Adopted: 11 December 2024

DOI: 10.2903/j.efsa.2025.9189

efsa JOURNAL

SCIENTIFIC OPINION

Commodity risk assessment of *Alnus cordata*, *Alnus glutinosa* and *Alnus incana* plants from the UK

EFSA Panel on Plant Health (PLH) | Antonio Vicent Civera | Paula Baptista | Anna Berlin | Elisavet Chatzivassiliou | Jaime Cubero | Nik Cunniffe | Eduardo de la Peña | Nicolas Desneux | Francesco Di Serio | Anna Filipiak | Paolo Gonthier | Beata Hasiów-Jaroszewska | Hervé Jactel | Blanca B. Landa | Lara Maistrello | David Makowski | Panagiotis Milonas | Nikos T. Papadopoulos | Hanna Susi | Dirk Jan van der Gaag | Jane Debode | Charles Manceau | Christer Sven Magnusson | Juan A. Navas-Cortes | Christos Kritikos | Maria Kormpi | Dimitrios Papachristos | Chrysavgi Reppa | Olaf Mosbach Schulz | Ciro Gardi | Chiara Civitelli | Monia Federica Lombardo | Antigoni Akrivou | Spyridon Antonatos | Despoina Beris | Roel Potting

Correspondence: plants@efsa.europa.eu

The declarations of interest of all scientific experts active in EFSA's work are available at https://open.efsa.europa.eu/experts

Abstract

The European Commission requested the EFSA Panel on Plant Health to prepare and deliver risk assessments for commodities listed in Commission Implementing Regulation (EU) 2018/2019 as 'high-risk plants, plant products and other objects'. Taking into account the available scientific information, including the technical information provided by the applicant country, this Scientific Opinion covers the plant health risks posed by the following commodities: *Alnus cordata*, *A. glutinosa* and *A. incana* graftwood, bare-root plants and rooted plants in pots up to 7 years old imported into the EU from the UK. A list of pests potentially associated with the commodities was compiled. The relevance of each pest was assessed based on evidence following defined criteria. Two EU-quarantine pests (*Entoleuca mammata, Phytophthora ramorum* (non-EU isolates)) and one non-quarantine pest (*Phytophthora siskiyouensis*) were selected for further evaluation. For the selected pests, the risk mitigation measures implemented in the UK and specified in the technical dossier were evaluated taking into account the factors reducing their efficacy. For these pests, an expert judgement is given on the likelihood of pest freedom taking into consideration the risk mitigation measures acting on the pest, including uncertainties associated with the assessment. The degree of pest freedom varies between the pests evaluated, with *E. mammata* being the pest most frequently expected on imported *Alnus* spp. small trees. Expert knowledge elicitation indicated, with 95% certainty, that between 9927 and 10,000 per 10,000 *Alnus* spp. small trees (bare-root plants or rooted plants in pots up to 7 years old) would be free from *E. mammata*.

KEYWORDS

alder, *Alnus*, commodity risk assessment, European Union, plant health, plant pests

CONTENTS

1 | INTRODUCTION

1.1 | Background and Terms of Reference as provided by European Commission

1.1.1 | Background

The Plant Health Regulation (EU) 2016/2031,[1] on the protective measures against pests of plants, has been applied from December 2019. Provisions within the above Regulation are in place for the listing of 'high risk plants, plant products and other objects' (Article 42) on the basis of a preliminary assessment, and to be followed by a commodity risk assessment. A list of 'high risk plants, plant products and other objects' has been published in Regulation (EU) 2018/2019.[2] Scientific opinions are therefore needed to support the European Commission and the Member States in the work connected to Article 42 of Regulation (EU) 2016/2031, as stipulated in the terms of reference.

1.1.2 | Terms of Reference

In view of the above and in accordance with Article 29 of Regulation (EC) No. 178/2002,[3] the Commission asks EFSA to provide scientific opinions in the field of plant health.

In particular, EFSA is expected to prepare and deliver risk assessments for commodities listed in the relevant Implementing Act as 'high risk plants, plant products and other objects'. Article 42, paragraphs 4 and 5, establishes that a risk assessment is needed as a follow-up to evaluate whether the commodities will remain prohibited, removed from the list and additional measures will be applied or removed from the list without any additional measures. This task is expected to be ongoing, with a regular flow of dossiers being sent by the applicant required for the risk assessment.

Therefore, to facilitate the correct handling of the dossiers and the acquisition of the required data for the commodity risk assessment, a format for the submission of the required data for each dossier is needed.

Furthermore, a standard methodology for the performance of 'commodity risk assessment' based on the work already done by Member States and other international organizations needs to be set.

In view of the above and in accordance with Article 29 of Regulation (EC) No. 178/2002, the Commission asked EFSA to provide scientific opinion in the field of plant health for *Alnus cordata* (Loisel.) Duby, *Alnus glutinosa* (L.) Gaertn. and *Alnus incana* (L.) Moench plants from the UK taking into account the available scientific information, including the technical dossier provided by the UK.

1.2 | Interpretation of the Terms of Reference

The EFSA Panel on Plant Health (from this point onwards referred to as 'the Panel') was requested to conduct a commodity risk assessment of *A. cordata, A. incana* and *A. glutinosa* plants from the UK following the Guidance on commodity risk assessment for the evaluation of high-risk plant dossiers (EFSA PLH Panel, 2019) and the protocol for commodity risk assessment as presented in the EFSA standard protocols for scientific assessment (EFSA PLH Panel, 2024; Gardi et al., 2024), taking into account the available scientific information, including the technical information provided by the UK. In accordance with the Agreement on the withdrawal of the United Kingdom of Great Britain and Northern Ireland from the European Union and the European Atomic Energy Community, and in particular Article 5(4) of the Windsor Framework in conjunction with Annex 2 to that Framework, for the purposes of this Opinion, references to the United Kingdom do not include Northern Ireland.

The EU-quarantine pests that are regulated as a group in the Commission Implementing Regulation (EU) 2019/2072[4] were considered and evaluated separately at species level.

Annex II of Implementing Regulation (EU) 2019/2072 lists certain pests as non-European populations or isolates or species. These pests are regulated quarantine pests. Consequently, the respective European populations, or isolates, or species are non-regulated pests.

Annex VII of the same Regulation, in certain cases (e.g. point 32) makes reference to the following countries that are excluded from the obligation to comply with specific import requirements for those non-European populations, or isolates, or species: Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canary Islands, Faeroe Islands,

[1]Regulation (EU) 2016/2031 of the European Parliament of the Council of 26 October 2016 on protective measures against pests of plants, amending Regulations (EU) 228/2013, (EU) 652/2014 and (EU) 1143/2014 of the European Parliament and of the Council and repealing Council Directives 69/464/EEC, 74/647/EEC, 93/85/EEC, 98/57/EC, 2000/29/EC, 2006/91/EC and 2007/33/EC. OJ L 317, 23.11.2016, pp. 4–104.

[2]Commission Implementing Regulation (EU) 2018/2019 of 18 December 2018 establishing a provisional list of high risk plants, plant products or other objects, within the meaning of Article 42 of Regulation (EU) 2016/2031 and a list of plants for which phytosanitary certificates are not required for introduction into the Union, within the meaning of Article 73 of that Regulation C/2018/8877. OJ L 323, 19.12.2018, pp. 10–15.

[3]Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. OJ L 31, 1.2.2002, pp. 1–24.

[4]Commission Implementing Regulation (EU) 2019/2072 of 28 November 2019 establishing uniform conditions for the implementation of Regulation (EU) 2016/2031 of the European Parliament and the Council, as regards protective measures against pests of plants, and repealing Commission Regulation (EC) No 690/2008 and amending Commission Implementing Regulation (EU) 2018/2019. OJ L 319, 10.12.2019, pp. 1–279.

Georgia, Iceland, Liechtenstein, Moldova, Monaco, Montenegro, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (SeveroZapadny 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 UK (except Northern Ireland[5]). Those countries are historically linked to the reference to 'non-European countries' existing in the previous legal framework, Directive 2000/29/EC.

Consequently, for those countries,

(i) Any pests identified, which are listed as non-European species in Annex II of Implementing Regulation (EU) 2019/2072 should be investigated as any other non-regulated pest.
(ii) Any pest found in a European country that belongs to the same denomination as the pests listed as non-European populations or isolates in Annex II of Implementing Regulation (EU) 2019/2072, should be considered as European populations or isolates and should not be considered in the assessment of those countries.

Pests listed as 'Regulated Non-Quarantine Pest' (RNQP) in Annex IV of the Commission Implementing Regulation (EU) 2019/2072, and deregulated pests [i.e. pest which were listed as quarantine pests in the Council Directive 2000/29/EC and were deregulated by Commission Implementing Regulation (EU) 2019/2072] were not considered for further evaluation. In case a pest is at the same time regulated as a RNQP and as a Protected zone Quarantine pest, in this Opinion it should be evaluated as Quarantine pest.

In its evaluation the Panel:

- Checked whether the provided information in the technical dossier (from this point onwards referred to as 'the Dossier') provided by the applicant (UK, Department for Environment Food and Rural Affairs – from this point onwards referred to as 'DEFRA') was sufficient to conduct a commodity risk assessment. When necessary, additional information was requested to the applicant.
- Selected the relevant Union quarantine pests and protected zone quarantine pests [as specified in Commission Implementing Regulation (EU) 2019/2072,[6] from this point onwards referred to as 'EU-quarantine pests'] and other relevant pests present in the UK and associated with the commodity.
- Assessed the effectiveness of the measures described in the Dossier for those Union quarantine pests for which no specific measures are in place for the importation of the commodity from the UK and other relevant pests present in the UK and associated with the commodity.
- Did not assess the effectiveness of measures for Union quarantine pests for which specific measures are in place for the import of the commodity from the UK in Commission Implementing Regulation (EU) 2019/2072 and/or in the relevant legislative texts for emergency measures and if the specific country is in the scope of those emergency measures. The assessment was restricted to whether or not the applicant country implements those measures.

Risk management decisions are not within EFSA's remit. Therefore, the Panel provided a rating based on expert judgement on the likelihood of pest freedom for each relevant pest given the risk mitigation measures proposed by DEFRA of the UK.

2 | DATA AND METHODOLOGIES

2.1 | Data provided by DEFRA of the UK

The Panel considered all the data and information in the Dossiers provided by DEFRA of the UK in July 2023. The Dossier is managed by EFSA.

The structure and overview of the Dossier is shown in Table 1. The number of the relevant section is indicated in the Opinion when referring to a specific part of the Dossier.

[5]In accordance with the Agreement on the withdrawal of the United Kingdom of Great Britain and Northern Ireland from the European Union and the European Atomic Energy Community, and in particular Article 5(4) of the Protocol on Ireland/Northern Ireland in conjunction with Annex 2 to that Protocol, for the purposes of this Opinion, references to Member States include the United Kingdom in respect of Northern Ireland.

[6]Commission Implementing Regulation (EU) 2019/2072 of 28 November 2019 establishing uniform conditions for the implementation of Regulation (EU) 2016/2031 of the European Parliament and the Council, as regards protective measures against pests of plants, and repealing Commission Regulation (EC) No 690/2008 and amending Commission Implementing Regulation (EU) 2018/2019, OJ L 319, 10.12.2019, pp. 1–279.

TABLE 1 Structure and overview of the Dossier.

Dossier section	Overview of contents	Filename
1.0	Technical dossiers	Alnus cordata commodity information final.pdf Alnus glutinosa commodity information final.pdf Alnus incana commodity information final.pdf
2.0	Pest list	Alnus_Pest_List_Final_DEFRA.xlsx
3.0	Nursery distribution map	A_cordata_distribution.pdf A_glutinosa_distribution.pdf A_incana_distribution.pdf
4.0	List of plants produced in the *Alnus* nurseries	Alnus_cordata_sample_product_list.xlsx Alnus_glutinosa_sample_product_list.xlsx Alnus_incana_sample_product_list.xlsx

The data and Supporting Information provided by DEFRA of the UK formed the basis of the commodity risk assessment. Table 2 shows the main data sources used by DEFRA of the UK to compile the Dossier (Dossier Sections 1.0 and 2.0).

TABLE 2 Databases used in the literature searches by DEFRA of the UK.

Database	Platform/link
Aphids on World Plants	http://www.aphidsonworldsplants.info/
Beetles of Britain and Ireland	https://www.coleoptera.org.uk/
Biological Records Centre	https://www.brc.ac.uk/
British Bugs	https://www.britishbugs.org.uk/gallery.html
Butterflies and Moths of North America	https://www.butterfliesandmoths.org/
CABI Crop Protection Compendium	https://www.cabi.org/cpc/
CABI Plantwise Knowledge Bank	https://www.plantwise.org/knowledgebank/
CABI Publishing	https://www.cabi.org/what-we-do/publishing/
Checklist of Aphids of Britain	https://influentialpoints.com/aphid/Checklist_of_aphids_in_Britain.htm
Encyclopedia of Life	https://eol.org/
EPPO Global Database	https://gd.eppo.int/
Fauna Europaea	https://www.gbif.org/dataset/90d9e8a6-0ce1-472d-b682-3451095dbc5a
Forest research	https://www.forestresearch.gov.uk/
Fungi of Great Britain and Ireland	https://fungi.myspecies.info/
Global Biodiversity Information Facility	https://www.gbif.org/
Global Taxonomic Database of Gracillariidae (Lepidoptera)	https://www.gbif.org/dataset/98fb9418-8215-4575-abfb-07a30b81acfc
National Collection of Plant Pathogenic Bacteria (NCPPB)	https://ncppb.fera.co.uk/ncppbresult.cfm
Nature Spot	https://www.naturespot.org.uk/
Natural History Museum (NHM)	https://data.nhm.ac.uk/dataset/hosts
NBN Atlas	https://species.nbnatlas.org/
NEMAPLEX	http://nemaplex.ucdavis.edu/
Plant Parasites of Europe – leafminers, galls and fungi	https://bladmineerders.nl/
Pyrenomycetes from southwestern France	http://pyrenomycetes.free.fr/
Scalenet	https://scalenet.info/
Spider Mites Web	https://www1.montpellier.inra.fr/CBGP/spmweb/
The Sawflies (Symphyta) of Britain and Ireland	https://www.sawflies.org.uk/
Thrips-iD	https://www.thrips-id.com/en/
UK Beetles	https://www.ukbeetles.co.uk/
UK Moths	https://ukmoths.org.uk/
UK Plant Health Information Portal	https://planthealthportal.defra.gov.uk/

2.2 | Literature searches performed by EFSA

Literature searches in different databases were undertaken by EFSA to complete a list of pests potentially associated with the genus *Alnus*. The following searches were combined: (i) a general search to identify pests reported on the genus *Alnus* in the databases and subsequently (ii) a tailored search to identify whether the above pests are present or not in the UK.

The searches were run on 30 January 2024. No language, date or document type restrictions were applied in the search strategy.

The Panel used the databases indicated in Table 3 to compile the list of pests associated with the genus *Alnus*. As for Web of Science, the literature search was performed using a specific, ad hoc established search string (see Appendix B). The string was run in 'All Databases' with no range limits for time or language filters.

TABLE 3 Databases used by EFSA for the compilation of the pest list associated with *Alnus* spp.

Database	Platform/link
Aphids on World Plants	http://www.aphidsonworldsplants.info/C_HOSTS_AAIntro.htm
CABI Crop Protection Compendium	https://www.cabi.org/cpc/
Database of Insects and their Food Plants	http://www.brc.ac.uk/dbif/hosts.aspx
Database of the World's Lepidopteran Hostplants	https://www.nhm.ac.uk/our-science/data/hostplants/search/index.dsml
EPPO Global Database	https://gd.eppo.int/
EUROPHYT	https://webgate.ec.europa.eu/europhyt/
Global Biodiversity Information Facility	https://www.gbif.org/
Google Scholar	https://scholar.google.com/
Leafminers	http://www.leafmines.co.uk/html/plants.htm
Nemaplex	http://nemaplex.ucdavis.edu/Nemabase2010/PlantNematodeHostStatusDDQuery.aspx
Plant Parasites of Europe	https://bladmineerders.nl/
Plant Pest Information Network	https://www.mpi.govt.nz/news-and-resources/resources/registers-and-lists/plant-pest-information-network/
Plant Viruses Online	http://www1.biologie.uni-hamburg.de/b-online/e35/35tmv.htm#Range
Scalenet	http://scalenet.info/associates/
Spider Mites Web	https://www1.montpellier.inra.fr/CBGP/spmweb/advanced.php
USDA ARS Fungal Database	https://fungi.ars.usda.gov/
Web of Science: All Databases (Web of Science Core Collection, CABI: CAB Abstracts, BIOSIS Citation Index, Chinese Science Citation Database, Current Contents Connect, Data Citation Index, FSTA, KCI-Korean Journal Database, Russian Science Citation Index, MEDLINE, SciELO Citation Index, Zoological Record)	Web of Science https://www.webofknowledge.com
World Agroforestry	http://www.worldagroforestry.org/treedb2/speciesprofile.php?Spid=1749
The American Phytopathological Society	https://www.apsnet.org/Pages/default.aspx

Additional searches, limited to retrieve documents, were run when developing the Opinion. The available scientific information, including previous EFSA opinions on the relevant pests and diseases and the relevant literature and legislation (e.g. Regulation (EU) 2016/2031; Commission Implementing Regulations (EU) 2018/2019; (EU) 2018/2018 and (EU) 2019/2072) were taken into account.

2.3 | Methodology

When developing the Opinion, the Panel followed the EFSA Guidance on commodity risk assessment for the evaluation of high-risk plant dossiers (EFSA PLH Panel, 2019).

In the first step, pests potentially associated with the commodity in the country of origin (EU-regulated pests and other pests) that may require risk mitigation measures are identified. The EU non-regulated pests not known to occur in the EU were selected based on evidence of their potential impact in the EU. After the first step, all the relevant pests that may need risk mitigation measures were identified.

In the second step, if applicable, the implemented risk mitigation measures for each relevant pest are evaluated.

A conclusion on the pest freedom status of the commodity for each of the relevant pests, if any, is determined and uncertainties identified using expert judgements.

Pest freedom was assessed by estimating the number of infested/infected units out of 10,000 exported units of:

1) Graftwood in bundles of 10–20 (up to 2 year old).
2) Bare-root plants which include bundles of 5, 10 or 15 whips (1–2 years old) and 1–7 years old single bare-root plants.
3) Plants in pots which include bundles of 5 and 10 cell-grown plants (1–2 years old) and single rooted plants in pots (1–7 years old). Single cell-grown plants are considered covered by rooted plants in pots.

2.3.1 | Commodity data

Based on the information provided by DEFRA of the UK, the characteristics of the commodity are summarised in Section 3 of this Opinion.

2.3.2 | Identification of pests potentially associated with the commodity

To evaluate the pest risk associated with the importation of the commodity from the UK, a pest list was compiled. The pest list is a compilation of all identified plant pests reported as associated with all species of *Alnus* based on information provided in the Dossier Sections 1.0 and 2.0 and on searches performed by the Panel. The search strategy and search syntax were adapted to each of the databases listed in Table 3, according to the options and functionalities of the different databases and CABI keyword thesaurus.

The scientific names of the host plants (i.e. *Alnus*) were used when searching in the European and Mediterranean Plant Protection Organisation (EPPO) Global database (EPPO GD, online) and CABI Crop Protection Compendium (CABI, online). The same strategy was applied to the other databases (see Table 3) excluding EUROPHYT and Web of Science. The notifications of interceptions associated to *Alnus* species from the whole world to the EU were investigated on EUROPHYT from 2009 to May 2020 and TRACES-NT from May 2020 to 21 July 2024, respectively. To check whether *Alnus* spp. can act as a pathway, all notifications (all origins) for *Alnus* spp. were evaluated. For each selected pest, it was checked if there were any notification records for UK (all commodities).

The search strategy used for Web of Science Databases was designed combining English common names for pests and diseases, terms describing symptoms of plant diseases and the scientific and English common names of the commodity and excluding pests which were identified during searches in other databases. The established search string is detailed in Appendix B and was run on 30 January 2024.

The titles and abstracts of the scientific papers retrieved were screened and the pests associated with *Alnus* genus were included in the pest list. The pest list was eventually further updated with other relevant information (e.g. EPPO code per pest, taxonomic information, categorisation, and distribution) useful for the selection of the pests relevant for the purposes of this Opinion.

The compiled pest list (see Microsoft Excel® in Appendix D) includes all identified pests that use the genus *Alnus* as a host.

The relevance of EU-quarantine pests was first assessed (Section 4.1), followed by an assessment of the relevance of any other plant pests (Section).

2.3.3 | Listing and evaluation of risk mitigation measures

All proposed risk mitigation measures were listed and evaluated. When evaluating the likelihood of pest freedom at origin, the following types of potential infestation/infection sources for *A. cordata, A. incana* and A. *glutinosa* in nurseries were considered (see also Figure 1):

- Pest entry from surrounding areas,
- Pest entry with new plants/seeds,
- Pest spread within the nursery.

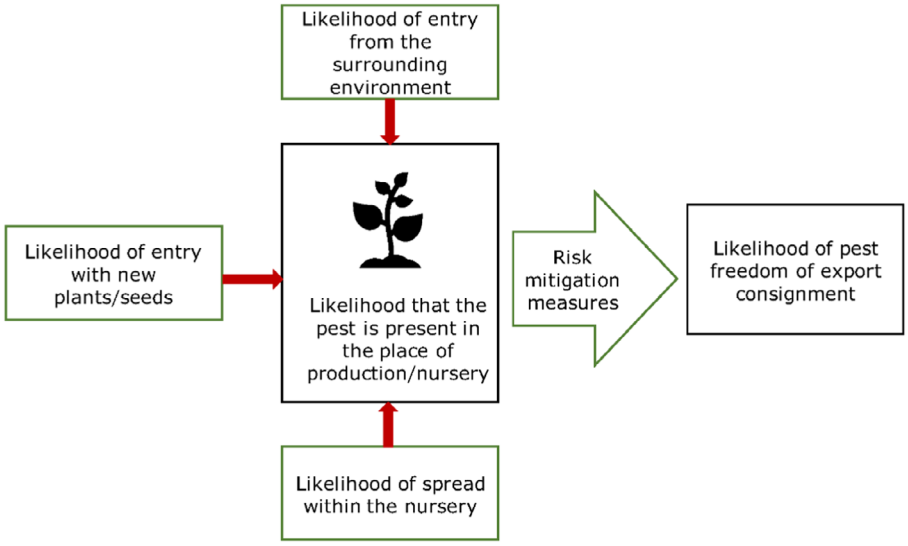


FIGURE 1 Conceptual framework to assess likelihood that plants are exported free from relevant pests. *Source*: EFSA PLH Panel (2019).

Information on the biology, estimates of likelihood of entry of the pest into the nursery and spread within the nursery, and the effect of the measures on a specific pest is summarised in pest data sheets compiled for each pest selected for further evaluation (see Appendix A).

2.3.4 | Expert knowledge elicitation

To estimate the pest freedom of the commodities an expert knowledge elicitation (EKE) was performed following EFSA guidance (Annex B.8 of EFSA Scientific Committee, 2018).

The specific question for EKE was defined as follows: 'taking into account (i) the risk mitigation measures listed in the Dossier and (ii) other relevant information (reported in the specific pest datasheets), how many of 10,000 plants, either single or in bundles, and small trees will be infested with the relevant pest/pathogen when arriving in the EU?'

The risk assessment considers (i) graftwood (bundles of 10 or 20); (ii) bare-root plants and whips (Figure 2) (bundles of 5, 10 or 15 for whips; or single bare-root trees), (iii) rooted plants in pots/cells (Figure 2), single or up to five plants per bundle (Figure 2).

