical treatments on consignments or during processing	The chemical compounds that may be applied to plants or to plant products after harvest, during process or packaging operations and storage could mitigate the likelihood of infestation of pests susceptible to chemical treatment	Entry/Spread
Physical treatments on consignments or during processing	Brushing, washing and other mechanical cleaning methods can be used to reduce the likelihood of the presence of the pest in consignments to be exported	Entry/Spread
Heat and cold treatments	Controlled temperature treatments aimed to kill or inactivate pests without causing any unacceptable prejudice to the treated material itself	Entry/Spread
Controlled atmosphere	Treatment of plants by storage in a modified atmosphere (including modified humidity, O_2, CO_2, temperature, pressure) could mitigate the likelihood of entry and spread of the pest Controlled atmosphere storage can be used in commodities such as fresh and dried fruits, cut flowers and vegetables	Entry/Spread (via commodity)

3.6.1.2 | *Additional supporting measures*

Potential additional supporting measures are listed in Table 7.

TABLE 7 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	ISPM 5 (FAO, 2023) defines inspection 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 The effectiveness of sampling and subsequent inspection to detect pests may be enhanced by including trapping and luring techniques Any shipments of fresh plant material from an infested country to another that is not infested should be inspected thoroughly to detect *L. malicola*	Entry/Establishment/Spread
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 (FAO, 2008), it is usually not feasible to inspect entire consignments, so phytosanitary inspection is performed mainly on samples obtained from a consignment. It is noted that the sampling concepts presented in this standard may also apply to other phytosanitary procedures, notably selection of units for testing For inspection, testing and/or surveillance purposes the sample may be taken according to a statistically based or a non-statistical sampling methodology	Entry/Spread

(Continues)

TABLE 7 (Continued)

Supporting measure (Blue underline = Zenodo doc, Blue = WIP)	Summary	Risk element targeted (entry/establishment/spread/impact)
Phytosanitary certificate and plant passport	According to ISPM 5 (FAO, 2023) a phytosanitary certificate and a plant passport are official paper documents or their official electronic equivalents, consistent with the model certificates of the IPPC, attesting that a consignment meets phytosanitary import requirements: 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
Surveillance	Surveillance to guarantee that plants and produce originate from a Pest Free Area could be an option	Spread

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

- *L. malicola* is polyphagous, making the inspections of all consignments containing hosts from countries where the pest occurs difficult.
- *L. malicola* occurs mainly on the trunk and branches of the trees, where they are camouflaged. The crawlers can hide in wounds or in the underside of the leaves. The scales are difficult to detect when the population density is low.
- Limited effectiveness of contact insecticide treatments because of the protection of scale cover.

3.7 | Uncertainty

Uncertainty exists as to the current presence of *L. malicola* in the EU, as it has not been reported for many years. There is uncertainty around its ability to cause impacts (a) in Greece and Bulgaria and (b) elsewhere in the EU.

4 | CONCLUSIONS

Except for the criterion of having an economic or environmental impact in the EU, for which there is the greatest uncertainty, *L. malicola* satisfies the other criteria that are within the remit of EFSA to assess, for it to be regarded as a potential Union quarantine pest. Table 8 provides a summary of the PLH Panel conclusions.

TABLE 8 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 the pest is clearly defined and *Lepidosaphes malicola* (Borchsenius, 1947) is the accepted name	None
Absence/presence of the pest in the EU (Section 3.2)	The pest has a restricted distribution in the EU territory, specifically it was found in Greece and Bulgaria more than 30 years ago. There have been no reports in recent decades	None
Pest potential for entry, establishment and spread in the EU (Section 3.4)	*L. malicola* is able to enter into, become established and spread within the EU territory. The main pathways are: • plants for planting • fruits and cut flowers	None

TABLE 8 (Continued)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Key uncertainties
Potential for consequences in the EU (Section 3.5)	*L. malicola* is considered as an important and widespread pest in some Asian countries. However, it occurs in Greece and Bulgaria and no evidence of economic or environmental damage in these EU countries was found in the literature	Uncertainty exists whether *L. malicola* will have an economic or environmental impact in the EU
Available measures (Section 3.6)	There are measures available to prevent the entry, establishment and spread of *L. malicola* within the EU. These measures include the inspections and chemical treatments on consignments of fresh plant material from infested countries	None
Conclusion (Section 4)	Except for the criterion of having an economic or environmental impact in the EU, for which there is great uncertainty, *L. malicola* satisfies all other 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:	Studies of *L. malicola* in Greece and Bulgaria would help reduce uncertainties within this pest categorisation	

ABBREVIATIONS

EPPO	European and Mediterranean Plant Protection Organization
FAO	Food and Agriculture Organization
IPPC	International Plant Protection Convention
ISPM	International Standards for Phytosanitary Measures
MS	Member State
PLH	EFSA Panel on Plant Health
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, 2023).
Control (of a pest)	Suppression, containment or eradication of a pest population (FAO, 2023).
Entry (of a pest)	Movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled (FAO, 2023).
Eradication (of a pest)	Application of phytosanitary measures to eliminate a pest from an area (FAO, 2023).
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2023).
Greenhouse	A walk-in, static, closed place of crop production with a usually translucent outer shell, which allows controlled exchange of material and energy with the surroundings and prevents release of plant protection products (PPPs) into the environment.
Hitchhiker	An organism sheltering or transported accidentally via inanimate pathways including with machinery, shipping containers and vehicles; such organisms are also known as contaminating pests or stowaways (Toy & Newfield, 2010).
Impact (of a pest)	The impact of the pest on the crop output and quality and on the environment in the occupied spatial units.
Introduction (of a pest)	The entry of a pest resulting in its establishment (FAO, 2023).
Pathway	Any means that allows the entry or spread of a pest (FAO, 2023).
Phytosanitary measures	Any legislation, regulation or official procedure having the purpose to prevent the introduction or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests (FAO, 2023).
Quarantine pest	A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (FAO, 2023).
Risk reduction option (RRO)	A measure acting on pest introduction and/or pest spread and/or the magnitude of the biological impact of the pest should the pest be present. A RRO may become a phytosanitary measure, action or procedure according to the decision of the risk manager.
Spread (of a pest)	Expansion of the geographical distribution of a pest within an area (FAO, 2023).

CONFLICT OF INTEREST

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APPENDIX A

Lepidosaphes malicola host plants/species affected

Source: García Morales et al. (2016), EFSA PLH Panel (2023), Yasaman et al. (2017), Moghaddam (2013) and Torabi et al. (2010).

Host status	Host name	Plant family	Common name	Reference
Cultivated hosts	*Amygdalus*	Rosaceae		García Morales et al. (2016)
	Armeniaca vulgaris	Rosaceae	Armenian plum	García Morales et al. (2016)
	Berberis	Berberidaceae	Barberry	García Morales et al. (2016)
	Betula	Betulaceae	Birch	García Morales et al. (2016)
	Cephalotaxus harringtonii	Cephalotaxaceae	Japanese plum-yew, Harrington's cephalotaxus, cowtail pine	García Morales et al. (2016)
	Cerasus	Rosaceae		García Morales et al. (2016)
	Cercis	Fabaceae	Redbuds	García Morales et al. (2016)
	Cercis siliquastrum	Fabaceae	Judas tree, Mediterranean redbud	García Morales et al. (2016)
	Cornus	Cornaceae	Dogwoods	García Morales et al. (2016)
	Cotoneaster integerrimus	Rosaceae	Common cotoneaster	García Morales et al. (2016)
	Cotoneaster melanocarpus	Rosaceae	Black Cotoneaster	García Morales et al. (2016)
	Cotoneaster vulgaris	Rosaceae		Moghaddam (2013)
	Daphne angustifolia	Thymelaeaceae		Moghaddam (2013)
	Daphne mucronata	Thymelaeaceae	Kashmir Daphne, Kheweshk	García Morales et al. (2016)
	Elaeagnus angustifolia	Elaeagnaceae	Russian olive, silver Berry, oleaster, wild olive	García Morales et al. (2016)
	Elaeagnus rhamnoides	Elaeagnaceae	Sea-buckthorn	García Morales et al. (2016)
	Euonymus	Celastraceae	Spindle burning-bush, strawberry bush, wahoo, wintercreeper	García Morales et al. (2016)
	Fraxinus excelsior	Oleaceae	European ash, common ash	García Morales et al. (2016)
	Fraxinus	Oleaceae	Ash	García Morales et al. (2016)
	Jasminum	Oleaceae	Jasmine	García Morales et al. (2016)
	Juglans regia	Juglandaceae	Persian walnut, English walnut, Carpathian walnut, Madeira walnut, common walnut	García Morales et al. (2016)
	Hippophae	Elaeagnaceae	Sandthorn, sallowthorn, seaberry	EFSA PLH Panel (2023)
	Ligustrum	Oleaceae	Privet	García Morales et al. (2016)
	Lonicera	Caprifoliaceae	Honeysuckles	García Morales et al. (2016)
	Lycium	Solanaceae	Box thorn, desert thorn	García Morales et al. (2016)
	Malus domestica	Rosaceae	Apples	Torabi et al. (2010)
	Malus	Rosaceae	Apples	García Morales et al. (2016)
	Mespilus germanica	Rosaceae	Medlar, common medlar	García Morales et al. (2016)
	Populus nigra	Salicaceae	Black poplar, Lombardy poplar	García Morales et al. (2016)
	Populus tremula	Salicaceae	Aspen, common aspen, Eurasian Aspen, European aspen, quaking aspen	García Morales et al. (2016)
	Populus	Salicaceae	Poplar, aspen, cottonwood	García Morales et al. (2016)
	Prunus armeniaca	Rosaceae	Apricot	García Morales et al. (2016)
	Prunus cerasus	Rosaceae	Sour cherry, tart cherry, dwarf Cherry	García Morales et al. (2016)
	Prunus persica	Rosaceae	Peach	García Morales et al. (2016)
	Prunus serrulata	Rosaceae	Japanese cherry	García Morales et al. (2016)
	Punica granatum	Lythraceae	Pomegranate	García Morales et al. (2016)
	Pyrus communis	Rosaceae	Common pear	García Morales et al. (2016)
	Pyrus	Rosaceae	Pear	García Morales et al. (2016)
	Rhamnus	Rhamnaceae	Buckthorns	García Morales et al. (2016)
	Rhododendron	Ericaceae	Rhododendron	García Morales et al. (2016)