The uncertainties associated with the EKE were taken into account and quantified in the probability distribution applying the semi-formal method described in section 3.5.2 of the EFSA-PLH Guidance on quantitative pest risk assessment (EFSA PLH Panel, 2018). Finally, the results were reported in terms of the likelihood of pest freedom. The lower 5% percentile of the uncertainty distribution reflects the opinion that pest freedom is with 95% certainty above this limit.

3 | COMMODITY DATA

3.1 | Description of the commodity

The commodity consists of the following type of deciduous plant of *A. cordata* (Loisel.) Duby (common name: Italian alder; family: Betulaceae), *A. glutinosa* (L.) Gaertn. (common name: alder, common alder, black alder; family: Betulaceae) and *A. incana* (L.) Moench (common name: grey alder, white alder, silver-leaved alder, speckled alder) (Figure 2) to be imported from UK to EU as graftwood, bare-root plants, cell-grown plants, whips, rooted plants in pots (Table 4).

TABLE 4 Type of *Alnus cordata*, *A. incana* and *A. glutinosa* plants to be exported to the EU (Dossier Section 1.0).

Type of plant	Age	Diameter	Height/length	Species
Graftwood*	Up to 2 years	6–12 mm	40 cm	*A. cordata*, *A. incana*, *A. glutinosa*
Bare-root plants (whips**)	1–2 years	4–10 mm	20–200 cm	*A. cordata*, *A. incana*, *A. glutinosa*
Bare-root plants	1–7 years	4–40 mm	20–200 cm	*A. cordata*, *A. incana*, *A. glutinosa*
Cell-grown plants (small containers)	1–2 years	4–10 mm	20–60 cm	*A. cordata*, *A. incana*, *A. glutinosa*
Rooted plants in pots	1–7 years	10–40 mm	20–250 cm	*A. cordata*, *A. incana*, *A. glutinosa*

*Graftwood are strong young shoots bearing buds which are suitable for use in chip budding or grafting. The shoots are approximately 40 cm long and will typically have 9, 10 or more buds present. **Whips are slender, unbranched trees. Bare-root plants can be either whips or more mature plants.

FIGURE 2 (A) Field-grown *Alnus* plants for bare-root plant production; (B) cell-grown plants of *Alnus* grown on metal stands above ground level; (C) individual cell-grown plants bundled ready for dispatch; (D) rooted *Alnus* plants in pots grown in plastic trays on top of membrane; (E) individual rooted plant in pot (Source: Dossier Section 1.0).

Rooted plants in pots may be exported with leaves, depending on the timing of the export and the life cycle of the species, in any period of the year. Bare-root plants may also have some leaves at the time of export, particularly in November/early winter (Dossier Section 1.0).

According to ISPM 36 (FAO, 2019) the commodity can be classified as 'bare-root plants', 'graftwood' or 'rooted plants in pots'. According to the Dossier Section 1.0, the expected trade volume for *A. cordata, A. glutinosa* and *A. incana* is listed in Table 5.

TABLE 5 Expected trade volume per year and seasonal timing planned for export to the EU for *Alnus cordata*, *A. incana* and *A. glutinosa* plants.

Type of plant	Number of items	Seasonal timing
Graftwoods	1500 (*A. cordata*); 500 (*A. incana* and *A. glutinosa*)	January to March
Bare-root plants	5000 (*A. cordata*); 50,000 (*A. glutinosa*); 2000 (*A. incana*)	November to March
Rooted plants in pots	20,000	Mainly September/October to April/May

Trade of all plant types will mainly be to Northern Ireland and Republic of Ireland.

- Bare-root plants will be lifted in winter (November to March) as this is the best time to move/export dormant plants (Dossier Section 1.0).
- Rooted plants in pots can be moved/exported at any time in the year to fulfil consumer demand, but more usually from September/October to April/May (Dossier Section 1.0).

3.2 | Description of the production areas

The nurseries producing the commodity for export to the EU are distributed in the northern (*A. cordata* and *A. incana*), northeastern, central and southern (*A. cordata* and *A. glutinosa*) parts of Great Britain (Figure 3A–C). According to the dossier, producers do not set aside separate areas for export production. Approximately 20% of the nurseries likely to export to the EU also sell plants within the UK to final users as ornamental plants, e.g. to the Local Authorities/Landscape Architects (Dossier Section 1.0). There is no distancing between production areas for the export and the local market. All nurseries are registered as professional operators with the UK NPPO, either by the Animal and Plant Health Agency (APHA) in England and Wales, or by the Scottish Government, and are authorised to issue UK plant passports and phytosanitary certificates for export (Dossier Section 1.0).

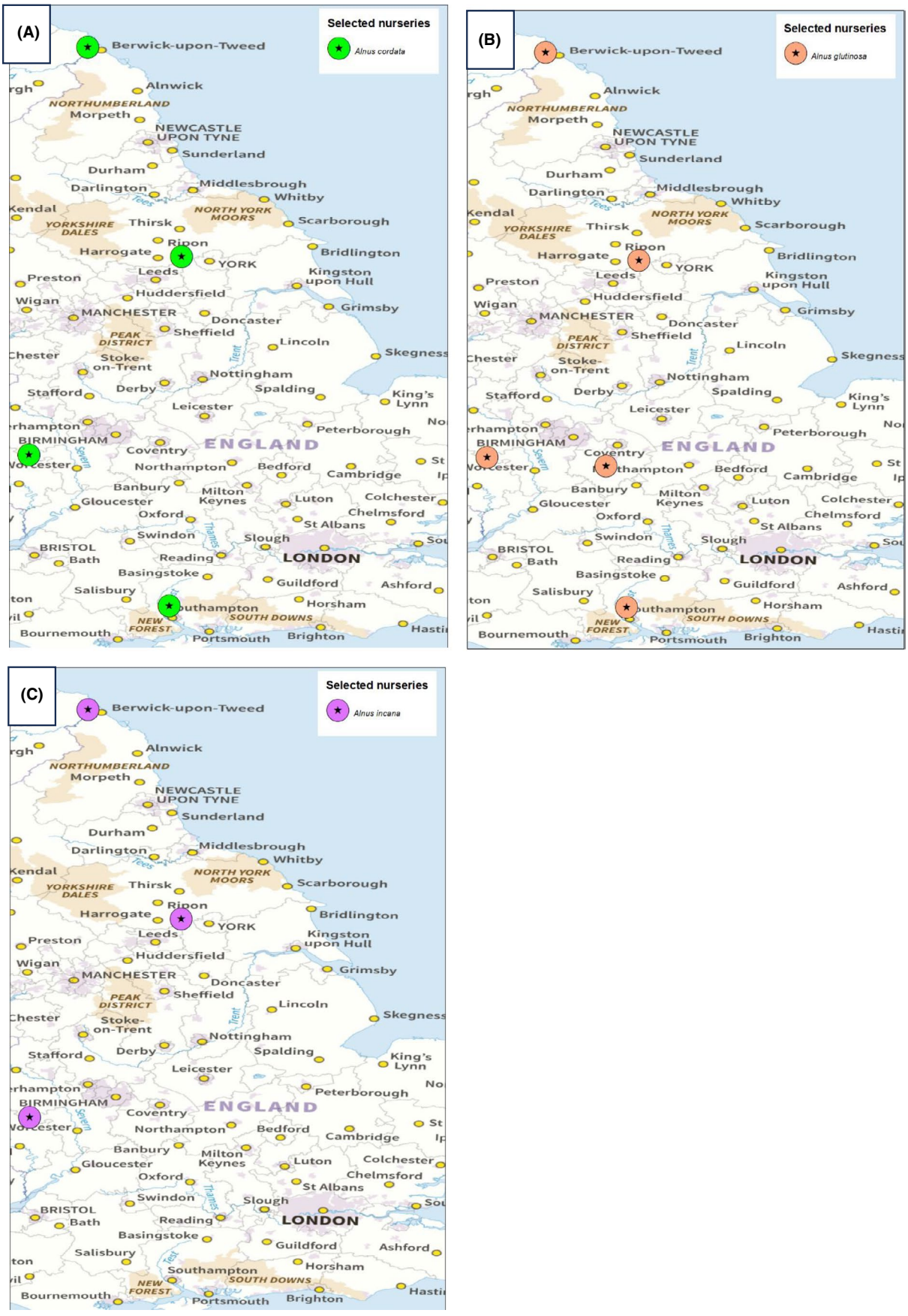


FIGURE 3 Location of the production areas of (A) *Alnus cordata*; (B) *A. glutinosa* and (C) *A. incana* in United Kingdom for export to the European Union (Source: Dossier Section 1.0).

The minimum and maximum sizes of nurseries growing *A. cordata, A. incana, A. glutinosa* for export are as follows: for container grown stock, a minimum 8 ha and a maximum of 150 ha; for field-grown stock intended for bare-root plants, the maximum size is 325 ha.

The exporting nurseries cultivate a variety of other plant species. The production area for *A. glutinosa* plants is approximately 0.1–4% of the total nurseries area, while the production area for *A. cordata* and *A. incana* plants is around 1–4%. The commodities grown at the nurseries will vary depending on the nursery (Dossier Section 1.0).

The surrounding areas of exporting nurseries are predominately rural, mainly characterised by arable farmland with some pasture for livestock and small areas of woodland. Arable crops are rotated in line with good farming practice and could include oilseed rape (*Brassica napus*), wheat (*Triticum* spp.), barley (*Hordeum vulgare*), turnips (*Brassica rapa* subsp. *rapa*), potatoes (*Solanum tuberosum*) and maize (*Zea mays*) (Dossier Section 1.0).

The pasture is predominantly composed of ryegrass (*Lolium* spp.) (Dossier Section 1.0).

Woodlands tend to be a standard UK mixed woodland, with a range of UK native trees such as oak (*Quercus robur*), pine (*Pinus* spp.), poplar (*Populus* spp.), ash (*Fraxinus* spp.), sycamore (*Acer pseudoplatanus*), holly (*Ilex* spp.), Norway maple (*Acer platanus*), field maple (*Acer campestre*) (Dossier Section 1.0).

Hedges are commonly used to delineate field boundaries and grown along roadsides (Dossier Section 1.0).

Hedges are made up of a range of species including hazel (*Corylus avellana*), yew (*Taxus baccata*), holly (*Ilex* spp.), ivy (*Hedera* spp.), alder (*Alnus glutinosa*), cherry laurel (*Prunus laurocerasus)*, hawthorn (*Crataegus* spp.), blackthorn (*Prunus spinosa*) and leylandii (*Cupressus* × *leylandii*) (Dossier Section 1.0). The minimum distance in a straight line, between the growing area in the nurseries and the closest *A. cordata, A. glutinosa or A. incana* plants in the local surroundings is 50 metres.

It is not possible to identify what plant species are growing within the gardens of private dwellings. The nearest woodland to one of the nurseries borders the boundary fence, and its composition is as per the description above.

3.3 | Production and handling processes

3.3.1 | Growing conditions

As the plants are intended for outdoor cultivation, only early growth stages are normally maintained under protection, such as young plants/seedlings that are vulnerable to climatic conditions including frost. The commodity to be exported should therefore be regarded as outdoor grown. Growth under protection is primarily to protect against external climatic conditions rather than protection from pests. The early stages of plants grown under protection are maintained in plastic polytunnels, or in glasshouses which typically consist of a metal or wood frame construction and glass panels (Dossier Section 1.0).

3.3.2 | Source of planting material

The starting material is a mix of seeds and seedlings depending on the nursery. *Alnus cordata* seeds purchased in the UK is not covered by The Forest Reproductive Material (Great Britain) Regulations 2002 (legislation.gov.uk). *Alnus glutinosa* and *A. incana* seeds purchased in the UK are certified under The Forest Reproductive Material (Great Britain) Regulations 2002 (legislation.gov.uk). *Alnus cordata*, *A. glutinosa* and *A. incana* seedlings sourced in the UK are traded with UK Plant Passports; a small percentage of plants may be obtained from the EU (The Netherlands); seedlings originating from the EU countries are certified with phytosanitary certificates (Dossier section 1.0). None of the nurseries expected to export *A. glutinosa* to the EU produce plants from grafting. Only one of the nurseries expected to export *A. cordata* and *A. incana* to the EU produces plants from grafting. This nursery has mother plants of *A. cordata* and *A. incana* on site, but as these are the only species produced by grafting, there are no mother plants of other *Alnus* species present. All other growers use only seed and seedlings.

3.3.3 | Production cycle

The growing conditions are as follows (as defined in Annex 1 of ISPM 36 (FAO, 2019)):

- Field-grown in containers (cells, pots, tubes etc.).
- Field-grown (in soil).
- Greenhouse (initial growth stage).

Plants are either grown in containers (cells, pots, tubes, etc.) or in field. Cell-grown trees may be grown in cells at one plant per cell. These may be grown under protection initially; however, most plants will be field-grown or field-grown in containers.

The planting material for bare-root plant production is planted from late autumn until early spring (October to April); rooted plants in pots can be planted at any time of year, though winter is most common.

Most of the nurseries expected to export to the EU do not use grafting in the production of *A. cordata, A. glutinosa* and *A. incana*. Where it does occur, grafting is done indoors and two different methods are used:

- Side-spliced grafting is usually undertaken in late winter or early spring before bud break.
- Whip and tongue grafting is normally undertaken in March or early April.

Any plants in pots with organic growing medium being exported from the UK to the EU need to meet the requirements for growing media in EU Regulation 2019/2072, Annex VII.

In the production or procurement of plants, the use of growing media is assessed for the potential to harbour and transmit plant pests. Growers use virgin peat or peat-free compost, which is a mixture of coir, tree bark, wood fibre, etc. This compost is heat-treated by commercial suppliers during production to eliminate pests and diseases. It is supplied in sealed bulk bags or shrink-wrapped bales and stored off the ground on pallets, these are completely hygienic and free from contamination. Where delivered in bulk, compost is kept in a dedicated bunker, either indoors or covered by tarpaulin outdoors, and with no risk of contamination with soil or other material (Dossier Section 1.0).

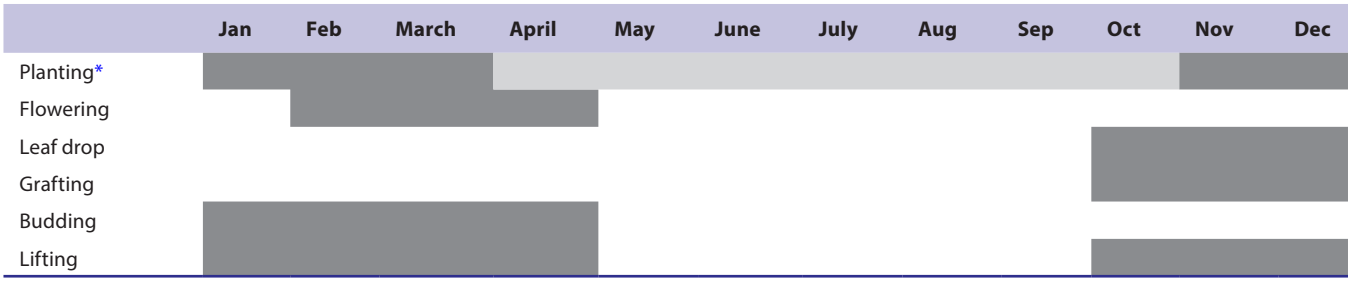
Material for bare-root plant is planted from late autumn until early spring (October to April); rooted plants in pots can be planted at any time of year, though winter is most common. Flowering occurs during early spring (February to April), depending upon the variety and weather conditions (Dossier Section 1.0).

To ensure a good root architecture, trees are regular pruned (at least once per year) and transplanted (every 3 to 5 years). The trees are grown on racks with no substrate below them (on gravel or on a geotex root barrier (geotex 1000)) and are sold either as root-balls or in peat-free container bags.

Soil testing might also be carried out to ensure pest freedom ahead of export.

The commodity production stages and the phenology of the crop associated are reported in Table 6.

TABLE 6 Commodity production stages (planting, grafting, budding) and the phenology of the crop (including flowering, leaf drop), and harvesting periods (lifting).



*Rooted plants in pots can be planted at any time of year (light grey), though winter is most common (dark grey).

All nurseries have plant hygiene, housekeeping rules and practices in place, which are communicated to all relevant employees. The rules will be dependent on the plants handled and the type of business but will refer to growing media, water usage, weed management, tools and visitors.

The irrigation is done on a need basis and could be overhead, sub irrigation or drip irrigation. Water used for irrigation can be drawn from several sources, the mains supply, bore holes or from rainwater collection/water courses. All mains water supply used meets the UK standard Water Supply (Water quality) regulation 2016 and the WHO/EU potable water standards, (Drinking water Directive (98/83/EC and the revised Drinking Water Directive 2020/2184)) which includes a total freedom from both human and plant pathogens (Article 2-(7)). All mains water supply conducting pipework fully complies with the UK Water Supply (Water Fittings) regulations of 1999 and the amendments of 2019. Irrigation water used is not stored in any open tanks where air borne contamination could take place and is entirely isolated from any outside exposure.

In some cases, where the underlying geology permits, nurseries can draw water directly from bore holes drilled into underground aquafers. The water that fills these aquafers is naturally filtered through the layers of rock (e.g. limestone) over long periods of time, many millennia in some cases. The water from such supplies is generally of such high quality that it is fit for human consumption with little to no further processing and is often bottled and sold as mineral water.

For rainwater or freshwater watercourse supply some nurseries use a combination of rain capture systems or abstract directly from available watercourses. All water is passed through a sand filtration system to remove contaminants and is contained in storage tanks prior to use. One nursery that operates this approach is currently in the process of installing additional nanobubble technology to treat the water. The production nursery has never experienced the introduction of a pest/disease resulting from contamination of the water supply.

Regardless of the source of the water used to irrigate, the nurseries contributing information to this dossier declared that they have never experienced the introduction of a pest/disease because of contamination of the water supply.

Growers are required to assess water sources, irrigation and drainage systems used in the plant production for the potential to harbour and transmit plant pests. Water is routinely sampled and sent for analysis. No quarantine pests have been found so far (Dossier Section 1.0).

Growers must assess weeds and volunteer plants for the potential to host and transmit plant pests and have an appropriate programme of weed management in place at the nursery (Dossier Section 1.0). Growing areas are kept clear of non-cultivated herbaceous plants. In access areas, non-cultivated herbaceous plants are kept to a minimum and only exist at nursery boundaries. Non-cultivated herbaceous plants grow on less than 1% of the nursery area (Dossier Section 1.0). The

predominant species is rye grass (*Lolium*). Other species may include dandelions (*Taraxacum officinale*), hairy bittercress (*Cardamine hirsute*), common daisy (*Bellis perennis*), creeping cinquefoil (*Potentilla reptans*) and bluebells (*Hyacinthoides non-scripta*), present in a low amount.

General hygiene measures are undertaken as part of routine nursery production, including disinfection of tools and equipment between batches/lots. Tools are disinfected after operation on a stock and before being used on a different plant species. The tools are dipped and wiped with a clean cloth between trees to reduce the risk of virus and bacterial transfer between subjects. Virkon S (active substance: potassium peroxymonosulfate and sodium chloride) was reported as the most commonly used disinfectant. Growers keep records allowing traceability for all plant material handled (Dossier Section 1.0).

Plant material is regularly monitored for plant health issues. This monitoring is carried out by trained nursery staff via regular crop walking and records kept of this monitoring. Qualified agronomists also undertake regular crop walks to verify the producer's assessments. Curative or preventative actions are implemented together with an assessment of phytosanitary risk. Unless a pest can be immediately and definitively identified as non-quarantine growers, are required to treat it as a suspect quarantine pest and notify the competent authority (Dossier Section 1.0).

Pest and disease pressures vary from season to season. Chemical treatments are reported to be applied when required and depend on the situation at that time (disease pressure, growth stage, environmental factors, etc.) (Dossier Section 1.0).

There are no specific measures/treatments against soil pests. However, containerised plants are grown in trays on top of protective plastic membranes to prevent contact with soil (Figure 2). Membranes are regularly refreshed when needed. Alternatively, plants may be grown on raised galvanised steel benches stood on gravel as a barrier between the soil and bench feet and/or concreted surfaces (Dossier Section 1.0).

3.3.4 | Post-harvest processes and export procedure

The UK NPPO carries out inspections and testing (where required by the country of destination's plant health legislation) to ensure all requirements are fulfilled and a valid phytosanitary certificate with the correct additional declarations is issued (Dossier Section 1.0).

The following processes are typical of all exporting nurseries:

- Graftwood is wrapped in plastic and packed in cardboard boxes or Dutch crates on ISPM 15 certified wooden pallets, or metal pallets, dependant on quantity. This may be exported in bundles of 10–20 items.
- Bare-root plants are lifted and washed free from soil with a low-pressure washer in the outdoors nursery area away from packing/cold store area. In some cases, the plants may be kept in a cold storage for up to 5 months after harvesting prior to export (Dossier Section 1.0). Prior to export bare-root plants may be placed in bundles, depending on the size of the plants (25 or 50 for seedlings or transplants; 5, 10 or 15 for whips; or single bare-root trees). They are then wrapped in polythene and packed and distributed on ISPM 15 certified wooden pallets, or metal pallets. Alternatively, they may be placed in pallets which are then wrapped in polythene. Small volume orders may be packed in waxed cardboard cartons or polythene bags and dispatched via courier (Dossier Section 1.0).
- Rooted plants in pots are transported on Danish trolleys for smaller containers, or ISPM 15 certified pallets, or individually in pots for larger containers. Small volume orders may be packed in waxed cardboard cartons or polythene bags and dispatched via courier (Dossier Section 1.0).

The preparation of the commodities for export is carried out inside the nurseries in a closed environment, e.g. packing shed (Dossier Section 1.0).

Plants are transported by lorry (size dependent on load quantity). Sensitive plants will occasionally be transported by temperature-controlled lorry if weather conditions during transit are likely to be very cold (Dossier Section 1.0).

4 | IDENTIFICATION OF PESTS POTENTIALLY ASSOCIATED WITH THE COMMODITY

The search for potential pests associated with *Alnus* spp. (and if available specific information with pests associated to *Alnus* species including *A. cordata*, *A. glutinosa* and *A. incana*) retrieved 2743 pest species (for search string see Appendix B, for pest list see Appendix D).

4.1 | Selection of relevant EU-quarantine pests associated with the commodity

The EU listing of Union quarantine pests and protected zone quarantine pests (Commission Implementing Regulation (EU) 2019/2072) is based on assessments concluding that the pests can enter, establish, spread and have potential impact in the EU.

The 20 EU-quarantine species that are reported to use *Alnus* spp. as a host plant were evaluated (Table 7) for their relevance of being included in this Opinion.

The relevance of an EU-quarantine pest for this Opinion was based on evidence that:

(a) the pest is present in the UK;
(b) the commodity is a host of the pest;
(c) one or more life stages of the pest can be associated with the specified commodity.

Pests that fulfilled all criteria are selected for further evaluation.

Of the 20 EU-quarantine pest species evaluated, two pests (*Entoleuca mammata* and *Phytophthora ramorum*) were selected for further assessment.

TABLE 7 Overview of the evaluation of the 20 EU-quarantine pest species known to use *Alnus* species as host plants for their relevance for this Opinion.

No.	Pest name according to EU legislation*	EPPO code	Group	Pest present in the UK	*Alnus* confirmed as a host (reference)	Pest can be associated with the commodity (NA = not assessed)	Pest relevant for the opinion
1	*Acleris senescens*	ACLRSE	Insect	No	Gilligan and Epstein (2014)	NA	No
2	*Aleurocanthus spiniferus*	ALECSN	Insect	No	Dubey and Ko (2012)	NA	No
3	*Anoplophora chinensis*	ANOLCN	Insect	No	Lim et al. (2014), Sjöman et al. (2014)	NA	No
4	*Anoplophora glabripennis*	ANOLGL	Insect	No	Sjöman et al. (2014)	NA	No
5	*Choristoneura conflictana*	ARCHCO	Insect	No	Ciesla and Kruse (2009), Prentice (1966)	NA	No
6	*Choristoneura rosaceana*	CHONRO	Insect	No	Ferguson (1975), Prentice (1966)	NA	No
7	*Cryphonectria parasitica***	ENDOPA	Fungi	Yes	Uncertain	NA	No
8	*Euwallacea fornicatus* sensu lato	XYLBFO	Insect	No	Eskalen et al. (2013), GBIF (online), USDA (online)	NA	No
9	*Entoleuca mammata*	HYPOMA	Fungi	Yes	Callan (1998)	Yes	Yes
10	*Grapevine flavescence dorée phytoplasma*	PHYP64	Phytoplasma	No	Malembic-Maher et al. (2020), Mehle et al. (2011), Radonjic et al. (2013)	NA	No
11	*Lopholeucaspis japonica*	LOPLJA	Insect	No	Batsankalashvili et al. (2017), Shrewsbury et al. (2013), EPPO (online)	NA	No
12	*Lycorma delicatula*	LYCMDE	Insect	No	Barringer and Ciafré (2020), Park et al. (2009), CABI (online)	NA	No
13	*Monochamus guttulatus*	MONCGU	Insect	No	Anisimov and Bezborodov (2021)	NA	No
14	*Oemona hirta*	OEMOHI	Insect	No	Plant-SyNZ (online)	NA	No
15	*Phymatotrichum omnivorum*	PHMPOM	Fungi	No	Anonymous (1960)	NA	No
16	*Phytophthora ramorum* (non-EU isolates)	PHYTRA	Chromista	Yes	O'Hanlon et al. (2016)	Yes	Yes
17	*Popillia japonica*	POPIJA	Insect	No	Fleming (1972), Regione Lombardia (online)	NA	No
18	*Pseudopityophthorus pruinosus*	PSDPPR	Insect	No	Atkinson (online)	NA	No
19	*Spodoptera ornithogalli*	PRODOR	Insect	No	Brito et al. (2019), Palmer (1987)	NA	No
20	*Trirachys sartus*	AELSSA	Insect	No	Farashiani et al. (2001)	NA	No

*Commission Implementing Regulation (EU) 2019/2072. **There is only one host record of *C. parasitica* on *Alnus* sp. (Turchetti et al., 1991). This host record could not be verified and therefore this pathogen was not considered as relevant for this commodity.

4.2 | Selection of other relevant pests (non-quarantine in the EU) associated with the commodity

The information provided by the UK, integrated with the search performed by EFSA, was evaluated in order to assess whether there are other relevant pests potentially associated with the commodity species present in the exporting country. For these potential pests that are non-regulated in the EU, pest risk assessment information on the probability of entry, establishment, spread and impact is usually lacking. Therefore, these pests were also evaluated to determine their relevance for this Opinion based on evidence that:

(a) the pest is present in the UK;
(b) the pest is (i) absent or (ii) has a limited distribution in the EU;
(c) *Alnus* spp. is a host of the pest;
(d) one or more life stages of the pest can be associated with the traded commodity of *Alnus* spp.;
(e) the pest may have an impact in the EU.

For non-regulated species with a limited distribution in the EU (i.e. present in one or a few EU member states) they should also satisfy at least one of the following conditions for the pest to be selected for further evaluation:

- official phytosanitary measures have been adopted in at least one EU member state;
- any other reason justified by the working group (e.g. recent evidence of presence).

Based on the information collected, 2723 potential pests (non-EU quarantine) known to be associated with *Alnus* spp. were evaluated for their relevance to this Opinion.

Species were excluded from further evaluation when at least one of the conditions listed above (a–e) was not met. Details can be found in the Appendix D. One of the evaluated EU non-quarantine pests, *Phytophthora siskiyouensis*, was selected for further evaluation.

4.3 | List of potential pests not further assessed

The Panel highlighted four potentially relevant pests for which there is uncertainty on one of the selection criteria (see Appendix C).

4.4 | Summary of pests selected for further evaluation

Three pests that were identified to be present in the UK and having potential for association with *Alnus cordata, A. glutinosa* and *A. incana* plants designated for export to the EU, selected for further evaluation, are listed in Table 8. The efficacy of the risk mitigation measures applied to the commodity were evaluated for these selected pests.

TABLE 8 List of relevant pests selected for further evaluation.

No.	Current scientific name	EPPO code	Taxonomic information	Group	Regulatory status
1	*Entoleuca mammata*	HYPOMA	Xylariales, Xylariaceae	Fungi	EU-Quarantine Pest
2	*Phytophthora ramorum*	PHYTRA	Peronosporales, Peronosporaceae	Chromista	EU-Quarantine Pest
3	*Phytophthora siskiyouensis*	PHYTSK	Peronosporales, Peronosporaceae	Chromista	Non-EU Quarantine Pest

5 | RISK MITIGATION MEASURES

For the selected pests (Table 7), the Panel evaluated the likelihood that it could be present in the *A. cordata, A. glutinosa* and *A. incana* nurseries by evaluating the possibility that the commodity in the export nurseries is infested either by:

- Introduction of the pest from the environment surrounding the nursery;
- Introduction of the pest with new plants/seeds;
- Spread of the pest within the nursery.

The information used in the evaluation of the effectiveness of the risk mitigation measures is summarised in pest data sheets (see Appendix A).

5.1 | Risk mitigation measures applied in the UK

With the information provided by the UK (Dossier Sections 1.0, 2.0, 3.0, & 4.0), the Panel summarised the risk mitigation measures (Table 9) that are implemented in the production nursery.

TABLE 9 Overview of implemented risk mitigation measures for *Alnus cordata*, *Alnus glutinosa* and *Alnus incana* plants designated for export to the EU from the UK.

No.	Risk mitigation measure	Implementation in the UK
1	Registration of production sites	All nurseries are registered as professional operator with the UK NPPO, by the APHA for England and Wales, or with SASA for Scotland, and is authorised to issue UK plant passports (Dossier Section 1.0)
2	Certification of propagation material	*Alnus cordata, A. incana* and *A. glutinosa* seeds purchased in the UK are certified under The Forest Reproductive Material (Great Britain) Regulations 2002 (legislation.gov.uk); seedlings sourced in the UK are certified with UK Plant Passports; a small percentage of plants may be obtained from EU (Netherlands); seedlings from the EU countries are certified with phytosanitary certificates. (Dossier Section 1.0)
3	Origin and treatment of growing media	Rooted plants in pots: in production or procurement of these plants, the use of growing media is assessed for the potential to harbour and transmit plant pests. Growers most commonly use virgin peat or peat-free compost, which is a mixture of coir, tree bark, wood fibre, etc. The compost is heat-treated by commercial suppliers during production to eliminate pests and diseases. It is supplied in sealed bulk bags or shrink-wrapped bales and stored off the ground on pallets, these are completely hygienic and free from contamination. Where delivered in bulk, compost is kept in a dedicated bunker, either indoors or covered by tarpaulin outdoors, and with no risk of contamination with soil or other material (Dossier Section 1.0)
4	Surveillance, monitoring and sampling	Inspection is carried out at least once a year as part of the Quarantine Surveillance programme (Great Britain uses the same framework for its surveillance programme as the EU). Surveillance is based on visual inspection with samples taken from symptomatic material, and where appropriate, samples are also taken from asymptomatic material (e.g. plants, tubers, soil, watercourses) (Dossier Section 1.0)
5	Hygiene measures	According to the Dossier Section 1.0, all the nurseries have plant hygiene and housekeeping rules and practices in place, which are communicated to all relevant employees
6	Irrigation water quality and/or treatments	Growers are required to assess water sources, irrigation and drainage systems used in the plant production for the potential to harbour and transmit plant pests. Rainwater that is collected is sand filtrated. Water is routinely sampled and sent for analysis. No quarantine pests have been found (Dossier Section 1.0)
7	Application of pest control products	Crop protection is achieved using a combination of measures including approved plant protection products, biological control or physical measures. Plant protection products are only used when necessary and records of all plant protection treatments are kept (Dossier Section 1.0)
8	Washing of the roots (bare-root plants)	Bare-root plants are lifted from the field in winter and then root-washed on site and stored prior to export (Dossier Section 1.0)
9	Inspections and management of plants before export	The UK NPPO carries out inspections and testing where required by the country of destination's plant health legislation, to ensure all requirements are fulfilled and a valid phytosanitary certificate with the correct additional declarations is issued. Separate to any official inspection, plant material is checked by growers for plant health issues before dispatch

5.2 | Evaluation of the current measures for the selected pests including uncertainties

The relevant risk mitigation measures acting on the selected pests were identified. Factors reducing the efficacy of the measures were documented. All the relevant information including the related uncertainties deriving from the limiting factors used in the evaluation are summarised in the pest datasheets provided in Appendix A.

Based on this information, an expert judgement has been given for the likelihood of pest freedom of the commodity taking into consideration the risk mitigation measures acting on the pest and their combination.

An overview of the evaluation of the selected pests is given in the sections below (Sections 5.2.1–5.2.3). The outcome of EKE on pest freedom after the evaluation of the proposed risk mitigation measures is summarised in the Section 5.2.4.

5.2.1 | Overview of the evaluation of *Entoleuca mammata*

Overview of evaluation of *E. mammata* for bundles of graftwood					
Rating of the likelihood of pest freedom	**Pest free with some exceptional cases** (based on the Median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9974 out of 10,000 plants	9985 out of 10,000 plants	9991 out of 10,000 plants	9995 out of 10,000 plants	9999 out of 10,000 plants
Proportion of infested plants	1 out of 10,000 plants	5 out of 10,000 plants	9 out of 10,000 plants	15 out of 10,000 plants	26 out of 10,000 plants
Summary of the information used for the evaluation	**Possibility that the pest could become associated with the commodity** *E. mammata* is present in the UK, although not widely distributed. *E. mammata* has been reported on various *Alnus* species, including ***A. incana***, *A. crispa*, *A. rugosa*, *A. sinuata* and *A. tenuifolia* (for references see Appendix A.1). Given the fact that *E. mammata* has been reported in several *Alnus* spp. the Panel assumes that ***A. cordata*** and ***A. glutinosa*** can be a host of *E. mammata*. The pathogen can naturally spread with ascospores dispersed by air currents from the surrounding natural environment. Furthermore, mechanical wounds are expected to be present and may represent infection courts. Altogether, this suggests that the association of *E. mammata* with the commodity is possible Because of the similarity of the commodities, the production systems and the locations of the nurseries, the Panel validated the scenarios from the previous Scientific opinion on *Betula pendula* and *B. pubescens* from the UK (EFSA PLH Panel, 2024) for *A. cordata*, *A. glutinosa* and *A. incana*. As a result of this evaluation, the same values as for *Betula* spp. were considered to be applicable for *Alnus* spp **Pest control measures applied during production** Pest control measures applied during the production of *Alnus* plants include: (a) registration of production sites; (b) the use of certified plant material; (c) surveillance, monitoring and sampling; (d) hygiene measures; (e) irrigation water testing; (f) application of pest control products; (g) inspection and management of plants before export **Evaluation of control measures** In general, the measures taken by the growers are effective against this pathogen. The following critical points were identified: – Early infections are difficult to be detected by visual inspections **Main uncertainties** – The presence/abundance of the pathogen in the areas where the nurseries are located – The level of susceptibility of *Alnus* spp. to the pathogen – Whether symptoms on *Alnus* spp. are recognisable and may be promptly detected				

Overview of evaluation of *E. mammata* for bundles of bare-root plants and whips (small trees)					
Rating of the likelihood of pest freedom	**Pest free with some exceptional cases** (based on the Median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9927 out of 10,000 plants	9961 out of 10,000 plants	9979 out of 10,000 plants	9991 out of 10,000 plants	9998 out of 10,000 plants
Proportion of infested plants	2 out of 10,000 plants	9 out of 10,000 plants	21 out of 10,000 plants	39 out of 10,000 plants	73 out of 10,000 plants
Summary of the information used for the evaluation	**Possibility that the pest could become associated with the commodity** *E. mammata* is present in the UK, although not widely distributed. *E. mammata* has been reported on various *Alnus* species, including ***A. incana***, *A. crispa*, *A. rugosa*, *A. sinuata* and *A. tenuifolia* (for references see Appendix A.1). Given the fact that has been reported in several *Alnus* spp. the Panel assumes that ***A. cordata*** and ***A. glutinosa*** can be a host of *E. mammata*. The pathogen can naturally spread with ascospores dispersed by air currents from the surrounding natural environment. Furthermore, mechanical wounds are expected to be present and may represent infection courts. Altogether, this suggests that the association of *E. mammata* with the commodity is possible Because of the similarity of the commodities, the production systems and the locations of the nurseries, the Panel validated the scenarios from the previous Scientific opinion on *Betula pendula* and *B. pubescens* from the UK (EFSA PLH Panel, 2024) for *Alnus cordata*, *A. glutinosa* and *A. incana*. As a result of this evaluation, the same values as for *Betula* spp. were considered to be applicable for *Alnus* spp **Pest control measures applied during production** Pest control measures applied during the production of Alnus plants include: (a) registration of production sites; (b) the use of certified plant material; (c) surveillance, monitoring and sampling; (d) hygiene measures; (e) irrigation water testing; (f) washing of the roots of the bare-root plants (g) application of pest control products; (h) inspection and management of plants before export **Evaluation of control measures** In general, the measures taken by the growers are effective against this pathogen. The following critical points were identified: – Leaves could be present on the commodity at the time of export increasing the probability that the fungus could be present – Early infections are difficult to be detected by visual inspections **Main uncertainties** – The presence/abundance of the pathogen in the area where the nursery is located – The level of susceptibility of *Alnus* spp. to the pathogen – Whether symptoms on *Alnus* spp. are recognisable and may be promptly detected				

Overview of evaluation of *E. mammata* for bundles of cell-grown plants and single plants in pots (small trees)					
Rating of the likelihood of pest freedom	**Pest free with few exceptional cases** (based on the Median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9927 out of 10,000 plants	9961 out of 10,000 plants	9979 out of 10,000 plants	9991 out of 10,000 plants	9998 out of 10,000 plants
Proportion of infested plants	2 out of 10,000 plants	9 out of 10,000 plants	21 out of 10,000 plants	39 out of 10,000 plants	73 out of 10,000 plants
Summary of the information used for the evaluation	**Possibility that the pest could become associated with the commodity** *E. mammata* is present in the UK, although not widely distributed. *E. mammata* has been reported on various *Alnus* species, including ***A. incana***, *A. crispa*, *A. rugosa*, *A. sinuata* and *A. tenuifolia* (for references see Appendix A.1). Given the fact that has been reported in several *Alnus* spp. the Panel assumes that ***A. cordata*** and ***A. glutinosa*** can be a host of *E. mammata*. The pathogen can naturally spread with ascospores dispersed by air currents from the surrounding natural environment. Furthermore, mechanical wounds are expected to be present and may represent infection courts. Altogether, this suggests that the association of *E. mammata* with the commodity is possible Because of the similarity of the commodities, the production systems and the locations of the nurseries, the Panel validated the scenarios from the previous Scientific opinion on *Betula pend*ula and *B. pubescens* from the UK (EFSA PLH Panel, 2024) for *A. cordata*, *A. glutinosa* and *A. incana*. As a result of this evaluation, the same values as for *Betula* spp. were considered to be applicable for *Alnus* spp **Pest control measures applied during production** Pest control measures applied during the production of Alnus plants include: (a) registration of production sites; (b) the use of certified plant material; (c) surveillance, monitoring and sampling; (d) hygiene measures; (e) irrigation water testing; (f) application of pest control products; (g) inspection and management of plants before export **Evaluation of control measures** In general, the measures taken by the growers are effective against this pathogen. The following critical points were identified: – Leaves could be present on the commodity at the time of export increasing the probability that the fungus could be present – Early infections are difficult to be detected by visual inspections **Main uncertainties** – The presence/abundance of the pathogen in the area where the nurseries is located – The level of susceptibility of *Alnus* spp. to the pathogen – Whether symptoms on *Alnus* spp. are recognisable and may be promptly detected				

5.2.2 | Overview of the evaluation of *Phytophthora ramorum*

Overview of evaluation of *Phytophthora ramorum* for bundles of graftwood					
Rating of the likelihood of pest freedom	**Pest free with some exceptional cases** (based on the Median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9964 out of 10,000 plants	9978 out of 10,000 plants	9988 out of 10,000 plants	9994 out of 10,000 plants	9999 out of 10,000 plants
Proportion of infected plants	1 out of 10,000 plants	6 out of 10,000 plants	12 out of 10,000 plants	22 out of 10,000 plants	36 out of 10,000 plants
Summary of the information used for the evaluation	**Possibility that the pest could become associated with the commodity** *P. ramorum* is present in most regions of the UK, but it is more often reported in wetter, western regions. *P. ramorum* has a wide host range, including *A. cordata* as natural host, whereas *A. glutinosa* and *A. incana* were reported to be susceptible hosts following artificial inoculation (for references see Appendix A.2) The possible entry of *P. ramorum* from the surrounding environment may occur through wind, water and infested soil propagules on animals/humans entering the field (if any). The pathogen can also enter with new seedlings of *Alnus* spp. and new plants of other species used for plant production in the nurseries Because of the similarity of the commodities, the production systems and the locations of the nurseries, the Panel validated the scenarios from the previous Scientific opinion on *Betula pendula* and *B. pubescens* from the UK (EFSA PLH Panel, 2024) for *A. cordata*, *A. glutinosa* and *A. incana*. As a result of this evaluation, the same values as for *Betula* spp. were considered to be applicable for *Alnus* spp **Pest control measures applied during production** Pest control measures applied during the production of *Alnus* plants include: (a) registration of production sites; (b) the use of certified plant material; (c) surveillance, monitoring and sampling; (d) hygiene measures; (e) irrigation water testing; (f) application of pest control products; (g) inspection and management of plants before export **Evaluation of control measures** In general, the measures taken by the growers are effective against this pathogen. The following critical points were identified: – Early infections are difficult to be detected by visual inspections				

(Continued)

	Main uncertainties – The efficiency of the hygiene measures especially concerning the cleaning of the machinery and the possible movement of soil within the nursery – Whether symptoms on *Alnus* spp. are recognisable and may be promptly detected – The susceptibility of *Alnus* spp. to the pathogen

Overview of evaluation of *Phytophthora ramorum* for bundles of bare-root plants and whips (small trees)					
Rating of the likelihood of pest freedom	**Pest free with some exceptional cases** (based on the Median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9935 out of 10,000 plants	9961 out of 10,000 plants	9978 out of 10,000 plants	9990 out of 10,000 plants	9998 out of 10,000 plants
Proportion of infected plants	2 out of 10,000 plants	10 out of 10,000 plants	22 out of 10,000 plants	39 out of 10,000 plants	65 out of 10,000 plants
Summary of the information used for the evaluation	**Possibility that the pest could become associated with the commodity** *P. ramorum* is present in most regions of the UK, but it is more often reported in wetter, western regions. *P. ramorum* has a wide host range, including *A. cordata* as natural host, whereas *A. glutinosa* and *A. incana* were reported to be susceptible hosts following artificial inoculation (for references see Appendix A.2) The possible entry of *P. ramorum* from the surrounding environment may occur through wind, water and infested soil propagules on feet of animals/humans entering the field (if any). The pathogen can also enter with new seedlings of *Alnus* spp. and new plants of other species used for plant production in the nurseries Because of the similarity of the commodities, the production systems and the locations of the nurseries, the Panel validated the scenarios from the previous Scientific opinion on *Betula pend*ula and *B. pubescens* from the UK (EFSA PLH Panel, 2024) for *A. cordata*, *A. glutinosa* and *A. incana*. As a result of this evaluation, the same values as for *Betula* spp. were considered to be applicable for *Alnus* spp **Pest control measures applied during production** Pest control measures applied during the production of *Alnus* plants include: (a) registration of production sites; (b) the use of certified plant material; (c) surveillance, monitoring and sampling; (d) hygiene measures; (e) irrigation water testing; (f) washing of the roots of the bare-root plants (g) application of pest control products; (h) inspection and management of plants before export **Evaluation of control measures** In general, the measures taken by the growers are effective against this pathogen. The following critical points were identified: – The washing of the roots removes (parts of) the soil and the pathogen present in the soil, but it does not remove the pathogen present in the roots – Early infections are difficult to be detected by visual inspections **Main uncertainties** – The efficiency of the hygiene measures especially concerning the cleaning of the machinery and the possible movement of soil within the nursery – Whether symptoms on *Alnus* spp. are recognisable and may be promptly detected – The susceptibility of *Alnus* spp. to the pathogen				

Overview of evaluation of *Phytophthora ramorum* for bundles of cell-grown plants and single plants in pots (small trees)					
Rating of the likelihood of pest freedom	**Pest free with some exceptional cases** (based on the Median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9935 out of 10,000 plants	9961 out of 10,000 plants	9978 out of 10,000 plants	9990 out of 10,000 plants	9998 out of 10,000 plants
Proportion of infected plants	2 out of 10,000 plants	10 out of 10,000 plants	22 out of 10,000 plants	39 out of 10,000 plants	65 out of 10,000 plants
Summary of the information used for the evaluation	**Possibility that the pest could become associated with the commodity** *P. ramorum* is present in most regions of the UK, but it is more often reported in wetter, western regions. *P. ramorum* has a wide host range, including *A. cordata* as natural host, whereas *A. glutinosa* and *A. incana* were reported to be susceptible hosts following artificial inoculation (for references see Appendix A.2) The possible entry of *P. ramorum* from the surrounding environment may occur through wind, water and infested soil propagules on feet of animals/humans entering the field (if any). The pathogen can also enter with new seedlings of *Alnus* spp. and new plants of other species used for plant production in the nurseries Because of the similarity of the commodities, the production systems and the locations of the nurseries, the Panel validated the scenarios from the previous Scientific opinion on *Betula pendula* and *B. pubescens* from the UK (EFSA PLH Panel, 2024) for *A. cordata*, *A. glutinosa* and *A. incana*. As a result of this evaluation, the same values as for *Betula* spp. were considered to be applicable for *Alnus* spp				

(Continues)

(Continued)

Pest control measures applied during production

Pest control measures applied during the production of *Alnus* plants include: (a) registration of production sites; (b) the use of certified plant material; (c) surveillance, monitoring and sampling; (d) hygiene measures; (e) irrigation water testing; (f) application of pest control products; (g) inspection and management of plants before export

Evaluation of control measures

In general, the measures taken by the growers are effective against this pathogen. The following critical points were identified:

– Leaves could be present on the commodity at the time of export increasing the probability that the fungus could be present
– Early infections are difficult to be detected by visual inspections

Main uncertainties

– The efficiency of the hygiene measures especially concerning the cleaning of the machinery and the possible movement of soil within the nursery
– Whether symptoms on *Alnus* spp. are recognisable and may be promptly detected
– The susceptibility of *Alnus* spp. to the pathogen