(Continued)

Host status	Host name	Plant family	Common name	Reference
	Ribes rubrum	Grossulariaceae	Redcurrant, red currant	García Morales et al. (2016)
	Rosa canina	Rosaceae	Dog rose	García Morales et al. (2016)
	Rosa	Rosaceae	Rose	García Morales et al. (2016)
	Salix alba	Salicaceae	White willow, water willow, bat willow	Yasaman et al. (2017)
	Salix	Salicaceae	Willows, sallows, osiers	García Morales et al. (2016)
	Syringa	Oleaceae	Lilacs	García Morales et al. (2016)
	Taxus baccata	Taxaceae	Common yew, English yew, European yew	García Morales et al. (2016)
	Ulmus	Ulmaceae	Elms	García Morales et al. (2016)
	Vitis vinifera	Vitaceae	Grapes	García Morales et al. (2016)
Wild/weed hosts	*Acer monspessulanum*	Sapindaceae	Montpellier maple	García Morales et al. (2016)
	Acer negundo	Sapindaceae	Box elder, boxelder maple, Manitoba maple, ash-Leaved maple	García Morales et al. (2016)
	Acer	Sapindaceae	Maples	García Morales et al. (2016)
	Apocynum	Apocynaceae	Dogbane, Indian hemp	García Morales et al. (2016)
	Astragalus	Fabaceae	Milkvetch, locoweed, goat's-thorn	García Morales et al. (2016)
	Berberis heteropoda	Berberidaceae		García Morales et al. (2016)
	Catalpa	Bignoniaceae	Catawba	García Morales et al. (2016)
	Malus sylvestris	Rosaceae	European crab apple, European wild apple, crab apple	García Morales et al. (2016)
	Quercus	Fagaceae	Oak tree	García Morales et al. (2016)
	Quercus petraea	Fagaceae	Sessile oak, Cornish oak, Irish Oak, durmast oak	García Morales et al. (2016)
	Quercus robur	Fagaceae	Pedunculate oak	García Morales et al. (2016)
	Robinia	Fabaceae	Locusts	García Morales et al. (2016)

APPENDIX B

Distribution of *Lepidosaphes malicola*

Distribution records based on the references indicated.