5.2.3 | Overview of the evaluation of *Phytophthora siskiyouensis*

Overview of evaluation of *Phytophthora siskiyouensis* for bundles of graftwood					
Rating of the likelihood of pest freedom	**Almost always pest free** (based on the Median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9999 out of 10,000 plants	9999 out of 10,000 plants	10,000 out of 10,000 plants	10,000 out of 10,000 plants	10,000 out of 10,000 plants
Proportion of infected plants	0 out of 10,000 plants	0 out of 10,000 plants	0 out of 10,000 plants	1 out of 10,000 plants	1 out of 10,000 plants
Summary of the information used for the evaluation	**Possibility that the pest could become associated with the commodity** There is one record of the presence of *P. siskiyouensis* in the UK, reported on ***A. incana*** plants in 2013 within a conifer and broadleaves plantation in the southwest of England (Perez-Sierra et al., 2015). The host range of *P. siskiyouensis* include also ***A. cordata***, *A. rubra* and ***A. glutinosa***. *P. siskiyouensis* does not have a broad host range. *P. siskiyouensis* has been also reported in myrtlewood (*Umbellularia californica*) and tanoak (*Lithocarpus densiflorus*) in southwestern Oregon (USA) (for references see Appendix A.3). There is a possibility that the pathogen is present in areas where the export nurseries are located. The possible entry of *P. siskiyouensis* from the surrounding environment may occur through wind, water and infested soil propagules on feet of animals/humans entering the field (if any). The pathogen can also enter with new seedlings of *Alnus* spp. and new plants of other species used for plant production in the nurseries **Pest control measures applied during production** Pest control measures applied during the production of *Alnus* plants include: (a) registration of production sites; (b) the use of certified plant material; (c) surveillance, monitoring and sampling; (d) hygiene measures; (e) irrigation water testing; (f) application of pest control products; (g) inspection and management of plants before export **Evaluation of control measures** In general, the measures taken by the growers are effective against this pathogen. The following critical points were identified: – Early infections are difficult to be detected by visual inspections **Main uncertainties** – The extent and the distribution of the pathogen in the UK – Whether symptoms on *Alnus* spp. are distinguishable from *P. alni* – The efficiency of the hygiene measures especially concerning the cleaning of the machinery and the possible movement of soil within the nursery				

Overview of evaluation of *Phytophthora siskiyouensis* for bundles of bare-root plants and whips (small trees)					
Rating of the likelihood of pest freedom	**Almost always pest free** (based on the Median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9993 out of 10,000 plants	9995 out of 10,000 plants	9997 out of 10,000 plants	9998 out of 10,000 plants	9999 out of 10,000 plants
Proportion of infected plants	1 out of 10,000 plants	2 out of 10,000 plants	3 out of 10,000 plants	5 out of 10,000 plants	7 out of 10,000 plants

(Continued)

Summary of the information used for the evaluation	**Possibility that the pest could become associated with the commodity** There is one record of the presence of *P. siskiyouensis* in the UK, reported on ***A. incana*** plants in 2013 within a conifer and broadleaves plantation in the southwest of England (Perez-Sierra et al., 2015). The host range of *P. siskiyouensis* include also ***A. cordata***, *A. rubra* and *A. glutinosa*. *P. siskiyouensis* does not have a broad host range. *P. siskiyouensis* has been also reported in myrtlewood (*Umbellularia californica*) and tanoak (*Lithocarpus densiflorus*) in southwestern Oregon (USA) (for references see Appendix A.3). There is a possibility that the pathogen is present in areas where the export nurseries are located. The possible entry of *P. siskiyouensis* from the surrounding environment may occur through wind, water and infested soil propagules on feet of animals/humans entering the field (if any). The pathogen can also enter with new seedlings of *Alnus* spp. and new plants of other species used for plant production in the nurseries **Pest control measures applied during production** Pest control measures applied during the production of *Alnus* plants include: (a) registration of production sites; (b) the use of certified plant material; (c) surveillance, monitoring and sampling; (d) hygiene measures; (e) irrigation water testing; (f) washing of the roots of the bare-root plants; (g) application of pest control products; (h) inspection and management of plants before export **Evaluation of control measures** In general, the measures taken by the growers are effective against this pathogen. The following critical points were identified: – The washing of the roots removes (parts of) the soil and the pathogen present in the soil, but it does not remove the pathogen present in the roots – Early infections are difficult to be detected by visual inspections **Main uncertainties** – The extent and the distribution of the pathogen in the UK – Whether symptoms on *Alnus* spp. are distinguishable from *P. alni* – The efficiency of the hygiene measures especially concerning the cleaning of the machinery and the possible movement of soil within the nursery

Overview of evaluation of *Phytophthora siskiyouensis* for bundles of cell-grown plants and single plants in pots (small trees)					
Rating of the likelihood of pest freedom	**Almost always pest free** (based on the Median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9993 out of 10,000 plants	9995 out of 10,000 plants	9997 out of 10,000 plants	9998 out of 10,000 plants	9999 out of 10,000 plants
Proportion of infected plants	1 out of 10,000 plants	2 out of 10,000 plants	3 out of 10,000 plants	5 out of 10,000 plants	7 out of 10,000 plants
Summary of the information used for the evaluation	**Possibility that the pest could become associated with the commodity** There is one record of the presence of *P. siskiyouensis* in the UK, reported on ***A. incana*** plants in 2013 within a conifer and broadleaves plantation in the southwest of England (Perez-Sierra et al., 2015). The host range of *P. siskiyouensis* include also ***A. cordata***, *A. rubra* and *A. glutinosa*. *P. siskiyouensis* does not have a broad host range. *P. siskiyouensis* has been also reported in myrtlewood (*Umbellularia californica*) and tanoak (*Lithocarpus densiflorus*) in southwestern Oregon (USA) (for references see Appendix A.3). There is a possibility that the pathogen is present in areas where the export nurseries are located. The possible entry of *P. siskiyouensis* from the surrounding environment may occur through wind, water and infested soil propagules on feet of animals/humans entering the field (if any). The pathogen can also enter with new seedlings of *Alnus* spp. and new plants of other species used for plant production in the nurseries **Pest control measures applied during production** Pest control measures applied during the production of *Alnus* plants include: (a) registration of production sites; (b) the use of certified plant material; (c) surveillance, monitoring and sampling; (d) hygiene measures; (e) irrigation water testing; (f) application of pest control products; (g) inspection and management of plants before export **Evaluation of control measures** In general, the measures taken by the growers are effective against this pathogen. The following critical points were identified: – Early infections are difficult to be detected by visual inspections **Main uncertainties** – The extent and the distribution of the pathogen in the UK – Whether symptoms on *Alnus* spp. are distinguishable from *P. alni* – The efficiency of the hygiene measures especially concerning the cleaning of the machinery and the possible movement of soil within the nursery				

5.2.4 | Outcome of expert knowledge elicitation

Table 10 and Figure 4 show the outcome of the EKE regarding pest freedom after the evaluation of the currently proposed risk mitigation measures for the selected pests.

Figure 5 provides an explanation of the descending distribution function describing the likelihood of pest freedom after the evaluation of the currently proposed risk mitigation measures for *A. cordata*, *A. glutinosa* and *A. incana* (i) graftwood, (ii) bare-root plants and whips, (iii) cell-grown plants and single plants in pots designated for export to EU for *E. mammata, P. ramorum, P. siskiyouensis*. Since the values elicited for bare-root plants and whips, and cell-grown plants and single plants in pots (up to 7 years old) were identical, these are grouped as 'small trees' in the table and figures.

TABLE 10 Assessment of the likelihood of pest freedom following evaluation of current risk mitigation measures against pests on *Alnus cordata, Alnus glutinosa* and *Alnus incana* plants designated for export to the EU. In panel A, the median value for the assessed level of pest freedom for each pest is indicated by 'M', the 5% percentile is indicated by 'L', and the 95% percentile is indicated by 'U'. The percentiles together span the 90% uncertainty range regarding pest freedom. The pest freedom categories are defined in panel B of the table.

	Pest species	Sometimes pest free	More often than not pest free	Frequently pest free	Very frequently pest free	Extremely frequently pest free	Pest free with some exceptional cases	Pest free with few exceptional cases	Almost always pest free
1	*Entoleuca mammata*/Graftwood						L	M	U
2	*Entoleuca mammata*/Small trees					L	M		U
3	*Phytophthora siskiyouensis*/Graftwood								LMU
4	*Phytophthora siskiyouensis*/Small trees							L	MU
5	*Phytophthora ramorum*/Graftwood						LM		U
6	*Phytophthora ramorum*/Small trees					L	M		U

PANEL A

	Pest freedom category	Pest fee plants out of 10,000
	Sometimes pest free	≤ 5000
	More often than not pest free	5000–≤ 9000
	Frequently pest free	9000–≤ 9500
	Very frequently pest free	9500–≤ 9900
	Extremely frequently pest free	9900–≤ 9950
	Pest free with some exceptional cases	9950–≤ 9990
	Pest free with few exceptional cases	9990–≤ 9995
	Almost always pest free	9995–≤ 10,000

PANEL B

Legend of pest freedom categories	
L	Pest freedom category includes the elicited lower bound of the 90% uncertainty range
M	Pest freedom category includes the elicited median
U	Pest freedom category includes the elicited upper bound of the 90% uncertainty range

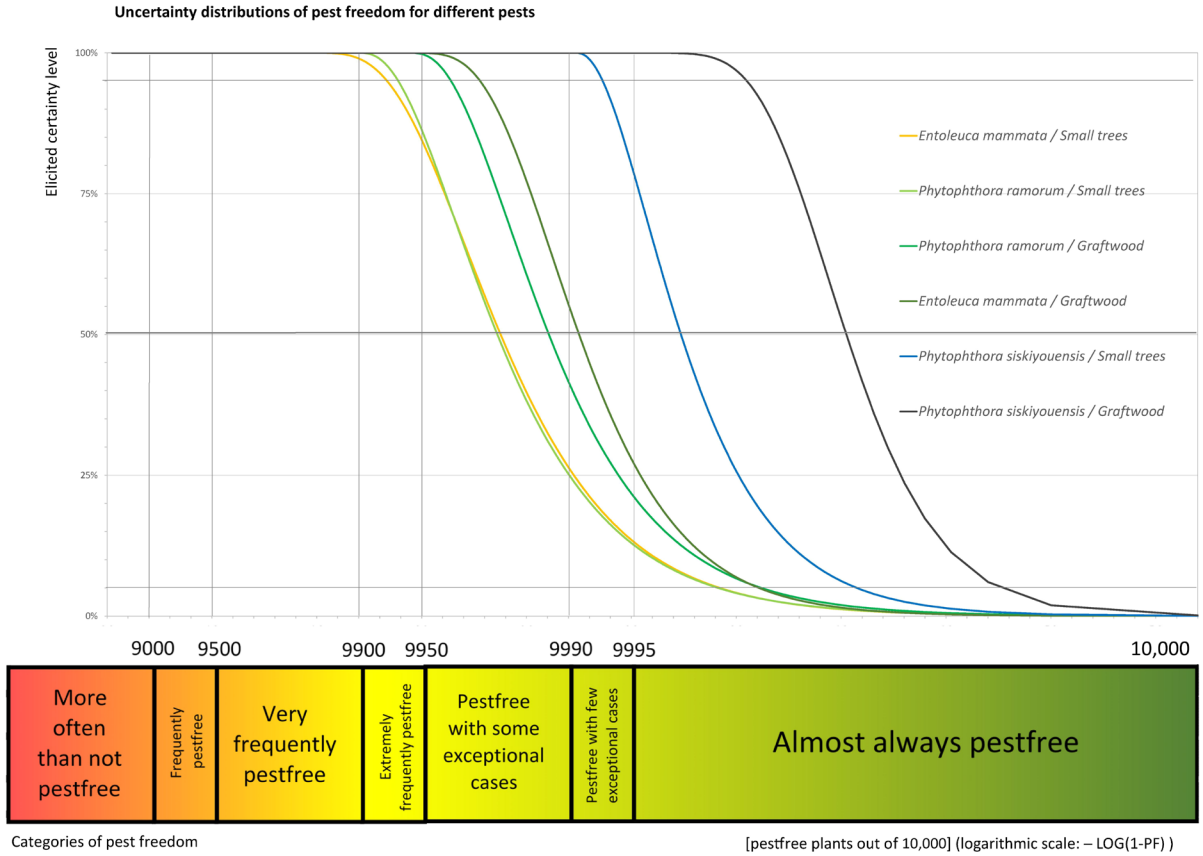


FIGURE 4 The elicited certainty (y-axis) of the number of pest-free *Alnus cordata*, *A. glutinosa* and *A. incana* plants (x-axis; log-scaled) out of 10,000 plants designated for export to the EU introduced from the UK for all evaluated pests visualised as descending distribution function. Horizontal lines indicate the percentiles (starting from the bottom 5%, 25%, 50%, 75%, 95%).

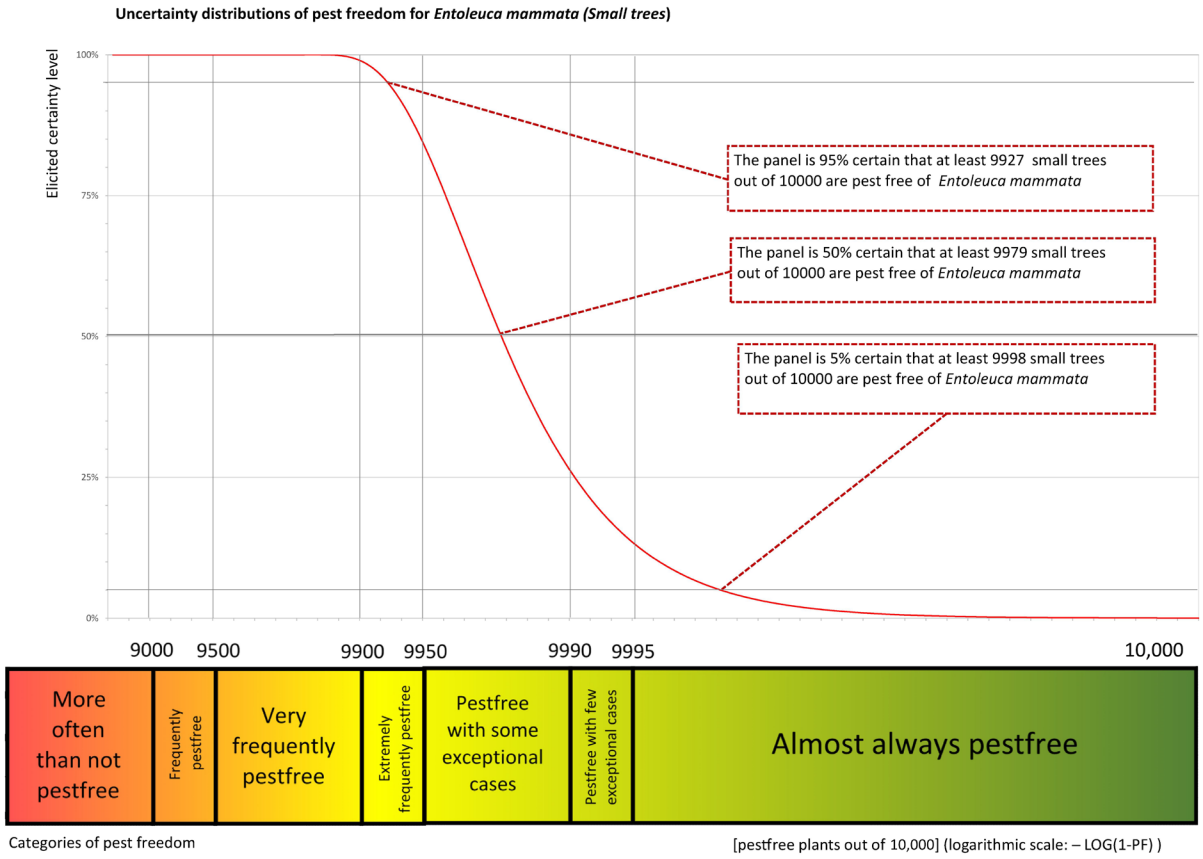


FIGURE 5 The explanation of the descending distribution function describing the likelihood of pest freedom for *Alnus cordata, A. glutinosa* and *A. incana* plants small trees designated for export to the EU based on the example of *Entoleuca mammata.*

6 | CONCLUSIONS

There are three pests (*E. mammata, P. ramorum* (non-EU isolates) and *P. siskiyouensis*) identified to be present in UK and considered to be potentially associated with the *A. cordata, A. glutinosa* and *A. incana* plants imported from the UK and relevant for the EU. The likelihood of the pest freedom after the evaluation of the implemented risk mitigation measures for graftwood, bare-root and rooted plants in pots up to 7 years old of *A. cordata, A. glutinosa and A. incana* designated for export to the EU was estimated.

For *E. mammata*, the likelihood of pest freedom for bundles of graftwood following evaluation of current risk mitigation measures was estimated as 'pest free with few exceptional cases' with the 90% uncertainty range reaching from 'pest free with few exceptional cases' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9974 and 10,000 bundles of graftwood per 10,000 will be free from *E. mammata*. The likelihood of pest freedom for bare-root plants and plants in pots (small trees) was identical, because of similarities in the suitability to the pathogen and detection probability and it was estimated as 'pest free with some exceptional cases' with the 90% uncertainty range spanning from 'extremely frequently pest free' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9927 and 10,000 bare-root plants and plants in pots per 10,000 will be free from *E. mammata*.

For *P. ramorum*, the likelihood of pest freedom for bundles of graftwood following evaluation of current risk mitigation measures was estimated as 'pest free with some exceptional cases' with the 90% uncertainty range reaching from 'pest free with some exceptional cases' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9964 and 10,000 bundles of graftwood per 10,000 will be free from *P. ramorum*. The likelihood of pest freedom for bare-root plants and plants in pots (small trees) was identical, because of similarities in the suitability to the pathogen and detection probability and it was estimated as 'pest free with some exceptional cases' with the 90% uncertainty range spanning from 'extremely frequently pest free' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9935 and 10,000 bare-root plants and plants in pots per 10,000 will be free from *P. ramorum*.

For *P. siskiyouensis*, the likelihood of pest freedom for bundles of graftwood following evaluation of current risk mitigation measures was estimated as 'almost always pest free' with the 90% uncertainty range reaching from 'almost always pest free' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9999 and 10,000 bundles of graftwood per 10,000 will be free from *P. siskiyouensis*. The likelihood of pest freedom for bare-root plants and plants in pots (small trees) was identical, because of similarities in the suitability to the pathogen and detection probability and it was estimated as 'almost always pest free' with the 90% uncertainty range spanning from 'pest free with few exceptional cases' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9993 and 10,000 bare-root plants and plants in pots per 10,000 will be free from *P. siskiyouensis*.

ABBREVIATIONS

APHA	Animal and Plant Health Agency
CABI	Centre for Agriculture and Bioscience International
DEFRA	Department for Environment Food and Rural Affairs
EKE	expert knowledge elicitation
EPPO	European and Mediterranean Plant Protection Organization
FAO	Food and Agriculture Organization
ISPM	International Standards for Phytosanitary Measures
NPPO	National Plant Protection Organisation
PLH	Plant Health
PRA	Pest Risk Assessment
PZQPs	Protected Zone Quarantine Pests
RNQPs	Regulated Non-Quarantine Pests

GLOSSARY

Control (of a pest)	Suppression, containment or eradication of a pest population (FAO, 2024a, 2024b)
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, 2024b)
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2024b)
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, 2024b)
Measures	Control (of a pest) is defined in ISPM 5 (FAO 2024b) as 'Suppression, containment or eradication of a pest population' (FAO, 2024a). Control measures are measures that have a direct effect on pest abundance. Supporting measures are organisational measures or procedures supporting the choice of appropriate risk mitigation measures that do not directly affect pest abundance
Pathway	Any means that allows the entry or spread of a pest (FAO, 2024b)

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, 2024b)
Protected zone	A Protected zone is an area recognised at EU level to be free from a harmful organism, which is established in one or more other parts of the Union
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, 2024b)
Regulated non-quarantine pest	A non-quarantine pest whose presence in plants for planting affects the intended use of those plants with an economically unacceptable impact and which is therefore regulated within the territory of the importing contracting party (FAO, 2024b)
Risk mitigation measure	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 risk mitigation measure 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, 2024b)

REQUESTOR

European Commission

QUESTION NUMBER

EFSA-Q-2023-00512, EFSA-Q-2023-00513, EFSA-Q-2023-00514

COPYRIGHT FOR NON-EFSA CONTENT

PANEL MEMBERS

Antonio Vicent Civera, Paula Baptista, Anna Berlin, Elisavet Chatzivassiliou, Jaime Cubero, Nik Cunniffe, Eduardo de la Peña, Nicolas Desneux, Francesco Di Serio, Anna Filipiak, Paolo Gonthier, Beata Hasiów-Jaroszewska, Hervé Jactel, Blanca B. Landa, Lara Maistrello, David Makowski, Panagiotis Milonas, Nikos T. Papadopulos, Roel Potting, Hanna Susi and Dirk Jan van der Gaag.

MAP DISCLAIMER

The designations employed and the presentation of material on any maps included in this scientific output do not imply the expression of any opinion whatsoever on the part of the European Food Safety Authority concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

REFERENCES

Anisimov, N. S., & Bezborodov, V. G. (2021). Longicorn beetles (Coleoptera: Disteniidae, Cerambycidae) of the Russky Island (Primorsky Krai, Russia). *Ecologica Montenegrina*, *40*, 46–58.

Anonymous. (1960). *Index of plant diseases in the United States*. Agriculture handbook no 165, USDA-ARS (US), 531 pp.

Atkinson, T. H. (online). *Bark and ambrosia beetles*. http://www.barkbeetles.info/index.php

Barringer, L., & Ciafré, C. M. (2020). Worldwide feeding host plants of spotted lanternfly, with significant additions from North America. *Environmental Entomology*, *49*(5), 999–1011. https://doi.org/10.1093/ee/nvaa093

Batsankalashvili, M., Kaydan, M. B., Kirkitadze, G., & Japoshvili, G. (2017). Updated checklist of scale insects (Hemiptera: Coccomorpha) in Sakartvelo (Georgia). *Annals of Agrarian Science*, *15*(2), 252–268. https://doi.org/10.1016/j.aasci.2017.05.002

Brito, R., Specht, A., Gonçalves, G. L., Moreira, G. R. P., Carneiro, E., Santos, F. L., Roque-Specht, V. F., Mielke, O. H. H., & Casagrande, M. M. (2019). Spodoptera marima: A new synonym of *Spodoptera ornithogalli* (Lepidoptera: Noctuidae), with notes on adult morphology, host plant use and genetic variation along its geographic range. *Neotropical Entomology*, *48*(3), 433–448. https://doi.org/10.1007/s13744-018-0654-z

CABI (Centre for Agriculture and Bioscience International). (online). *CABI crop protection compendium*. https://www.cabidigitallibrary.org/product/qc

Callan, B. E. (1998). *Diseases of Populus in British Columbia: A diagnostic manual*. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre.

Ciesla, W. M., & Kruse, J. J. (2009). *Large aspen tortrix [revised]* (Vol. *139*). USDA Forest Service, Forest Insect & Disease Leaflet.

Dubey, A. K., & Ko, C.-C. (2012). Sexual dimorphism among species of *Aleurocanthus* Quaintance & Baker (Hemiptera: Aleyrodidae) in Taiwan, with one new species and an identification key. *Zootaxa*, *3177*, 1–23.

EFSA PLH Panel (EFSA Panel on Plant Health). (2018). Guidance on quantitative pest risk assessment. *EFSA Journal*, *16*(8), 5350. https://doi.org/10.2903/j.efsa.2018.5350

EFSA PLH Panel (EFSA Panel on Plant Health). (2019). Guidance on commodity risk assessment for the evaluation of high risk plants dossiers. *EFSA Journal*, *17*(4), 5668. https://doi.org/10.2903/j.efsa.2019.5668

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Baptista, P., Chatzivassiliou, E., Di Serio, F., Gonthier, P., Jaques Miret, J. A., Justesen, A. F., MacLeod, A., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., Parnell, S., Potting, R., Stefani, E., Van der Werf, W., Vicent Civera, A., Yuen, J., Zappalà, L., … Thulke, H.-H. (2024). Standard protocols for plant health scientific assessments. *EFSA Journal*, *22*(9), 8891. https://doi.org/10.2903/j.efsa.2024.8891

EFSA PLH Panel (EFSA Panel on Plant Health), Civera, A. V., Baptista, P., Berlin, A., Chatzivassiliou, E., Cubero, J., Cunniffe, N., de la Peña, E., Desneux, N., Di Serio, F., Filipiak, A., Hasiów-Jaroszewska, B., Jactel, H., Landa, B. B., Maistrello, L., Makowski, D., Milonas, P., Papadopulos, N. T., Potting, R., … Gonthier, P. (2024). Commodity risk assessment *of Betula pendula* and *Betula pubescens* plants from the UK. *EFSA Journal*, *22*(11), 9051. https://doi.org/10.2903/j.efsa.2024.9051

EFSA Scientific Committee. (2018). Scientific opinion on the principles and methods behind EFSA's guidance on uncertainty analysis in scientific assessment. *EFSA Journal*, *16*(1), 5122. https://doi.org/10.2903/j.efsa.2018.5122

EPPO (European and Mediterranean Plant Protection Organization). (online). *EPPO global database*. https://gd.eppo.int/

Eskalen, A., Stouthamer, R., Lynch, S. C., Rugman-Jones, P. F., Twizeyimana, M., Gonzalez, A., & Thibault, T. (2013). Host range of Fusarium dieback and its ambrosia beetle (Coleoptera: Scolytinae) vector in southern California. *Plant Disease*, *97*(7), 938–951. https://doi.org/10.1094/PDIS-11-12-1026-RE

EUROPHYT. (online). *European Union notification system for plant health interceptions – EUROPHYT*. https://ec.europa.eu/food/plants/plant-health-and-biosecurity/European-union-notification-system-plant-health-interceptions

FAO (Food and Agriculture Organization of the United Nations). (2019). *ISPM (international standards for phytosanitary measures) no. 36. Integrated measures for plants for planting*. FAO. https://www.ippc.int/en/publications/636/

FAO (Food and Agriculture Organization of the United Nations). (2024a). ISPM (International standards for phytosanitary measures) No 4. Requirements for the establishment of pest free areas. FAO. https://www.ippc.int/en/publications/614/

FAO (Food and Agriculture Organization of the United Nations). (2024b). ISPM (international standards for phytosanitary measures) No. 5. Glossary of phytosanitary terms. FAO. https://www.ippc.int/en/publications/622/

Farashiani, M. E., Sadeghi, S. E., & Abaii, M. (2001). Geographic distribution and hosts of sart longhorn beetle, *Aeolesthes sarta* Solsky (Col.: Cerambycidae) in Iran. *Journal of Entomological Society of Iran*, *20*, 81–96.

Ferguson, D. C. (1975). Host records for Lepidoptera reared in eastern North America. *USDA Technical Bulletin*, *1521*, 1–49.

Fleming, W. E. (1972). *Biology of the Japanese beetle*. Technical Bulletin, Agricultural Research Service, USDA no 1449, 129 pp.

Gardi, C., Kaczmarek, A., Streissl, F., Civitelli, C., Do Vale Correia, C., Mikulová, A., Yuen, J., & Stancanelli, G. (2024). EFSA standard protocol for commodity risk assessment. *Zenodo*. https://doi.org/10.5281/zenodo.13149775

GBIF (Global Biodiversity Information Facility) Secretariat. (online). GBIF BackBone Taxonomy. https://www.gbif.org/.

Gilligan, T. M., & Epstein, M. E. (2014). *TortAI. Tortricidae of Agricultural Importance*. https://idtools.org/id/leps/tortai/Acleris_senescens.htm

Lim, J., Jung, S.-Y., Lim, J.-S., Jang, J., Kim, K.-M., Lee, Y.-M., & Lee, B.-W. (2014). A review of host plants of Cerambycidae (Coleoptera: Chrysomeloidea) with new host records for fourteen Cerambycids, including the Asian longhorn beetle (*Anoplophora glabripennis* Motschulsky), in Korea. *Korean Journal of Applied Entomology*, *53*(2), 111–133.

Malembic-Maher, S., Desqué, D., Khalil, D., Salar, P., Bergey, B., Danet, J.-L., Duret, S., Dubrana-Ourabah, M.-P., Beven, L., Ember, I., Acs, Z., Bartola, M. D., Materazzi, A., Filippin, L., Krnjajic, S., Krstić, O., Toševski, I., Lang, F., Jarausch, B., … Foissac, X. (2020). When a Palearctic bacterium meets a Nearctic insect vector: Genetic and ecological insights into the emergence of the grapevine Flavescence dorée epidemics in Europe. *PLoS Pathogens*, *16*(3), e1007967. https://doi.org/10.1371/journal.ppat.1007967

Mehle, N., Rupar, M., Seljak, G., Ravnikar, M., & Dermastia, M. (2011). Molecular diversity of 'flavescence doree' phytoplasma strains in Slovenia. *Bulletin of Insectology*, *64*, S29–S30.

O'Hanlon, R., Choiseul, J., Corrigan, M., Catarame, T., & Destefanis, M. (2016). Diversity and detections of Phytophthora species from trade and non-trade environments in Ireland. *EPPO Bulletin*, *46*(3), 594–602. https://doi.org/10.1111/epp.12331

Palmer, W. A. (1987). The phytophagous insect fauna associated with *Baccharis halimifolia* L. and *B. neglecta* Britton in Texas, Louisiana, and northern Mexico. *Proceedings of the Entomological Society of Washington*, *89*, 185–199.

Park, J. D., Kim, M.-Y., Lee, S.-G., Shin, S.-C., Kim, J., & Park, I.-K. (2009). Biological characteristics of Lycorma delicatula and the control effects of some insecticides. *Korean Journal of Applied Entomology*, *48*(1), 53–57.

Perez-Sierra, A., Kalantarzadeh, M., Sancisi-Frey, S., & Brasier, C. M. (2015). Phytophthora siskiyouensis causing stem lesions and cankers on Alnus incana. New Disease Reports, 31, 17-17.

Plant-SyNZ. (online). *Landcare Research (NZ). Host plants of a herbivore -Oemona hirta*. http://plant-synz.landcareresearch.co.nz/index.asp

Prentice, R. M. (1966). Volume 4. Microlepidoptera. In *Forest Lepidoptera of Canada recorded by the Forest Insect Survey* (Vol. *1142*, pp. 543–840). Department of Forestry.

Radonjic, S., Hrncic, S., Krstic, O., Cvrkovic, T., Mitrovic, M., Jovic, J., & Tosevski, I. (2013). First report of Alder yellows phytoplasma infecting common and grey alder (*Alnus glutinosa* and *A. incana*) in Montenegro. *Plant Disease*, *97*, 686.

Regione Lombardia. (online). *Servizio fitosanitario. Organismi nocivi. Popillia japonica. Specie particolarmente sensibili a Popillia japonica*. https://www.regione.lombardia.it/wps/wcm/connect/64dfeeea-c26a-4bf1-995d-660f87136d87/Specie+sensibili+Popillia+japonica+2020.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-64dfeeea-c26a-4bf1-995d-660f87136d87-nbxAUOb

Shrewsbury, P. M., Harding, N. M., Rojas, M. S., & Gill, S. (2013). *Japanese maple scale: Woody ornamental host plants*. UMD Extension Publication EBR-18 2013. https://extension.umd.edu/sites/extension.umd.edu/files/publications/Japanese%20Maple%20Scale%20%282%29.pdf

Sjöman, H., Östberg, J., & Nilsson, J. (2014). Review of host trees for the wood-boring pests *Anoplophora glabripennis* and *Anoplophora chinensis*: An urban forest perspective. *Arboriculture & Urban Forestry*, *40*(3), 143–164.

TRACES-NT. (online). Trade control and expert system. https://webgate.ec.europa.eu/tracesnt

Turchetti, T., Maresi, G., & Santagada, A. (1991). Cryphonectria parasitica blight on different hosts in the Cilento region, S. Italy. *Monti E Boschi*, *42*, 54–58.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: EFSA PLH Panel (EFSA Panel on Plant Health), Civera, A. V., Baptista, P., Berlin, A., Chatzivassiliou, E., Cubero, J., Cunniffe, N., de la Peña, E., Desneux, N., Di Serio, F., Filipiak, A., Gonthier, P., Hasiów-Jaroszewska, B., Jactel, H., Landa, B. B., Maistrello, L., Makowski, D., Milonas, P., Papadopoulos, N. T., … Potting, R. (2025). Commodity risk assessment of *Alnus cordata*, *Alnus glutinosa* and *Alnus incana* plants from the UK. *EFSA Journal*, *23*(1), e9189. https://doi.org/10.2903/j.efsa.2025.9189

APPENDIX A

Datasheets of pests selected for further evaluation

A.1 | *ENTOLEUCA MAMMATA*

A.1.1 | Organism information

Taxonomic information	Current valid scientific name: *Entoleuca mammata* (Wahlenb.) *J.D. Rogers & Y.M. Ju* Synonyms: *Anthostoma blakei, Anthostoma morsei, Fuckelia morsei, Hypoxylon blakei, Hypoxylon holwayi, Hypoxylon mammatum, Hypoxylon morsei, Hypoxylon pauperatum, Hypoxylon pruinatum, Nemania mammata, Rosellinia pruinata, Sphaeria mammata, Sphaeria pruinata* (according to Index Fungorum) Name used in the EU legislation: *Entoleuca mammata* (Wahlenb.) Rogers and Ju Order: Xylariales Family: Xylariaceae Common name: hypoxylon canker of poplar, canker of aspen
Group	Fungi
EPPO code	HYPOMA
Regulated status	*E. mammata* is listed in Annex III of Commission Implementing Regulation (EU) 2019/2072 as protected zone quarantine pest for Ireland The pathogen is quarantine pest in China and Israel. It is on the A1 list of Türkiye (EPPO, online_a)
Pest status in the UK	*E. mammata* is present in the UK, with few occurrences in England, Wales, Channel Islands and Scotland (CABI, online; EPPO, online_b)
Pest status in the EU	Not relevant, *E. mammata* is an EU regulated pest
Host status on Alnus spp.	*E. mammata* has been reported on various species of *Alnus*. These included *Alnus* spp. (Callan, 1998; French et al., 1969; Goos, 2010; Hawksworth, 1972; *A. crispa* var. *mollis* (Conners, 1967), *A. crispa* var. *sinuate* (Ginns, 1986), *A. incana* (Anonymous, 1960), *A. rugosa* (Conners, 1967; Ginns, 1986), *A. sinuata* (Callan, 1998; Conners, 1967) and *A. tenuifolia* (Anonymous, 1960). Given the fact that has been reported in several *Alnus* spp. the Panel assumes that *A. cordata* and *A. glutinosa* can be a host or *E. mammata*
Risk assessment information	Pest Risk Assessments available: – Scientific Opinion on the pest categorisation of *Entoleuca mammata* (EFSA PLH Panel, 2017) – UK Risk Register Details for *Entoleuca mammata* (DEFRA, online) – Express Pest Risk Analysis: *Entoleuca mammata* (Klejdysz et al., online) – Commodity risk assessment of *Acer campestris, A. platanoides* and *A. pseudoplatanus* plants from the UK (EFSA PLH Panel, 2023a, 2023b, 2023c) – Commodity risk assessment of *Sorbus aucuparia* plants from the UK (EFSA PLH Panel, 2024)
Other relevant information for the assessment	
Biology	*E. mammata* is an ascomycete fungus known as an important agent of canker disease in *Populus* species, mostly *Populus tremuloides* and *P. tremula*; other hardwood species like *Salix* spp. can also be infected (EFSA PLH Panel, 2017). The pathogen is native to North America and was introduced to Europe several centuries ago (Kasanen et al., 2004); The ascospores of *E. mammata* can infect the living wood of the hosts penetrating the periderm and invading tissues under healthy bark and through mechanical wounds, as well as through injuries caused by woodpeckers and insects, in particular the North American cerambycid beetles (mostly *Saperda inornata* and *Oberea* spp.) (Anderson et al., 1979a) and the cicada *Magicicada septemdecim* (Ostry & Anderson, 1983) water stress can increase host susceptibility (EFSA PLH Panel, 2017). *E. mammata* is mostly found on trees 15–40 years old, but all ages can be infected (EFSA PLH Panel, 2017; EPPO online_c). Infection usually starts from branches and twigs and then can spread to the main stem. The cankers expand very rapidly (7–8 cm per month) in summer and more slowly during winter; branches and stems can be girdled causing drying and breakage. The pathogen mostly develops in the range from 8 to 32°C, the optimum temperature is 28°C; toxins host-specific produced by the fungus are involved in pathogenesis (EFSA PLH Panel, 2017; EPPO, online_c; Stermer et al., 1984) *E. mammata* overwinters in host tissues as both mycelium and spores. Conidia are produced 5 to 14 months after infection, but their role in the disease transmission is considered not relevant (**EFSA PLH Panel, 2017**) The pathogen spreads over long distances via windborne ascospores, which are produced only 2–3 years after infection; cankers on felled trees on the ground can continue to produce ascospores for 23 months. Ascospores are dispersed at a temperature above −4°C and in wet weather; a minimum of 16°C is required for starting germination, which became rapid at 28–32°C (EFSA PLH Panel, 2017) Infected wood, mostly with bark, maybe a pathway for the passive spread of *E. mammata* in international trade; however, also young plants may carry ascospores or mycelium of the fungus, which can exist as a latent infection on living material inadvertently moved (EFSA PLH Panel, 2017; EPPO online_c)

(Continues)

(Continued)

Symptoms	**Main type of symptoms**	The symptoms are observed on *Populus* trees. Early symptoms of cankers on the bark appear as slightly sunken, yellowish-orange areas with an irregular border. Young cankers can be easily identified by removing the bark to expose the white mycelium in the cambial zone. The outer bark in older cankers is then lifted into blister-like patches and breaks away, exposing blackened areas prominently visible on green branches and trunks. Callus formation only occasionally develops because cankers spread very quickly (Anderson et al., 1979b; EPPO, online_c) Wilting of leaves may be observed when the trees are girdled, as well as sprouting of new shoots on stems and branches. Infected trees can be secondarily colonised by other fungi, accelerating the host decline (EPPO, online_c) There is no information on the symptoms caused to *Alnus* plants
	Presence of asymptomatic plants	Infections by *E. mammata* have an incubation period, with symptoms typically appearing on average 2 years after ascospore infection, therefore asymptomatic plants can be found (Ostry and Anderson, 2009)
	Confusion with other pests	Some *Hypoxylon* species present in Europe on deciduous trees (*H. confluens* and *H. udum*) show symptoms similar to those caused by *E. mammata* but can be easily distinguished in the laboratory by the ascospore characteristics (EFSA PLH Panel, 2017)
Host plant range	In North America, *E. mammata* mainly infects quacking aspen (*Populus tremuloides*); minor damage is recorded on *P. grandidentata*, *P. balsamifera* and various *Populus* hybrids Other reported hosts in North America are *Acer, Alnus, Betula, Carpinus, Fagus, Picea, Pyrus, Salix, Sorbus* and *Ulmus* (Manion and Griffin, 1986) In Europe, the main host is *Populus tremula*; other hosts are *Populus alba, P. nigra, P. trichocarpa* and the hybrid *P. tremula* × *P. tremuloides* (Ostry, 2013). The fungus is reported in *Salix* sp. (Eriksson, 2014; Vasilyeva & Scheuer, 1996) and *S. aucuparia* (Eriksson, 2014; Vasilyeva & Scheuer, 1996). There are no reports on *Alnus* spp. in Europe	
Reported evidence of impact	The fungus is an EU regulated pest	
Evidence that the commodity is a pathway	Plants for planting of *Alnus* species may carry ascospores and mycelium of *E. mammata* also as asymptomatic plants (EFSA PLH Panel; EPPO online_c). Mechanical wounds including pruning may facilitate infection courts. Bare-root plants graft wood and plants in pots with or without leaves can be a pathway, because the ascospore or mycelium can be found in the branches	
Surveillance information	*E. mammata* is not a regulated pest for UK and it is not under official control and surveillance (Dossier, Sections 1.0)	

A.1.2 | Possibility of pest presence in the nursery

A.1.2.1 | Possibility of entry from the surrounding environment

E. mammata is present in the UK in England, Wales, Channel Islands and Scotland (EPPO, online_b; CABI, online). The pathogen can naturally spread with ascospores dispersed by air currents also over long distance. The locations of the exporting nurseries are the same as for the nurseries evaluated for the *Acer* spp., *Betula* spp. and *Sorbus aucuparia* Dossiers (EFSA PHL Panel, 2023a, 2023b, 2023c; 2024a, 2024b).

Exporting nurseries are predominately situated in the rural areas. The surrounding land would tend to be arable farmland with some pasture for animals and small areas of woodland. Hedges are often used to define field boundaries and grown along roadsides. Woodlands tend to be a standard UK mixed woodland with a range of UK native trees, that include host plants for the fungus such as oak (*Quercus robur)*, poplar (*Populus* spp.), sycamore (*Acer pseudoplatanus*), norway maple (*Acer platanus*) and field maple (*Acer campestre*). Hedges are made up of a range of species, including alder (*Alnus glutinosa*) as a host for *E. mammata* (Dossier Section 1.0).

Uncertainties:

– The presence of the pathogen on host plants in the surrounding area.

Taking into consideration the above evidence and uncertainties, the Panel considers that it is possible for *E. mammata* to enter the nurseries from the surrounding environment via ascospores transported by wind and air currents.

A.1.2.2 | Possibility of entry with new plants/seeds

The starting material is a mix of seeds and seedlings depending on the nursery. Seeds are certified and come from the UK. Most plants are grown from UK-produced seeds and seedlings; however, some plants may be obtained from the EU (mostly the Netherlands). This is the only source of plants obtained from abroad (Dossier Section 1.0)

Only one of the nurseries expected to export to the EU produce plants from grafting. They have mother plants of *A. incana* and *A. cordata* present on the nursery but as these are the only species produced by grafting, there are no mother plants of other *Alnus* species present. All other growers use only seed and seedlings (Dossier Section 1.0).

The nurseries use virgin peat or peat-free compost (a mixture of coir, tree bark, wood fibre, etc.) as a growing media (Dossier Section 1.0). The growing media is heat-treated by commercial suppliers during production to eliminate pests and diseases (Dossier Section 1.0). There is no evidence that soil or growing media may be a pathway for *E. mammata*.

Uncertainties:

– No information is available on the provenance of new plants used for plant production in the area of the nurseries.
– There is no information on the proportion of the grafted plants of the exported commodity.

Taking into consideration the above evidence and uncertainties, the Panel considers that it is possible for the pathogen to enter the nurseries via new seedlings of *Alnus* and plants of other species used for plant production in the area. For the entry of the pathogen with seeds or the growing media the Panel considers as not possible.

A.1.2.3 | Possibility of spread within the nursery

Alnus spp. plants are grown in containers (cells, pots, tubes, etc.) outdoors, in the open air or field. Cell-grown trees may be grown in greenhouses; however, most plants will be field-grown or field-grown in containers (Dossier Section 1.0).

Several other host plant species of *E. mammata* are present in the nurseries exporting *Alnus* plants to EU. The fungus could spread from these other host plant species to *Alnus* plants via ascospores by air currents.

Uncertainties:

– Efficiency in detecting and removing *E. mammata* infected plants.

Taking into consideration the above evidence and uncertainties, the Panel considers that the spread of the pathogen within the nurseries is possible by air currents.

A.1.3 | Information from interceptions

In the EUROPHYT/TRACES-NT database there are no records of notification of *Alnus* plants for planting neither from the UK nor from other countries due to the presence of *E. mammata* between the years 1995 and July 2024 (EUROPHYT/TRACES-NT, online).

A.1.4 | Evaluation of the risk mitigation measures

In the table below, all risk mitigation measures currently applied in the UK are listed and an indication of their effectiveness on *E. mammata* is provided. The description of the implemented risk mitigation measures is provided in the Table 9.

No.	Risk mitigation measure	Effect on the pest	Evaluation and uncertainties
1	Registration of production sites	Yes	All nurseries are registered as professional operator with the UK NPPO, by the Animal Plant Health Agency (APHA) for England and Wales, or with SASA for Scotland, and is authorised to issue UK plant passports (Dossier Section 1.0) Evaluation: – The risk mitigation measure is expected to be effective in reducing the likelihood of presence of the pathogen on the commodity Uncertainties: – Whether early symptoms on *Alnus* spp. are easily recognisable
2	Certification of propagation material	Yes	*Alnus cordata*, *A. incana* and *A. glutinosa* seeds purchased in the UK are certified under The Forest Reproductive Material (Great Britain) Regulations 2002 (legislation.gov.uk); seedlings sourced in the UK are certified with UK Plant Passports; a small percentage of plants may be obtained from EU (Netherlands); seedlings from the EU countries are certified with phytosanitary certificates. (Dossier Section 1.0) Evaluation: – The risk mitigation measure is expected to be effective in reducing the likelihood of presence of the pathogen on the commodity Uncertainties: – None

(Continues)

(Continued)

No.	Risk mitigation measure	Effect on the pest	Evaluation and uncertainties
3	Origin and treatment of growing media	No	Rooted plants in pots: In the production or procurement of these plants, the use of growing media is assessed for the potential to harbour and transmit plant pests. Growers most commonly use virgin peat or peat-free compost, which is a mixture of coir, tree bark, wood fibre, etc. The compost is heat-treated by commercial suppliers during production to eliminate pests and diseases. It is supplied in sealed bulk bags or shrink-wrapped bales and stored off the ground on pallets, these are completely hygienic and free from contamination. Where delivered in bulk, compost is kept in a dedicated bunker, either indoors or covered by tarpaulin outdoors, and with no risk of contamination with soil or other material (Dossier Section 1.0) Evaluation: – Not relevant because the fungus is not reported as a soilborne pathogen
4	Surveillance, monitoring and sampling	Yes	Inspection is carried out at least once a year as part of the Quarantine Surveillance programme (Great Britain uses the same framework for its surveillance programme as the EU). Surveillance is based on visual inspection with samples taken from symptomatic material, and where appropriate, samples are also taken from asymptomatic material (e.g. plants, tubers, soil, watercourses) (Dossier Section 1.0) Evaluation: – If infected plants are detected and removed from the nursery, this measure could have some effect Uncertainties: – Whether symptoms caused by the pathogen on *Alnus* spp. are recognisable – Whether *Alnus* spp. plants are subjected to annual surveys
5	Hygiene measures	Yes	According to the Dossier Section 1.0, all the nurseries have plant hygiene and housekeeping rules and practices in place, which are communicated to all relevant employees. These measures include: – Cleaning and sterilisation of tools – Waste treatment and disposal Evaluation: – It is highly unlikely that the fungus spreads by the pruning tools – The correct disposal of infected plant material prevents the spread of the fungus Uncertainties: – The efficiency of hygiene measures performed in the nurseries
6	Irrigation water quality and/or treatments	No	Growers are required to assess water sources, irrigation and drainage systems used in the plant production for the potential to harbour and transmit plant pests. Water is routinely sampled and sent for analysis. No quarantine pests have been found (Dossier Section 1.0) Evaluation: – The fungus is not spread by irrigation water Uncertainties: – None
7	Application of pest control products	Yes	Crop protection is achieved using a combination of measures including approved plant protection products, biological control or physical measures. Plant protection products are only used when necessary and records of all plant protection treatments are kept (Dossier Section 1.0) Evaluation: – Although *E. mammata* is generally not a target of the pesticide treatments in the nurseries, some fungicides could reduce the likelihood of the infection by the pathogen Uncertainties: – No specific information on the fungicides used – The level of efficacy of fungicides in reducing infection of *E. mammata*
8	Washing of the roots (bare-root plants)	No	Bare-root plants are lifted from the field in winter and then root-washed on site and stored prior to export (Dossier Section 1.0) Evaluation: – Not relevant because the fungus is not reported as a soilborne pathogen Uncertainties: – None

(Continued)

No.	Risk mitigation measure	Effect on the pest	Evaluation and uncertainties
9	Inspections and management of plants before export	Yes	The UK NPPO carries out inspections and testing where required by the country of destination's plant health legislation, to ensure all requirements are fulfilled and a valid phytosanitary certificate with the correct additional declarations is issued. Separate to any official inspection, plant material is checked by growers for plant health issues before dispatch. Evaluation: – This measure could have some effect Uncertainties: – Whether early symptoms caused by the pathogen on *Alnus* species are identified by visual inspections

A.1.5 | Overall likelihood of pest freedom for the exported commodity (comparative)

A.1.5.1 | Comparison with other relevant commodity Risk Assessments involving *E. mammata*

E. mammata was already assessed as a relevant pest for the commodity risk assessment of *Betula pendula* and *B. pubescens* from the UK (EFSA PHL Panel, 2024).