Region	Country	Sub-national (e.g. state)	Status	Reference
EU	Greece		Present, no details	Kozar et al. (1991)
	Bulgaria		Present, no details	Trenchev (1987)
Asia	Armenia		Present, no details	García Morales et al. (2016)
	Azerbaijan		Present, no details	Watson (2002)
	China	Xinjiang Uygur	Present, no details	García Morales et al. (2016)
	Georgia		Present, no details	García Morales et al. (2016)
	India	Bihar	Present, no details	Watson (2002)
		Jammu & Kashmir	Present, no details	García Morales et al. (2016)
	Iran		Present, no details	García Morales et al. (2016)
	Israel		Present, no details	García Morales et al. (2016)
	Kazakhstan		Present, no details	García Morales et al. (2016)
	Kyrgyzstan		Present, no details	García Morales et al. (2016)
	Tajikistan		Present, no details	Watson (2002)
	Türkiye		Present, no details	Develioglu et al. (2018), Kaydan et al. (2013), Yiğit and Tunaz (2019)
	Turkmenistan		Present, no details	Watson (2002)
	Uzbekistan		Present, no details	Watson (2002)

APPENDIX C

Import data

TABLE C.1 **Fresh Apricots, Cherries, Peaches incl. Nectarines, Plums and Sloes (CN code: 0809)** imported in 100 kg into the EU from regions where *Lepidosaphes malicola* is known to occur (Source: Eurostat accessed on 17 November 2023).

COYNTRY	2018	2019	2020	2021	2022
Armenia	40.24	31.30	15.67	214.00	38.71
Azerbaijan			134.52		
China	0.90	3.24		0.14	19.79
Israel	91.11	46.42	3.80		
India	0.45		0.00	3.76	0.81
Iran	42.15	29.18	589.22	381.90	123.82
Kyrgyzstan	0.10		197.32		
Türkiye	455,647.50	430,701.97	692,517.62	610,890.17	405,973.64
Uzbekistan	600.72	176.54	1574.77	1391.55	537.17

TABLE C.2 **Fresh Apples, Pears and Quinces (CN code: 0808)** imported in 100 kg into the EU from regions where *Lepidosaphes malicola* is known to occur (Source: Eurostat accessed on 17 November 2023).

COYNTRY	2018	2019	2020	2021	2022
Armenia	5.83	2.00		1.00	
China	132,532.46	83,521.99	104,250.97	92,797.41	90,970.30
Israel	936.63	2382.40	1539.87	2694.67	1525.01
India			0.45	0.16	24.15
Iran	2977.68	0.38	705.90		
Kazakhstan	192.00				
Kyrgyzstan	395.20				
Türkiye	156,573.18	131,122.23	216,684.72	260,187.93	212,094.76
Uzbekistan	0.79		52.33	9.58	

TABLE C.3 **Grapes fresh or dried (CN code: 0806)** imported in 100 kg into the EU from regions where *Lepidosaphes malicola* is known to occur (Source: Eurostat accessed on 17 November 2023).

COYNTRY	2018	2019	2020	2021	2022
Armenia	544.00	0.12		0.12	0.06
China	87,690.22	191,986.55	156,789.04	80,255.76	23,689.94
Israel	6433.57	320.43	1083.52	8.85	2.21
India	741,303.06	970,130.19	767,803.65	852,065.11	896,702.51
Iran	101,488.05	165,329.68	201,689.92	298,066.29	114,871.64
Kazakhstan			48.00		
Kyrgyzstan	0.26		5.00	9.90	
Türkiye	1,650,673.26	1,505,665.12	1,410,795.14	1,507,167.06	1,571,786.79
Uzbekistan	74,951.18	113,826.20	69,333.46	72,907.11	91,856.96

TABLE C.4 **Fresh cut roses and buds, of a kind suitable for bouquets or for ornamental purposes (CN code: 06031100)** imported in 100 kg into the EU from regions where *Lepidosaphes malicola* is known to occur (Source: Eurostat accessed on 17 November 2023).

COUNTRY	2018	2019	2020	2021	2022
Armenia		0.15	36.82		6.87
China	0.24	1.03	9.67	2.62	2.34
Israel	7.96	2.21	0.04	21.99	32.73
India	780.52	359.09	314.69	114.74	291.29
Iran	10.00	1.26	7.34	1.42	22.09
Türkiye	12.30	179.89	490.02	525.54	52.62