– The similarities between the dossier of *Betula* spp. and *Alnus* spp. *are*:
– The type of commodities exported (graftwood, bare-root plants up to 7 years old and whips up to 2 years old and potted plants);
– The age and size of the exported plants;
– The overall production system;
– The location of the nurseries and the presence of other host plants in the surrounding environment;
– *Betula* and *Alnus* (both belonging to the *Betulaceae* family) are not reported as a major host of *E. mammata*.

Therefore, for the estimation of the pest freedom level of *E. mammata* in exported *Alnus* plants, the Panel decided to base the estimated values for *Alnus* spp. on the estimated pest freedom values for *Betula pendula* and *B. pubescens* (EFSA PHL Panel, 2024).

A.1.6 | Overall likelihood of pest freedom for bundles of graftwood

A.1.6.1 | Reasoning for a scenario which would lead to a reasonably low number of infected bundles of graftwood

The scenario assumes a low pressure of the pathogen in the nurseries and in the surroundings. The plants are exposed to the pathogen for only short period of time and are exported as dormant plants without roots and leaves. The scenario assumes *Alnus* spp. to be minor hosts for the pathogen. The scenario also assumes that symptoms of the disease are visible and promptly detected during inspections. The scenario also assumes that graftwood is not taken from symptomatic plants. *E. mammata* is a quarantine pest subjected to official inspections.

A.1.6.2 | Reasoning for a scenario which would lead to a reasonably high number of infected bundles of graftwood

The scenario assumes a high pressure of the pathogen in the surrounding environment of the nurseries because suitable hosts are present. The scenario also assumes that the pathogen is not detected during the inspections because of presence of asymptomatic plants or difficulties in recognising early symptoms.

A.1.6.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infected bundles of graftwood (Median)

The scenario assumes a limited presence of the pathogen in the nurseries and the surroundings and a limited reported susceptibility of *Alnus* spp.

A.1.6.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile / interquartile range)

The limited information on occurrence of the pathogen in the UK including the nurseries and the surroundings results in high level of uncertainties for infection rates below the median. Otherwise, the pest pressure from the surroundings is expected to be low giving less uncertainties for rates above the median.

A.1.7 | Elicitation outcomes of the assessment of the pest freedom for *Entoleuca mammata* on bundles of graftwood

The elicited and fitted values for ***E. mammata*** for pest infestation and pest freedom agreed by the Panel are shown in Tables A.1.1, A.1.2 and in Figure A.1.1.

TABLE A.1.1 Elicited and fitted values of the uncertainty distribution of pest infestation by *Entoleuca mammata* per 10,000 bundles of graftwood.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0.0					4.5		9.0		15.0					35.0
EKE	0.371	0.732	1.24	2.12	3.22	4.54	5.90	8.91	12.7	15.1	18.2	21.9	26.4	30.4	35.0

Note: The EKE results is the *BetaGeneral* (1.3743, 7.4777, 0, 69) distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infected bundles of graftwood the pest freedom was calculated (i.e. = 10,000 – number of infected bundles per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.1.2.

TABLE A.1.2 The uncertainty distribution of bundles free of *Entoleuca mammata* per 10,000 bundles of graftwood calculated by Table A.1.1.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9965.0					9985.0		9991.0		9995.5					10,000
EKE results	9965	9970	9974	9978	9982	9985	9982	9987	9994	9995	9996.8	9997.9	9998.8	9999.3	9999.6

Note: The EKE results are the fitted values.

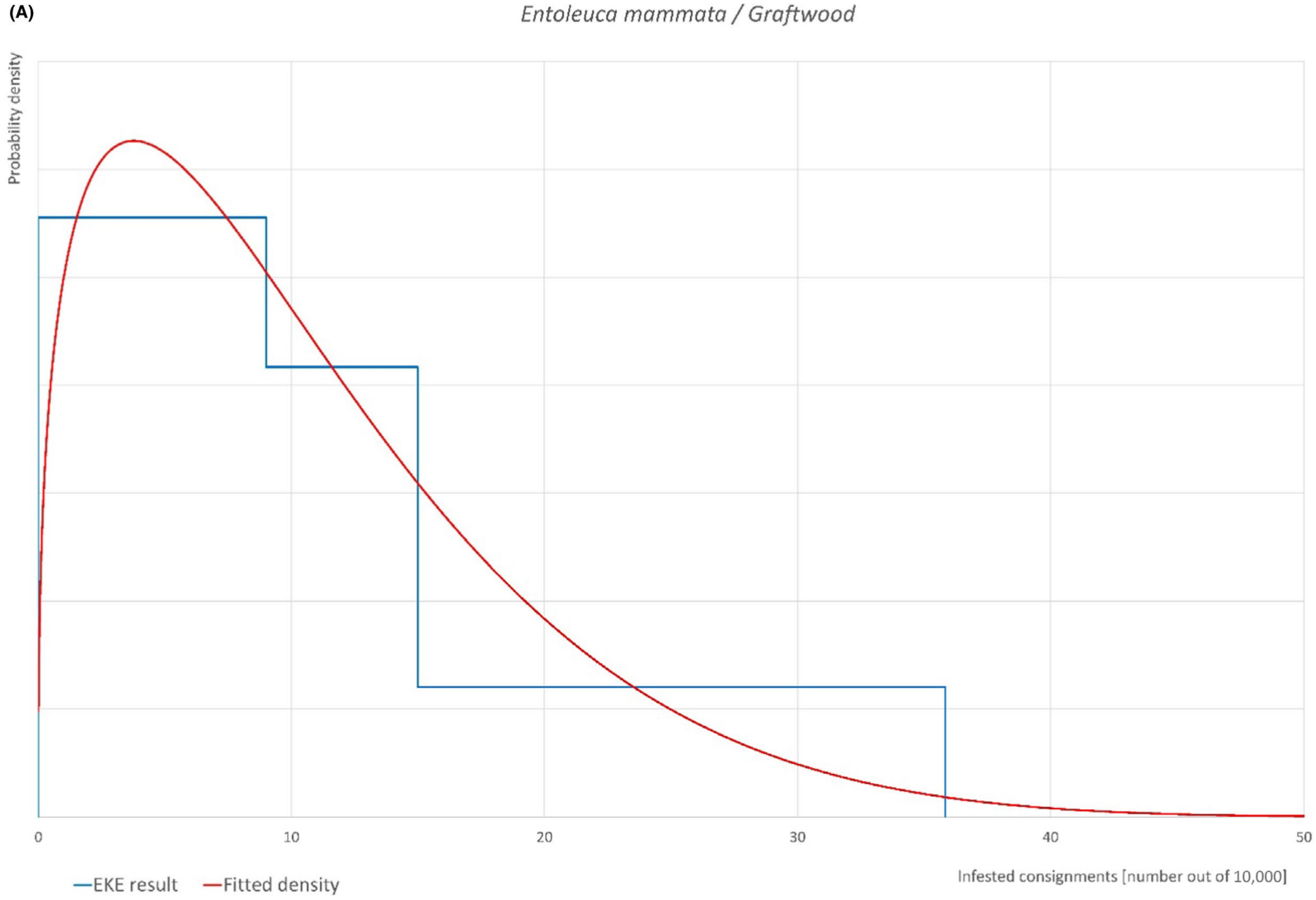


FIGURE A.1.1 (Continued)

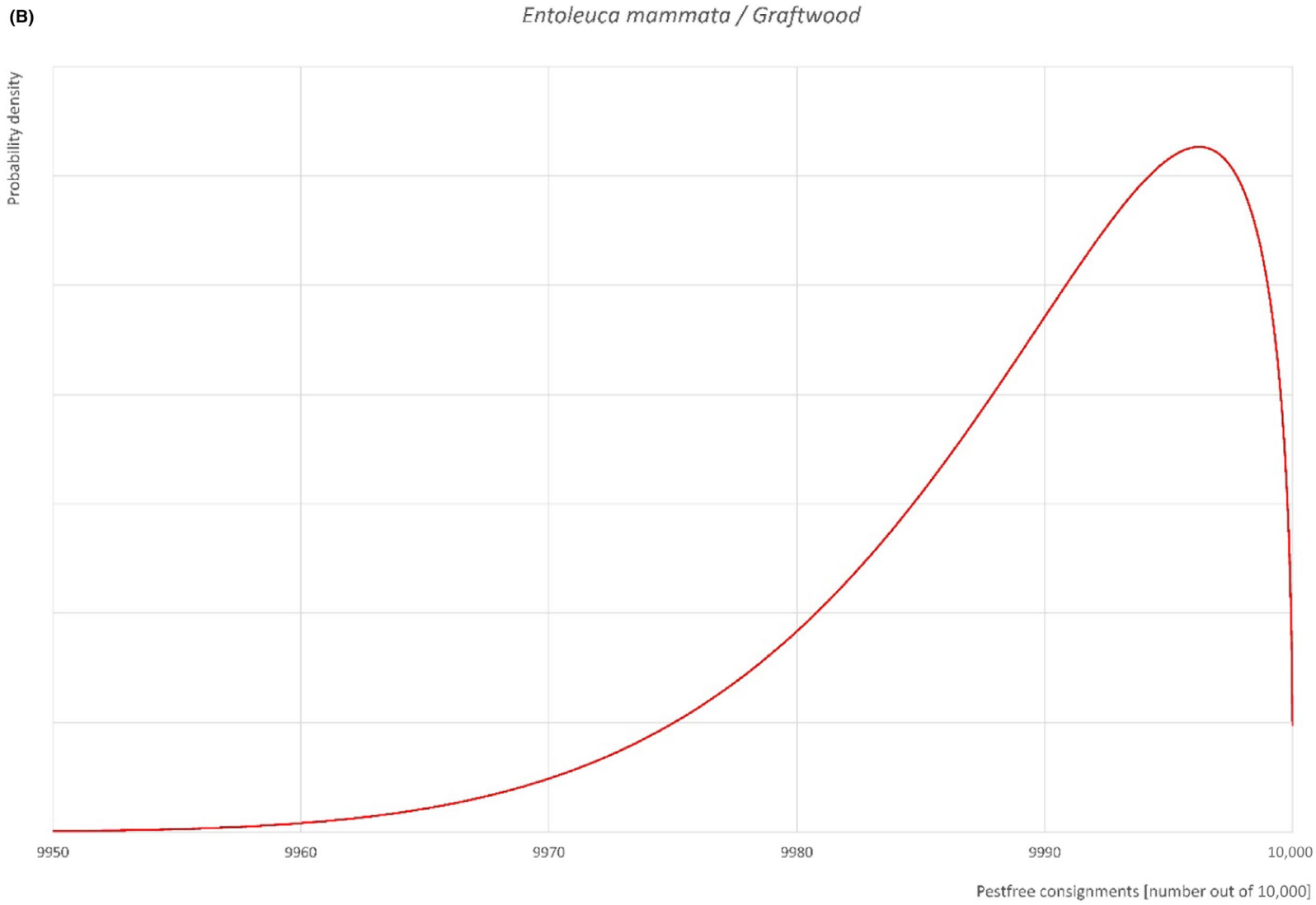


FIGURE A.1.1 (Continued)

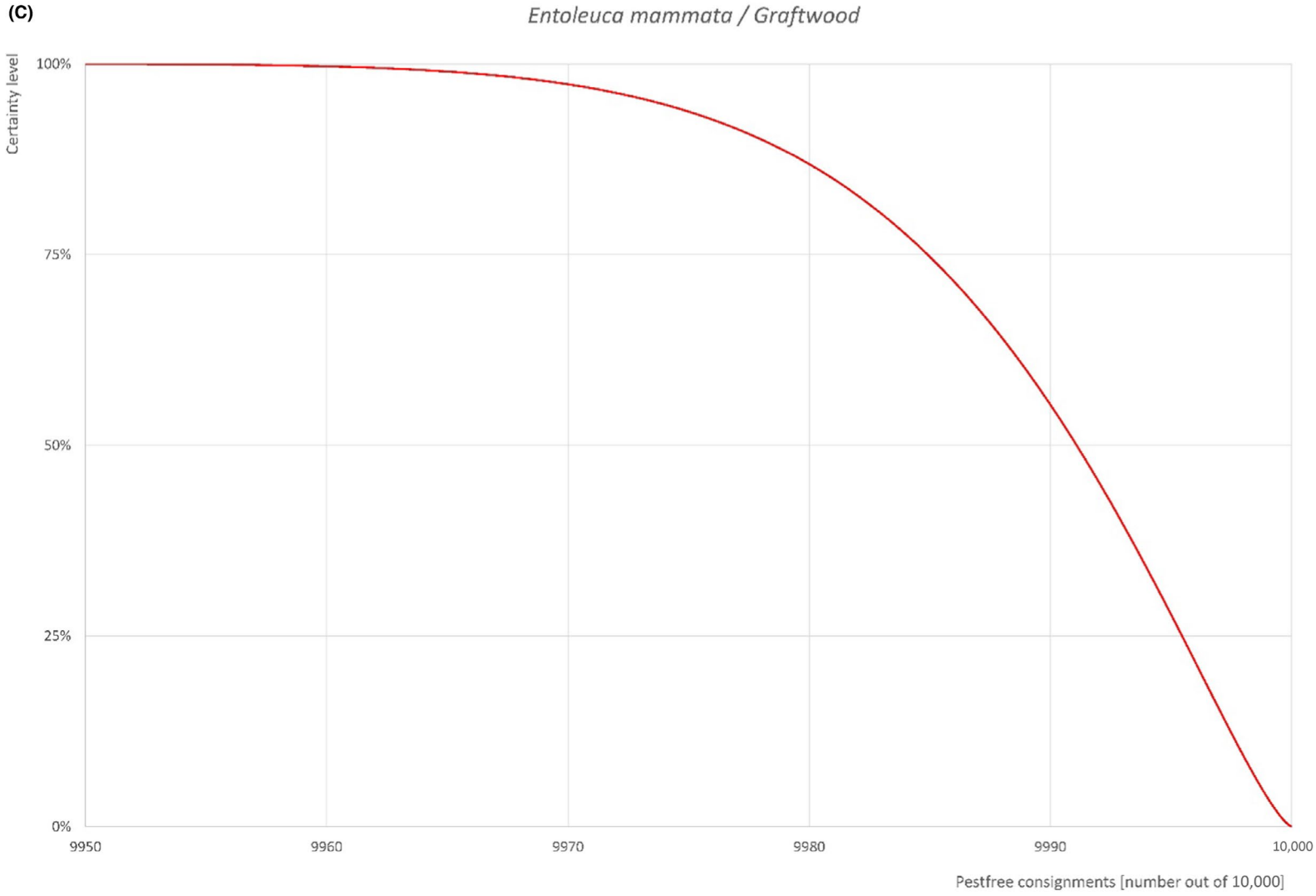


FIGURE A.1.1 (A) Elicited uncertainty of pest infection per 10,000 bundles of graftwood (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free bundles per 10,000 (i.e. = 1 – pest infection proportion expressed as percentage); (C) descending uncertainty distribution function of pestinfection per 10,000 bundles.

A.1.8 | Overall likelihood of pest freedom for bundles of bare-root plants and whips (small trees)

A.1.8.1 | Reasoning for a scenario which would lead to a reasonably low number of infected bundles of bare-root plants and whips

The scenario assumes a low pressure of the pathogen in the nurseries and in the surroundings. Younger plants are exposed to the pathogen for only short period of time and are exported as dormant plants without leaves. The scenario assumes *Alnus* spp. to be minor hosts for the pathogen. The scenario also assumes that symptoms of the disease are visible and promptly detected during inspections.

A.1.8.2 | Reasoning for a scenario which would lead to a reasonably high number of infected bundles of bare-root plants and whips

The scenario assumes a high pressure of the pathogen in the surrounding environment of the nurseries because suitable hosts are present. The scenario assumes that the pathogen can infect leaves, which may still be present on the plants at the time of export. The scenario also assumes that the pathogen is not detected during the inspections because of presence of asymptomatic plants or difficulties in recognising early symptoms. Grafting can increase the incidence of the pathogen (via infected buds or by woundings).

A.1.8.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infected bundles of bare-root plants and whips (Median)

The scenario assumes a limited presence of the pathogen in the nurseries and in the surroundings and a limited reported susceptibility of *Alnus* spp.

A.1.8.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile / interquartile range)

The limited information on the occurrence of the pathogen in the nurseries and the surroundings and the susceptibility of *Alnus* spp. results in high level of uncertainties.

A.1.9 | Overall likelihood of pest freedom for cell-grown plants and single plants in pots (up to 7 years old) (small trees)

A.1.9.1 | Reasoning for a scenario which would lead to a reasonably low number of infected cell-grown plants and single plants in pots (up to 7 years old)

Younger plants are exposed to the pathogen for only short period of time and are exported as dormant plants without leaves. The scenario assumes *Alnus* spp. to be minor hosts for the pathogen. The scenario also assumes that symptoms of the disease are visible and promptly detected during inspections.

A.1.9.2 | Reasoning for a scenario which would lead to a reasonably high number of infected cell-grown plants and single plants in pots (up to 7 years old)

The scenario assumes a high pressure of the pathogen in the surrounding environment of the nurseries because suitable hosts are present. The scenario assumes that the pathogen can infect leaves, which may still be present on the plants at the time of export. The scenario also assumes that the pathogen is not detected during the inspections because of presence of asymptomatic plants or difficulties in recognising early symptoms. Grafting can increase the incidence of the pathogen (via infected buds or by woundings).

A.1.9.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infected cell-grown plants and single plants in pots (up to 7 years old) (Median)

The scenario assumes a limited presence of the pathogen in the nurseries and in the surroundings and a limited reported susceptibility of *Alnus* spp.

A.1.9.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/ interquartile range)

The limited information on the occurrence of the pathogen in the nurseries and the surroundings and the susceptibility of *Alnus* spp. results in high level of uncertainties.

A.1.10 | Elicitation outcomes of the assessment of the pest freedom for *Entoleuca mammata* on small trees

The elicited and fitted values for *E. mammata* for pest infestation and pest freedom agreed by the Panel are shown in Tables A.1.3, A.1.4 and in Figure A.1.2.

TABLE A.1.3 Elicited and fitted values of the uncertainty distribution of pest infestation by *Entoleuca mammata* per 10,000 bundles of small trees.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0					10		20		40					100
EKE	0.418	0.987	1.90	3.72	6.20	9.44	12.9	21.1	31.8	38.9	48.4	59.5	73.3	85.6	100

Note: The EKE results is the *BetaGeneral* (*1.0764, 6.8505, 0, 200*) distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infected bundles/plants the pest freedom was calculated (i.e. = 10,000 – number of infected bundles/plants per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.1.4.

TABLE A.1.4 The uncertainty distribution of bundles/plants free of *Entoleuca mammata* per 10,000 bundles of small trees calculated by Table A.1.3.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9900					9960		9980		9990					10,000
EKE results	9900	9914	9927	9940	9952	9961	9968	9979	9987	9991	9994	9996	9998	9999.0	9999.6

Note: The EKE results are the fitted values.

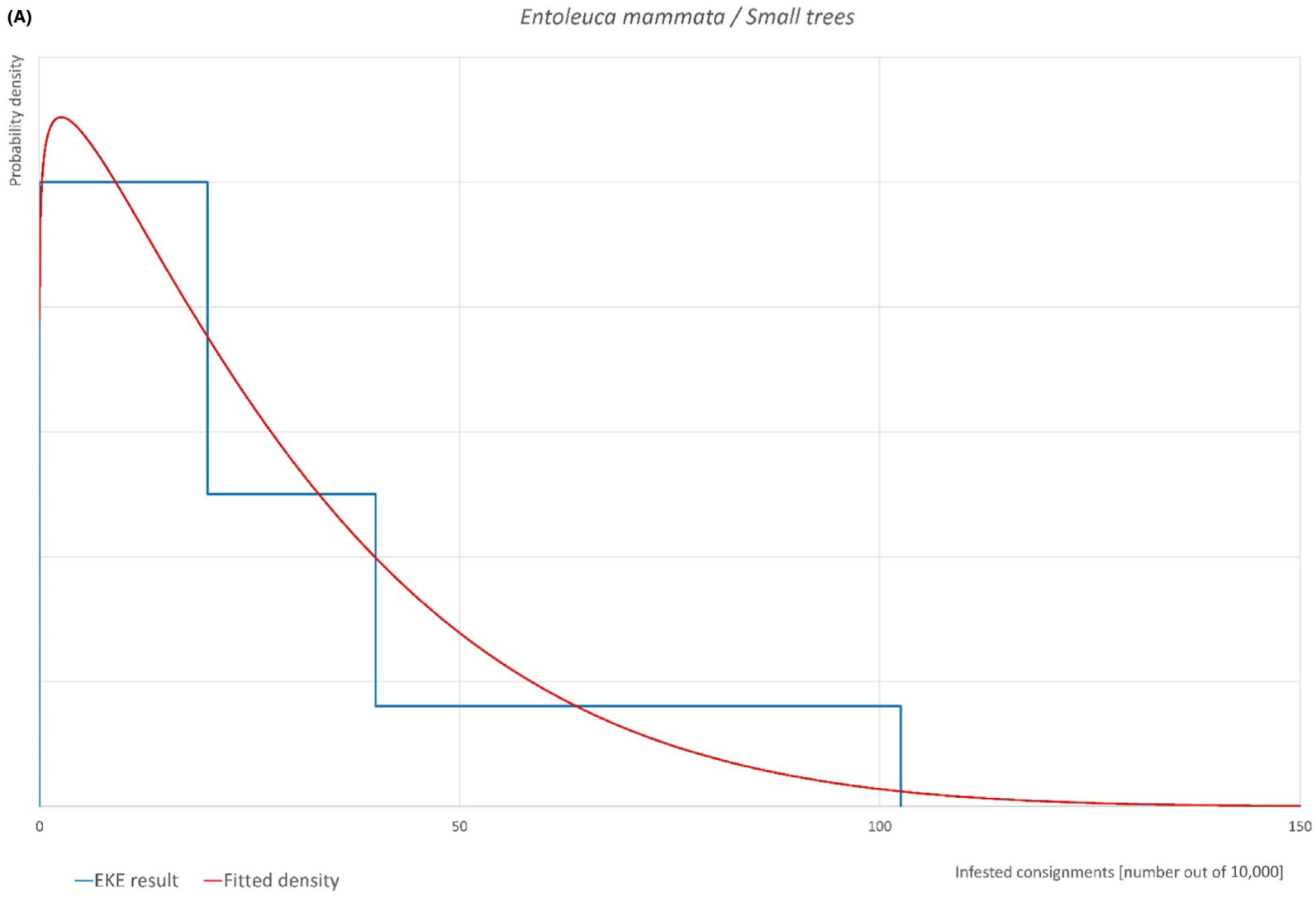


FIGURE A.1.2 (Continued)

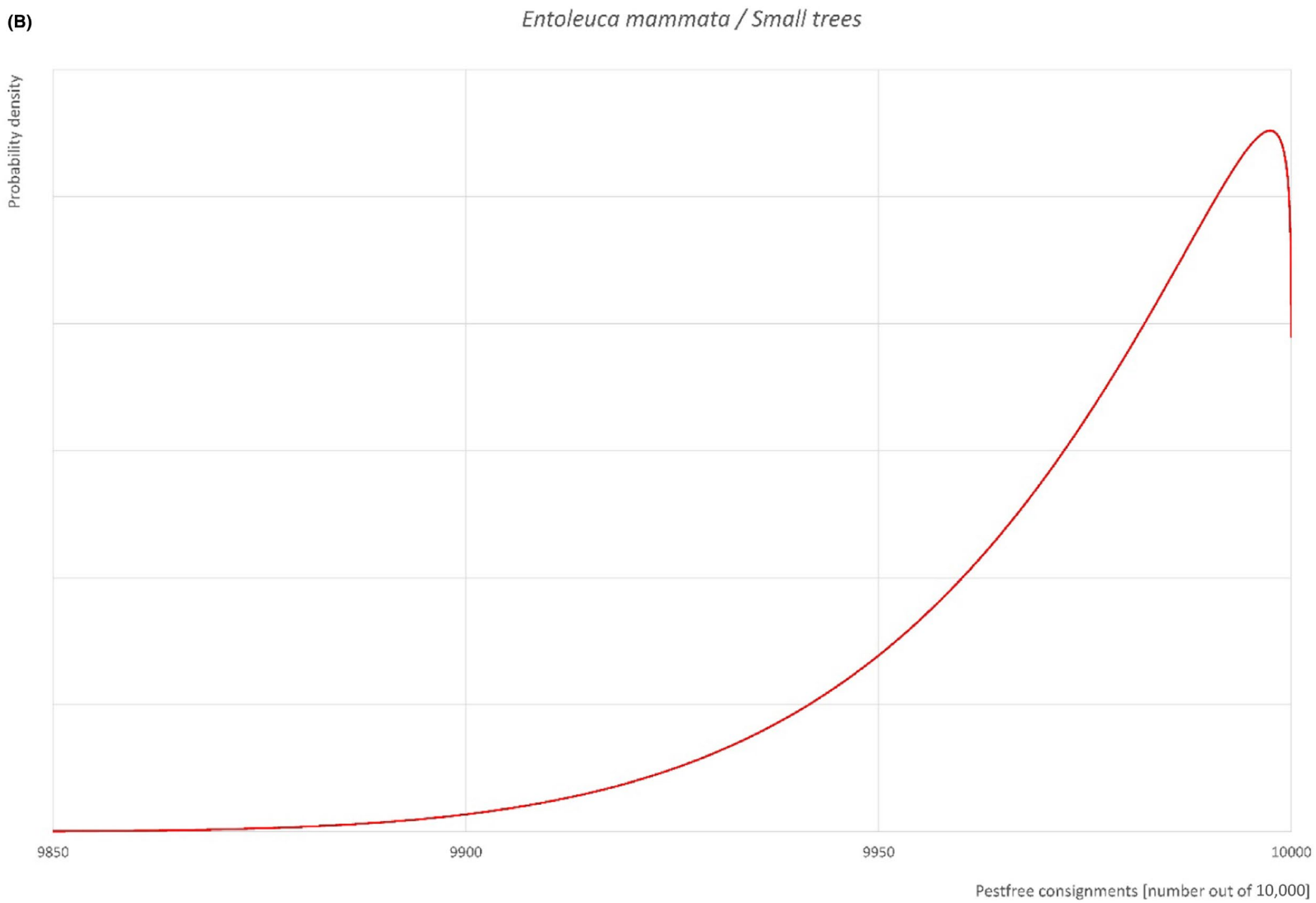


FIGURE A.1.2 (Continued)

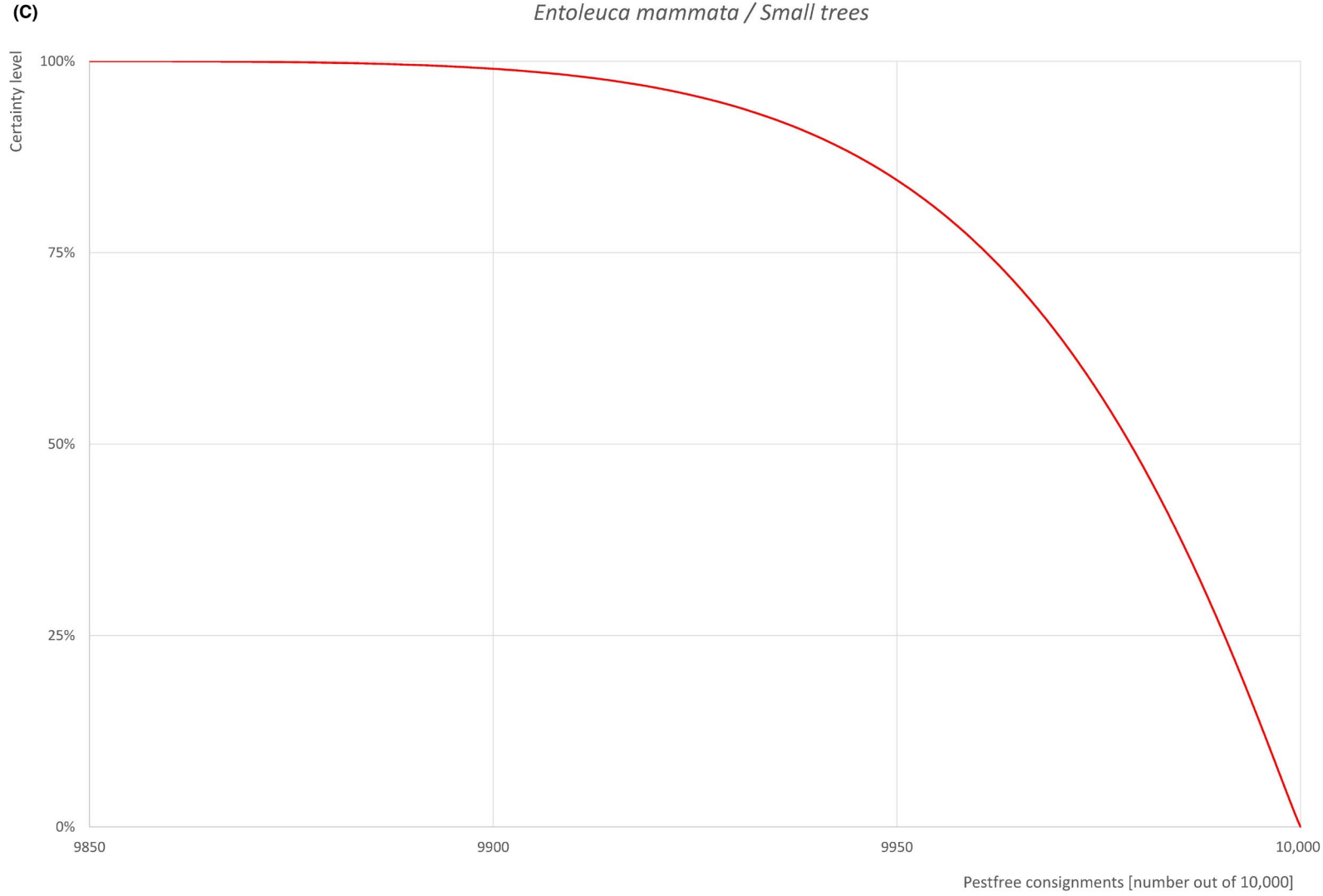


FIGURE A.1.2 (A) Elicited uncertainty of pest infection per 10,000 bundles of small trees (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free bundles/plants per 10,000 (i.e. = 1 – pest infection proportion expressed as percentage); (C) descending uncertainty distribution function of pestinfection per 10,000 bundles/plant.

A.1.11 | Reference list

Anderson, N. A., Ostry, M. E., & Anderson, G. W. (1979a). Insect wounds as infection sites for *Hypoxylon mammatum* on trembling aspen. *Phytopathology*, *69*, 476–479. https://doi.org/10.1094/phyto-69-476

Anderson, R. L., Anderson, G. W., & Schipper, A. L., Jr. (1979b). *Hypoxylon canker of aspen*. USDA Forest Insect and Disease Leaflet, 6, 6.

Anonymous. (1960). *Index of plant diseases in the United States*. U.S.D.A. Agric. Handb., 165, 1–531.

CABI (Centre for Agriculture and Bioscience International). (online). *Hypoxylon mammatum* (poplar canker). https://www.cabi.org/cpc/datasheet/28323

Callan, B. E. (1998). *Diseases of populus in British Columbia: A diagnostic manual*. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre.

Conners, I. L. (1967). *An annotated index of plant diseases in Canada and fungi recorded on plants in Alaska, Canada and Greenland*. Res. Bra. Canada Dept. Agri., 1251, 1–381.

DEFRA (Department for Environment, Food and Rural Affairs). (online). *UK risk register details for Entoleuca mammata*. https://planthealthportal.defra.gov.uk/pests-and-diseases/uk-plant-health-risk-register/viewPestRisks.cfm?cslref=11840

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Baptista, P., Chatzivassiliou, E., Di Serio, F., Gonthier, P., Jaques Miret, J. A., Justesen, A. F., MacLeod, A., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., Parnell, S., Reignault, P. L., Stefani, E., Thulke, H.-H., Van der Werf, W., Vicent Civera, A., Yuen, J., … Potting, R. (2024c). Commodity risk assessment of *Sorbus aucuparia* plants from the UK. *EFSA Journal*, *22*(6), e8837. https://doi.org/10.2903/j.efsa.2024.8837

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Baptista, P., Chatzivassiliou, E., Di Serio, F., Jaques Miret, J. A., Justesen, A. F., MacLeod, A., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., Parnell, S., Potting, R., Reignault, P. L., Stefani, E., Thulke, H.-H., Van der Werf, W., Vicent-Civera, A., Yuen, J., … Gonthier, P. (2023a). Scientific Opinion on the commodity risk assessment of *Acer campestre* plants from the UK. *EFSA Journal*, *21*(7), 8071. https://doi.org/10.2903/j.efsa.2023.8071

PLH Panel (EFSA Panel on Plant Health), Bragard, C., Baptista, P., Chatzivassiliou, E., Di Serio, F., Jaques Miret, J. A., Justesen, A. F., MacLeod, A., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., Parnell, S., Potting, R., Reignault, P. L., Stefani, E., Thulke, H.-H., Van der Werf, W., Vicent-Civera, A., Yuen, J., … Gonthier, P. (2023c). Scientific Opinion on the commodity risk assessment of *Acer platanoides* plants from the UK. *EFSA Journal*, *21*(7), 8073. https://doi.org/10.2903/j.efsa.2023.8073

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Baptista, P., Chatzivassiliou, E., Di Serio, F., Jaques Miret, J. A., Justesen, A. F., MacLeod, A., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., Parnell, S., Potting, R., Reignault, P. L., Stefani, E., Thulke, H.-H., Van der Werf, W., Vicent-Civera, A., Yuen, J., … Gonthier, P. (2023e). Scientific Opinion on the commodity risk assessment of *Acer pseudoplatanus* plants from the UK. *EFSA Journal*, *21*(7), 8074. https://doi.org/10.2903/j.efsa.2023.8074

EFSA PLH Panel (EFSA Panel on Plant Health), Civera, A. V., Baptista, P., Berlin, A., Chatzivassiliou, E., Cubero, J., Cunniffe, N., de la Peña, E., Desneux, N., Di Serio, F., Filipiak, A., Hasiów-Jaroszewska, B., Jactel, H., Landa, B. B., Maistrello, L., Makowski, D., Milonas, P., Papadopulos, N. T., Potting, R., … Gonthier, P. (2024a). Commodity risk assessment of *Betula pendula* and *Betula pubescens* plants from the UK. *EFSA Journal*, *22*(11), 9051. https://doi.org/10.2903/j.efsa.2024.9051

EFSA PLH Panel (EFSA Panel on Plant Health), Jeger, M., Bragard, C., Caffier, D., Candresse, T., Chatzivassiliou, E., Dehnen-Schmutz, K., Gilioli, G., Gregoire, J.-C., Jaques Miret, J. A., MacLeod, A., Navajas Navarro, M., Niere, B., Parnell, S., Potting, R., Rafoss, T., Rossi, V., Urek, G., Van Bruggen, A., … Pautasso, M. (2017). Scientific Opinion on the pest categorisation of *Entoleuca mammata*. *EFSA Journal*, *15*(7), 4925. https://doi.org/10.2903/j.efsa.2017.4925

EPPO (European and Mediterranean Plant Protection Organization). (online_a). *Entoleuca mammata (HYPOMA), categorization*. https://gd.eppo.int/taxon/HYPOMA/categorization

EPPO (European and Mediterranean Plant Protection Organization). (online_b). *Entoleuca mammata (HYPOMA), distribution*. https://gd.eppo.int/taxon/HYPOMA/distribution

EPPO (European and Mediterranean Plant Protection Organization). (online_c). *Datasheets on quarantine pests: Hypoxylon mammatum (HYPOMA), documents*. https://gd.eppo.int/taxon/HYPOMA/documents

Eriksson, O. E. (2014). *Checklist of the non-lichenized ascomycetes of Sweden*. Acta Univ. Upsal., Symb. Bot. Upsal., 36, 499.

EUROPHYT. (online). *European Union Notification System for Plant Health Interceptions – EUROPHYT*. http://ec.europa.eu/food/plant/plant_health_biosecurity/europhyt/index_en.htm

French, D. W., Hodges, C. S., Jr., & Froyd, J. D. (1969). Pathogenicity and taxonomy of *Hypoxylon mammatum*. *Canadian Journal of Botany*, *47*, 223–226.

Ginns, J. H. (1986). *Compendium of plant disease and decay fungi in Canada 1960–1980*. Res. Br. Can. Agric. Publ., 1813, 416.

Goos, R. D. (2010). *The mycota of Rhode Island: A checklist of the fungi recorded in Rhode Island (including lichens and myxomycetes)* (Vol. 4). Rhode Island Natural History Survey 222.

Hawksworth, D. L. (1972). *Hypoxylon mammatum*. CMI descriptions of pathogenic fungi and bacteria no. 356. CABI.

Kasanen, R., Hantula, J., Ostry, M. E., Pinon, J., & Kurkela, T. (2004). North American populations of *Entoleuca mammata* are genetically more variable than populations in Europe. *Mycological Research*, *108*, 766–774. https://doi.org/10.1017/s0953756204000334

Klejdysz, T., Kubasik, W., Strażyński, P., Gawlak, M., Pruciak, A., Rzepecka, D., & Kałuski, T. *Express pest risk analysis for Hypoxylon mammatum*. https://www.plantquarantine.pl//user_storage/36/pliki/pra_133/Entoleuca%20mammata.pdf

Manion, P. D., & Griffin, D. H. (1986). Sixty-five years of research on *Hypoxylon canker* of aspen. *Plant Disease*, *70*(8), 803–808. https://doi.org/10.1094/pd-70-803

Ostry, M. E. (2013). Hypoxylon canker. In P. Gonthier & G. Nicolotti (Eds.), *Infectious forest diseases* (pp. 407–419). Cabi International.

Ostry, M. E., & Anderson, N. A. (1983). Infection of trembling aspen by *Hypoxylon mammatum* through cicada oviposition wounds. *Phytopathology*, *73*, 1092–1096. https://doi.org/10.1094/phyto-73-1092

Ostry, M. E., & Anderson, N. A. (2009). Genetics and ecology of the *Entoleuca mammata*–Populus pathosystem: Implications for aspen improvement and management. *Forest Ecology and Management*, *257*, 390–400. https://doi.org/10.1016/j.foreco.2008.09.053

Stermer, B. A., Scheffer, R. P., & Hart, J. H. (1984). Isolation of toxins from *Hypoxylon mammatum* and demonstration of some toxin effects on selected clones of *Populus tremuloides*. *Phytopathology*, *74*, 654–658. https://doi.org/10.1094/phyto-74-654

TRACES-NT. (online). *TRAde control and expert system*. https://webgate.ec.europa.eu/tracesnt

Vasilyeva, L. N., & Scheuer, C. (1996). *Recent collections of stromatic pyrenomycetes from Austria, especially from Styria*. Mitt. Naturwiss. Vereins Steiermarkv.

A.2 | *Phytophthora ramorum*

A.2.1 | Organism information

Taxonomic information	Current valid scientific name: *Phytophthora ramorum* Werres, De Cock & Man in 't Veld Synonyms: – Name used in the EU legislation: *Phytophthora ramorum* (non-EU isolates) Werres, De Cock & Man in 't Veld [PHYTRA] Order: Peronosporales Family: Peronosporaceae Common name: Sudden Oak Death (SOD), ramorum bleeding canker, ramorum blight, ramorum leaf blight, twig and leaf blight Name used in the Dossier: *Phytophthora ramorum*
Group	Oomycetes
EPPO code	PHYTRA
Regulated status	The pathogen is listed in Annex II of Commission Implementing Regulation (EU) 2019/2072 as *Phytophthora ramorum* (non-EU isolates) Werres, De Cock & Man in 't Veld [PHYTRA]. The EU isolates of *P. ramorum* are listed as regulated non-quarantine pest (RNQP) The pathogen is included in the EPPO A2 list (EPPO, online_a) *P. ramorum* is listed as a quarantine pest in the UK (EPPO, online_b)
Pest status in the UK	*Phytophthora ramorum* is present in the UK (Brown and Brasier, 2007; Dossier Section 2.0; CABI, online; EPPO, online_c) According to the Dossier Section 2.0, non-EU isolates of *P. ramorum* are present in the UK: not widely distributed and under official control. It has been found in most regions of the UK, but it is more often reported in wetter, western regions
Pest status in the EU	*P. ramorum* is a regulated pest in the EU
Host status on Alnus spp.	*Alnus cordata* is reported as a host (EPPO online, O'Hanlon et al., 2016) According to Sansford et al. (2009) *A. glutinosa* and *A. incana* range from low susceptibility to resistant hosts *A. glutinosa* and *A. incana* show symptoms after inoculation in the lab (Denman et al., 2005; Matsiakh & Menkis, 2023)
Risk Assessment information	Pest Risk Assessments available: – Risk analysis for *Phytophthora ramorum* Werres, de Cock & Man in't Veld, causal agent of sudden oak death, ramorum leaf blight and ramorum dieback (Cave et al., 2008) – Risk analysis of *Phytophthora ramorum*, a newly recognised pathogen threat to Europe and the cause of sudden oak death in the USA (Sansford et al., 2009) – Scientific opinion on the pest risk analysis on *Phytophthora ramorum* prepared by the FP6 project RAPRA (EFSA Panel on Plant Health, 2011) – Pest risk management for *Phytophthora kernoviae* and *Phytophthora ramorum* (EPPO, 2013) – UK Risk Register Details for *Phytophthora ramorum* (DEFRA, online) – Commodity risk assessment of *Acer campestre, A. platanoides, A. pseudoplatanus*, *Cornus* spp., *Sorbus aucuparia*, *Betula* spp. plants from the UK (EFSA PLH Panel, 2023a, 2023b, 2023c, 2024a, 2024b, 2024c)
Other relevant information for the assessment	
Biology	*P. ramorum* is most probably native to East Asia (Jung et al., 2021; Poimala & Lilja, 2013). The pathogen is present in Asia (Japan, Vietnam), Europe (Belgium, Croatia, Denmark, Finland, France, Germany, Guernsey, Ireland, Luxembourg, the Netherlands, Norway, Poland, Portugal, Slovenia, the UK), North America (Canada, US) and South America (Argentina) (EPPO, online_c) *P. ramorum* is heterothallic oomycete species belonging to clade 8c (Blair et al., 2008) with two mating types: A1 and A2 (Boutet et al., 2010) *Phytophthora* species generally reproduce through a) dormant (resting) spores which can be either sexual (oospores) or asexual (chlamydospores); and b) fruiting structures (sporangia) which contain zoospores (Erwin & Ribeiro, 1996) *P. ramorum* produces sporangia on the surfaces of infected leaves and twigs of host plants. These sporangia can be splash-dispersed or carried by wind and rain to longer distances. The sporangia germinate in free water to produce zoospores that penetrate and initiate an infection on new hosts. In infected plant material the chlamydospores are produced and can serve as resting structures (Davidson et al., 2005; Grünwald et al., 2008). Trunk cankers (e.g. on *Quercus, Fagus*) are not known to support sporulation (DEFRA, 2008). The pathogen is also able to survive in soil (Shishkoff, 2007). In the west of Scotland, it persisted in soil for at least 2 years after its hosts were removed (Elliot et al., 2013). Oospores were only observed in pairing tests under controlled laboratory conditions (Brasier & Kirk, 2004). Optimal temperatures under laboratory conditions were 16–26°C for growth, 14–26°C for chlamydospore production and 16–22°C for sporangia production (Englander et al., 2006) *P. ramorum* is mainly a foliar pathogen, however it was also reported to infect shoots, stems and occasionally roots of various host plants (Grünwald et al., 2008; Parke & Lewis, 2007). According to Brown & Brasier (2007), *P. ramorum* commonly occupies xylem beneath phloem lesions and may spread within xylem and possibly recolonise the phloem from the xylem. *P. ramorum* can remain viable within xylem for 2 or more years after the overlying phloem has been excised *P. ramorum* can disperse by aerial dissemination, water, movement of infected plant material and soil containing propagules on footwear, tires of trucks and mountain bikes, or the feet of animals (Brasier, 2008; Davidson et al., 2002)

(Continued)

	Infected foliar hosts can be a major source of inoculum, which can lead to secondary infections on nearby host plants. Important foliar hosts in Europe are *Rhododendron* spp. and *Larix kaempferi* (Brasier & Webber, 2010, Grünwald et al., 2008) Possible pathways of entry for *P. ramorum* are plants for planting (excluding seed and fruit) of known susceptible hosts; plants for planting (excluding seed and fruit) of non-host plant species accompanied by contaminated attached growing media; soil/growing medium (with organic matter) as a commodity; soil as a contaminant; foliage or cut branches; susceptible (isolated) bark and susceptible wood (EFSA Panel on Plant Health, 2011)	
Symptoms	**Main type of symptoms**	There is no information on the symptoms caused by *P. ramorum* to *Alnus* spp. plants *P. ramorum* causes different types of symptoms depending on the host species and the plant tissue infected According to DEFRA (2008) *P. ramorum* causes three different types of disease: a) 'Ramorum bleeding canker' – cankers on trunks of trees, which emit a dark ooze. As they increase in size they can lead to tree death b) 'Ramorum leaf blight' – infection of the foliage, leading to discoloured lesions on the leaves c) 'Ramorum dieback' – shoot and bud infections which result in wilting, discolouration and dying back of affected parts
	Presence of asymptomatic plants	If roots are infected by *P. ramorum*, the plants can be without aboveground symptoms for months until developmental or environmental factors trigger disease expression (Roubtsova and Bostock, 2009; Thompson et al., 2021) Application of some fungicides may reduce symptoms and therefore mask infection, making it more difficult to determine whether the plant is pathogen-free (DEFRA, 2008)
	Confusion with other pests	Various symptoms caused by *P. ramorum* can be confused with other pathogens, such as: canker and foliar symptoms caused by other *Phytophthora* species (*P. cinnamomi*, *P. cambivora*, *P. citricola* and *P. cactorum*); leaf lesions caused by rust in early stages; leafspots caused by sunburn; dieback of twigs and leaves caused by *Botryosphaeria dothidea* (Davidson et al., 2003) *P. ramorum* can be easily distinguished from other *Phytophthora* species based on morphology and molecular tests EPPO (2006)
Host plant range	*P. ramorum* has a very wide host range, which is expanding Main host plants include *Camellia* spp., *Larix decidua*, *L. kaempferi*, *Pieris* spp., *Rhododendron* spp., *Syringa vulgaris, Viburnum* spp. and the North American trees species, *Lithocarpus densiflorus* and *Quercus agrifolia* (EPPO online_d) Further proven hosts confirmed by Koch's postulates are *Abies grandis*, *A. magnifica*, *Acer circinatum*, *A. macrophyllum, A. pseudoplatanus*, *Adiantum aleuticum, A. jordanii, Aesculus californica*, *A. hippocastanum*, *Arbutus menziesii*, *Arbutus unedo*, *Arctostaphylos columbiana*, *Agrostis glauca*, *A. hooveri*, *A. manzanita, A. montereyensis*, *A. morroensis*, *A. pilosula*, *A. pumila*, *A. silvicola*, *A. viridissima*, *Calluna vulgaris*, *Castanea sativa*, *Ceanothus thyrsiflorus*, *Chamaecyparis lawsoniana*, *Chrysolepis chrysophylla*, *Cinnamomum camphora*, *Cornus kousa, Cornus hybrids, Corylus cornuta*, *Fagus sylvatica*, *Frangula californica*, *Frangula purshiana*, *Fraxinus excelsior, Gaultheria procumbens*, *G. shallon*, *Griselinia littoralis*, *Hamamelis virginiana*, *Heteromeles arbutifolia*, *Kalmia* spp., *Larix* × *eurolepis*, *Laurus nobilis*, *Lonicera hispidula*, *Lophostemon confertus*, *Loropetalum chinense*, *Magnolia* × *loebneri*, *M. oltsopa*, *M. stellata*, *Mahonia aquifolium*, *Maianthemum racemosum*, *Parrotia persica*, *Photinia fraseri*, *Phoradendron serotinum* subsp. *macrophyllum*, *Photinia* × fraseri, *Prunus laurocerasus*, *Pseudotsuga menziesii* var. *menziesii*, *Quercuscerris*, *Q. chrysolepis*, *Q. falcata Q. ilex*, *Q. kelloggii*, *Q. parvula* var. *shrevei*, *Rosa gymnocarpa*, *Salix caprea*, *Sequoia sempervirens*, *Taxus baccata*, *Trientalis latifolia*, *Umbellularia californica*, *Vaccinium myrtillus*, *V. ovatum*, *V. parvifolium* and *Vinca minor* (APHIS USDA, 2022; Cave et al., 2008; EPPO, online_d; Jung et al., 2016)	
Reported evidence of impact	Not relevant, *P. ramorum* is an EU regulated quarantine pest	
Evidence that the commodity is a pathway	Life stages of *P. ramorum* can be present on leaves, stems, branches or roots of whips, bare-root plants and potted plants. *P. ramorum* can be present in soil, however potted plants contain only new growing media. *P. ramorum* is regularly intercepted in the EU on different plant species intended for planting (EUROPHYT/TRACES-NT, online). Therefore, plants for planting of *Alnus* spp. are possible pathway for *P. ramorum*	
Surveillance information	The UK carries out surveys for *P. ramorum* (Dossier Section 1.0). At growing sites, *P. ramorum* -infested plants are destroyed and potentially infested plants are 'held' (prohibited from moving). The UK has a containment policy in the wider environment with official action taken to remove infected trees (Dossier Section 1.0) As part of an annual survey at ornamental retail and production sites (frequency of visits determined by a decision matrix) *P. ramorum* is inspected on common host plants. An additional inspection, during the growing period, is carried out at plant passport production sites. Inspections are carried out at a survey to 300 non-woodland wider environment sites annually (Dossier Sections 1.0)	

A.2.2 | Possibility of pest presence in the nursery

A.2.2.1 | Possibility of entry from the surrounding environment

Phytophthora ramorum is present in the UK, it has been found in most regions of the UK, but it is more often reported in wetter, western regions (Dossier Section 1.0). The possible entry of *P. ramorum* from surrounding environment to the nurseries may occur through aerial dissemination, water and animals (Davidson et al., 2002).

The locations of the exporting nurseries are the same as for the nurseries evaluated for the *Acer* campestre, *A. platanoides*, *A. pseudoplatanus, Betula pendula*, *Cornus alba*, *C. sanguinea* and *Sorbus aucuparia* Dossiers (EFSA PHL Panel, 2023a, 2023b, 2023c; EFSA PHL Panel, 2024a, 2024b, 2024c).

Therefore, the Panel assumes that the same host plant species are present in the surrounding environment.

Exporting nurseries are predominately situated in the rural areas. The surrounding land would tend to be arable farmland with some pasture for animals and small areas of woodland. Hedges are often used to define field boundaries and grown along roadsides. Woodlands tend to be a standard UK mixed woodland with a range of UK native trees, that include host plants for the pathogen such as Oak (*Quercus robur*), Ash (*Fraxinus*), Sycamore (*Acer pseudoplatanus*), Holly (*Ilex*), Norway maple (*Acer platanus*) and field maple (*Acer campestre*). Hedges are made up of a range of species, including Yew (*Taxus baccata*), Holly (*Ilex*), Laurel (*Prunus laurocerasus*) and leylandii (Cupressus × leylandii) as a host for *P. ramorum* (Dossier Section 1.0; EPPO).

Uncertainties:

– The dispersal range of *P. ramorum* sporangia.
– There is no information available on the distance of the nurseries to sources of pathogen in the surrounding environment.

A.2.2.2 | Possibility of entry with new plants/seeds

Plants are produced by seeds and grafting. Seeds purchased in the UK are certified under The Forest Reproductive Material (Great Britain) Regulations 2002 (legislation.gov.uk); seedlings sourced in the UK are certified with UK Plant Passports; a small percentage of plants may be obtained from EU (Netherlands); seedlings from the EU countries are certified with phytosanitary certificates.

The pathogen is not known to be seedborne or seed transmitted, therefore not expected to enter the nursery via the seed pathway. Grafted plants (scion and buds in the case of grafting) originate from the nursery itself.

The seedling pathways is unlikely because the conditions of their production (seedbed in the greenhouse, pest free growing media) are expected to prevent the infection of seedlings.

The nurseries use virgin peat or peat-free compost (a mixture of coir, tree bark, wood fibre, etc.) as a growing media (Dossier Section 1.0).

The growing media is heat-treated by commercial suppliers during production to eliminate pests and diseases (Dossier Section 1.0).

Uncertainties:

– There are no uncertainties.
– Taking into consideration the above evidence and uncertainties, the Panel considers that it is unlikely for the pathogen to enter the nurseries via seeds or seedlings of *Alnus*.

A.2.2.3 | Possibility of spread within the nursery

Alnus plants are grown in containers (cells, pots, tubes, etc.) outdoors, in the open air or field. Cell-grown trees may be grown in greenhouses; however, most plants will be field-grown or field-grown in containers (Dossier Section 1.0).

The nurseries exporting *Alnus* spp. plants produce several other host plants of *P. ramorum*. Therefore, is it possible that *P. ramorum* can spread within the nursery from infested host plants of other species to the plot with *Alnus* spp. plants.

P. ramorum can spread within the nurseries by aerial dissemination/water splash: via soil, water, movement of infested plant material (e.g. infested leaves) and animals/humans (Davidson et al., 2002).

Uncertainties:

– The phytosanitary status of other species grown inside the nursery.

A.2.3 | Information from interceptions

P. ramorum is regularly intercepted in the EU on different plant species intended for planting (EUROPHYT/TRACES-NT, online). In the EUROPHYT/TRACES-NT database there are no records of interceptions of *P. ramorum* on *Alnus* spp. from third countries or on any other plant species from the UK.

A.2.4 | Evaluation of the risk mitigation measures

In the table below, all risk mitigation measures currently applied in the UK are listed and an indication of their effectiveness on *P. ramorum* is provided. The description of the implemented risk mitigation measures is provided in the Table 9.

No.	Risk mitigation measure	Effect on the pest	Evaluation and uncertainties
1	Registration of production sites	Yes	All nurseries are registered as professional operator with the UK NPPO, by the Animal Plant Health Agency (APHA) for England and Wales, or with SASA for Scotland, and is authorised to issue UK plant passports (Dossier Section 1.0) Evaluation: – The risk mitigation measure is expected to be effective in reducing the likelihood of presence of the pathogen on the commodity Uncertainties: – Whether early symptoms on *Alnus* spp. are easily recognisable
2	Certification of plant material	Yes	*Alnus cordata, A. incana* and *A. glutinosa* seeds purchased in the UK are certified under The Forest Reproductive Material (Great Britain) Regulations 2002 (legislation.gov.uk); seedlings sourced in the UK are certified with UK Plant Passports; a small percentage of plants may be obtained from EU (Netherlands); seedlings from the EU countries are certified with phytosanitary certificates. (Dossier Section 1.0) The starting material of *Alnus* production consists of seed and seedlings. Seeds are certified. Seedlings for production sourced in the UK are certified with UK Plant Passports; seedlings from the EU countries are certified with phytosanitary certificates Evaluation: – *P. ramorum* is a quarantine pest and it is highly unlikely that the pathogen is present on the certified starting material Uncertainties: – None
3	Origin and treatment of growing media	Yes	Rooted plants in pots: In the production or procurement of these plants, the use of growing media is assessed for the potential to harbour and transmit plant pests. Growers most commonly use virgin peat or peat-free compost, which is a mixture of coir, tree bark, wood fibre, etc. The compost is heat-treated by commercial suppliers during production to eliminate pests and diseases. It is supplied in sealed bulk bags or shrink-wrapped bales and stored off the ground on pallets, these are completely hygienic and free from contamination. Where delivered in bulk, compost is kept in a dedicated bunker, either indoors or covered by tarpaulin outdoors, and with no risk of contamination with soil or other material (Dossier Section 1.0) Evaluation: – The measure is efficient in preventing the entry of the pathogen via the substrate into the nursery Uncertainties: – None
4	Surveillance, monitoring and sampling	Yes	Inspection is carried out at least once a year as part of the Quarantine Surveillance programme (Great Britain uses the same framework for its surveillance programme as the EU). Surveillance is based on visual inspection with samples taken from symptomatic material, and where appropriate, samples are also taken from asymptomatic material (e.g. plants, tubers, soil, watercourses) (Dossier Section 1.0) Evaluation: – The surveillance, monitoring and sampling can detect the pathogen. No results are reported Uncertainties: – The efficiency of the surveillance, monitoring and sampling
5	Hygiene measures	Yes	According to the Dossier Section 1.0, all the nurseries have plant hygiene and housekeeping rules and practices in place, which are communicated to all relevant employees. These measures include: – Cleaning and sterilisation of tools – Waste treatment and disposal Evaluation: – It is unlikely that the fungus spreads by the pruning tools – The correct disposal of infected plant material prevents the spread of the fungus Uncertainties: – The efficiency of hygiene measures performed in the nurseries

(Continues)

(Continued)

No.	Risk mitigation measure	Effect on the pest	Evaluation and uncertainties
6	Irrigation water quality and/or treatments	Yes	Growers are required to assess water sources, irrigation and drainage systems used in the plant production for the potential to harbour and transmit plant pests. Water is routinely sampled and sent for analysis. No quarantine pests have been found (Dossier Section 1.0) Evaluation: – There is no disinfestation treatment applied to the irrigation water. However, irrigation water is routinely sampled and tested for quarantine pests. This procedure can reduce the risk Uncertainties: – The frequency of sampling and the method used for the detection of the pathogen
7	Application of pest control products	Yes	Crop protection is achieved using a combination of measures including approved plant protection products, biological control or physical measures. Plant protection products are only used when necessary and records of all plant protection treatments are kept (Dossier Section 1.0) Evaluation: – Some fungicides are applied and could reduce the likelihood of the infection by the pathogen, but detailed information is lacking in the Dossier Uncertainties: – No specific information on the efficacy of the fungicides used
8	Washing of the roots (bare-root plants)	Yes	Bare-root plants are lifted from the field in winter and then root-washed on site and stored prior to export (Dossier Section 1.0) Evaluation: – The washing of the roots removes (parts of) the soil and the pathogen present in the soil Uncertainties: – The effectiveness of the washing to remove all soil with the pathogen
9	Inspections and management of plants before export	Yes	The UK NPPO carries out inspections and testing where required by the country of destination's plant health legislation, to ensure all requirements are fulfilled and a valid phytosanitary certificate with the correct additional declarations is issued Separate to any official inspection, plant material is checked by growers for plant health issues before dispatch Evaluation: – The inspections and management of plants before export can detect the pathogen Uncertainties: – Whether early symptoms caused by the pathogen on *Alnus* species are identified by visual inspections

A.2.5 | Overall likelihood of pest freedom for the exported commodity (comparative)

A.2.5.1 | Comparison with other relevant commodity Risk Assessments involving *Phytophthora ramorum*

P. ramorum was already assessed as actionable pest for several commodity risk assessments of *Acer* campestre, *A. platanoides*, *A. pseudoplatanus*, *Betula* spp., *Corylus avellana, Cornus* spp., *Fagus sylvatica, Quercus robur and Sorbus* spp. plants from UK (EFSA PLH Panel, 2023a, 2023b, 2023c, 2023d, 2023e; 2024a, 2024b, 2024c, 2024d).

There are large similarities in the production sites, procedures and exported commodity types for *Alnus* spp. and *Betula* spp.

The similarities between the dossier of *Betula* spp. and *Alnus* spp. are:

The type of commodities exported (graftwood, whips up to 2 years old, bare-root plants up to 7 years old and potted plants);

– The age and size of the exported plants;
– The overall production system;
– The location of the nurseries and the presence of other host plants in the surrounding environment;
– *Betula* and *Alnus* (both belonging to the *Betulaceae* family) are not reported as a major host of *P. ramorum*.

Therefore, for the estimation of the pest freedom level of *P. ramorum* in exported *Alnus* plants, the Panel decided to base the estimated values for *Alnus* on the estimated values for *Betula pendula* and *B. pubescens* (EFSA PLH Panel 2024a).

A.2.6 | Overall likelihood of pest freedom for bundles of graftwood

A.2.6.1 | Reasoning for a scenario which would lead to a reasonably low number of infected bundles of graftwood

The scenario assumes a low pressure of the pathogen in the nurseries and in the surroundings. The plants are exposed to the pathogen for only a short period of time and are exported as dormant plants without roots and leaves. The scenario assumes *Alnus* spp. to be minor hosts for the pathogen. The scenario also assumes that symptoms of the disease are visible and promptly detected during inspections. The scenario also assumes that graftwood is not taken from symptomatic plants. *P. ramorum* is a quarantine pest subjected to official inspections.

A.2.6.2 | Reasoning for a scenario which would lead to a reasonably high number of infected bundles of graftwood

The scenario assumes a high pressure of the pathogen in the surrounding environment of the nurseries because suitable hosts are present. The scenario also assumes that the pathogen is not detected during the inspections because of presence of asymptomatic plants or difficulties in recognising early symptoms.

A.2.6.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infected bundles of graftwood (Median)

The scenario assumes a limited presence of the pathogen in the nurseries and in the surroundings and a limited reported susceptibility of *Alnus* spp. The pathogen is a regulated quarantine pest in the UK and under official control.

A.2.6.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/ interquartile range)

The limited information on the occurrence of the pathogen in the nurseries and the surroundings and the susceptibility of *Alnus* spp. results in high level of uncertainties.

A.2.7 | Elicitation outcomes of the assessment of the pest freedom for *Phytophthora ramorum* on graftwood

The elicited and fitted values for *P. ramorum* for pest infestation and pest freedom agreed by the Panel are shown in Tables A.2.1, A.2.2 and in Figure A.2.1.

TABLE A.2.1 Elicited and fitted values of the uncertainty distribution of pest infestation by *Phytophthora ramorum* per 10,000 bundles of graftwood.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0					6		12		22					45
EKE	0.270	0.631	1.21	2.33	3.84	5.78	7.82	12.4	18.1	21.6	26.1	30.9	36.3	40.6	45.0

Note: The EKE results is the *BetaGeneral* (*1.0863, 3.2055, 0, 58.3*) distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infected bundles the pest freedom was calculated (i.e. = 10,000 – number of infected bundles per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.2.2.

TABLE A.2.2 The uncertainty distribution of plants free of *Phytophthora ramorum* per 10,000 bundles of graftwood calculated by Table A.2.1.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9955					9978		9988		9994					10,000
EKE results	9955	9959	9964	9969	9974	9978	9982	9988	9992	9994	9996	9997.7	9998.8	9999.4	9999.7

Note: The EKE results are the fitted values.

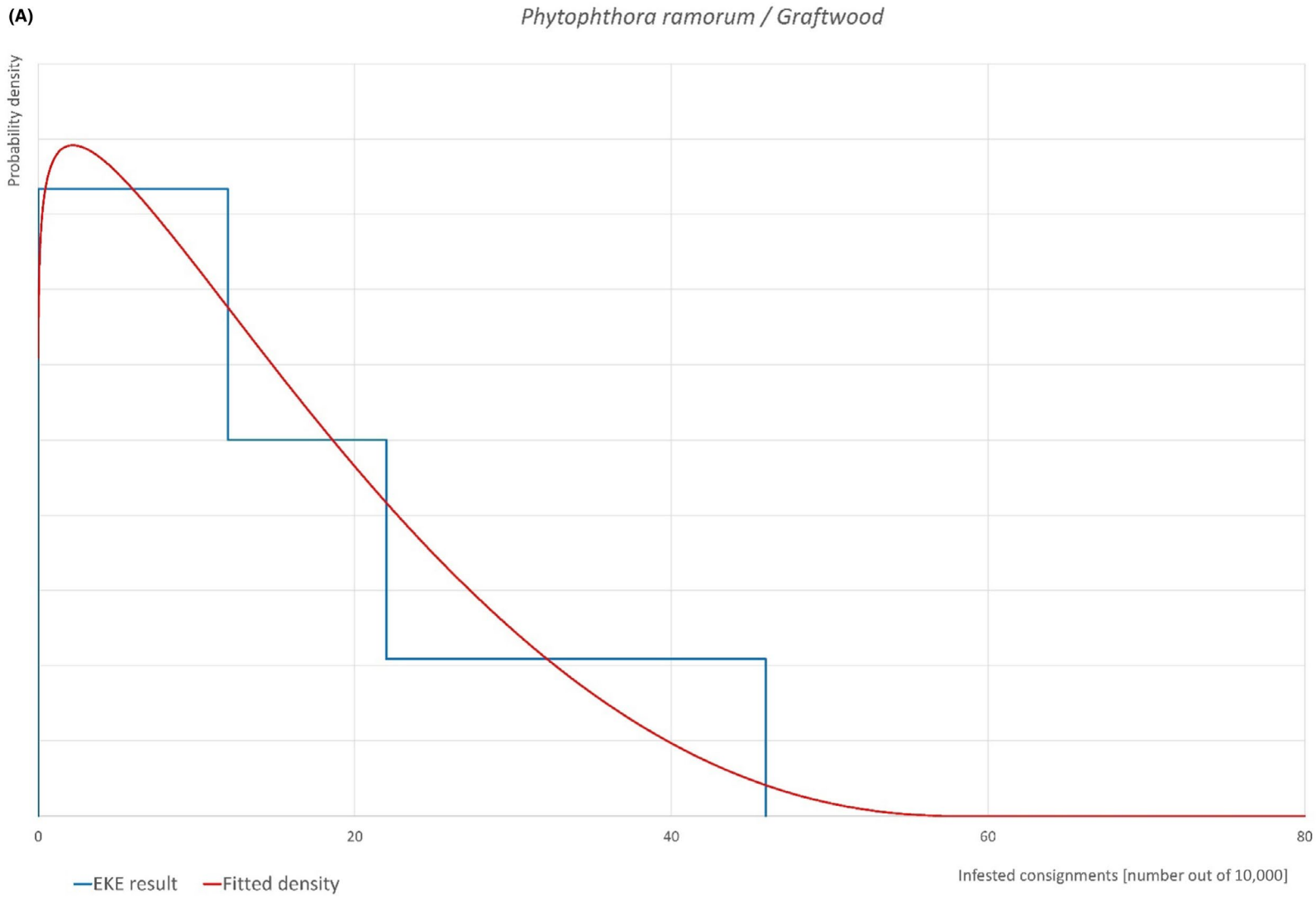


FIGURE A.2.1 (Continued)

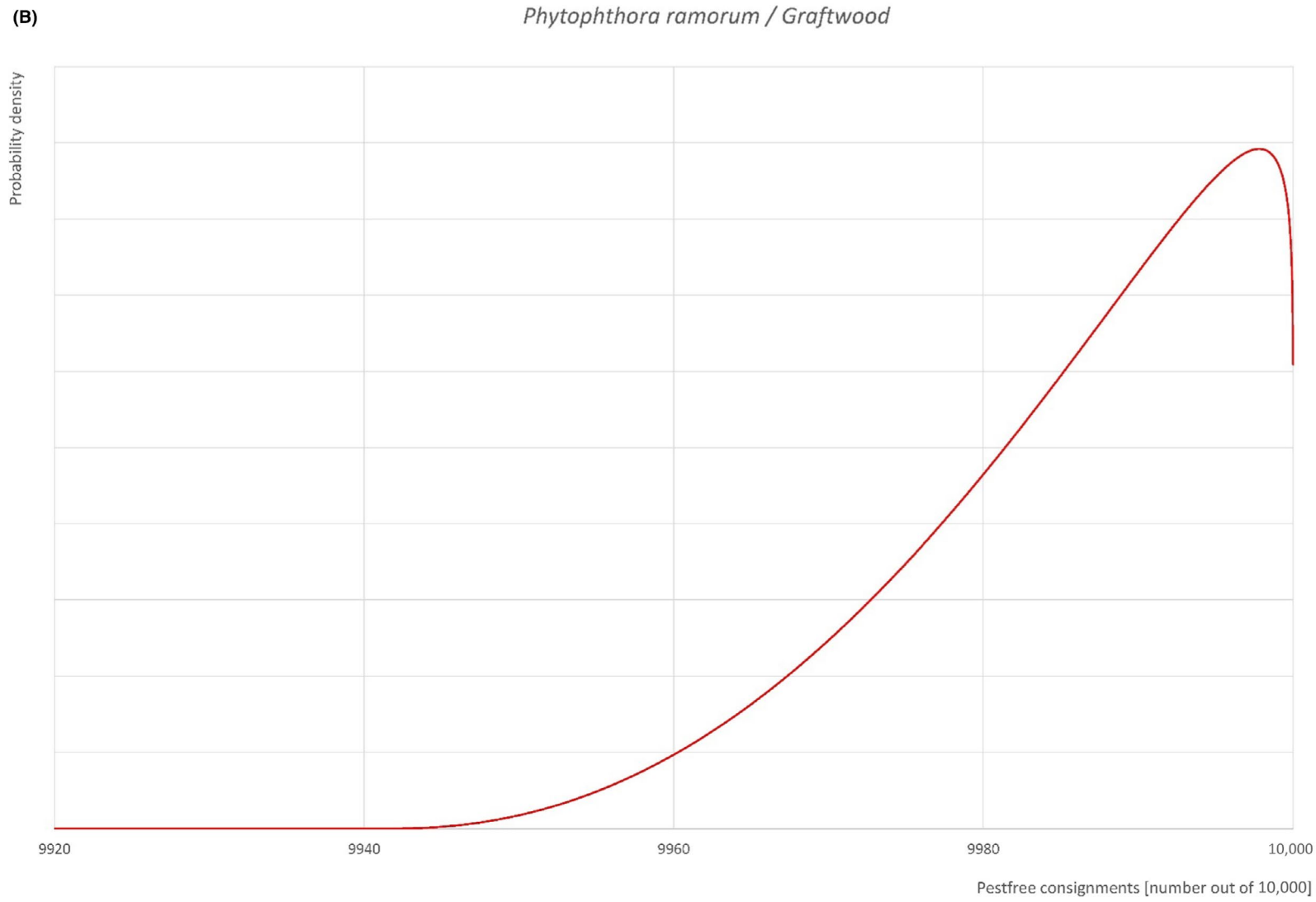


FIGURE A.2.1 (Continued)

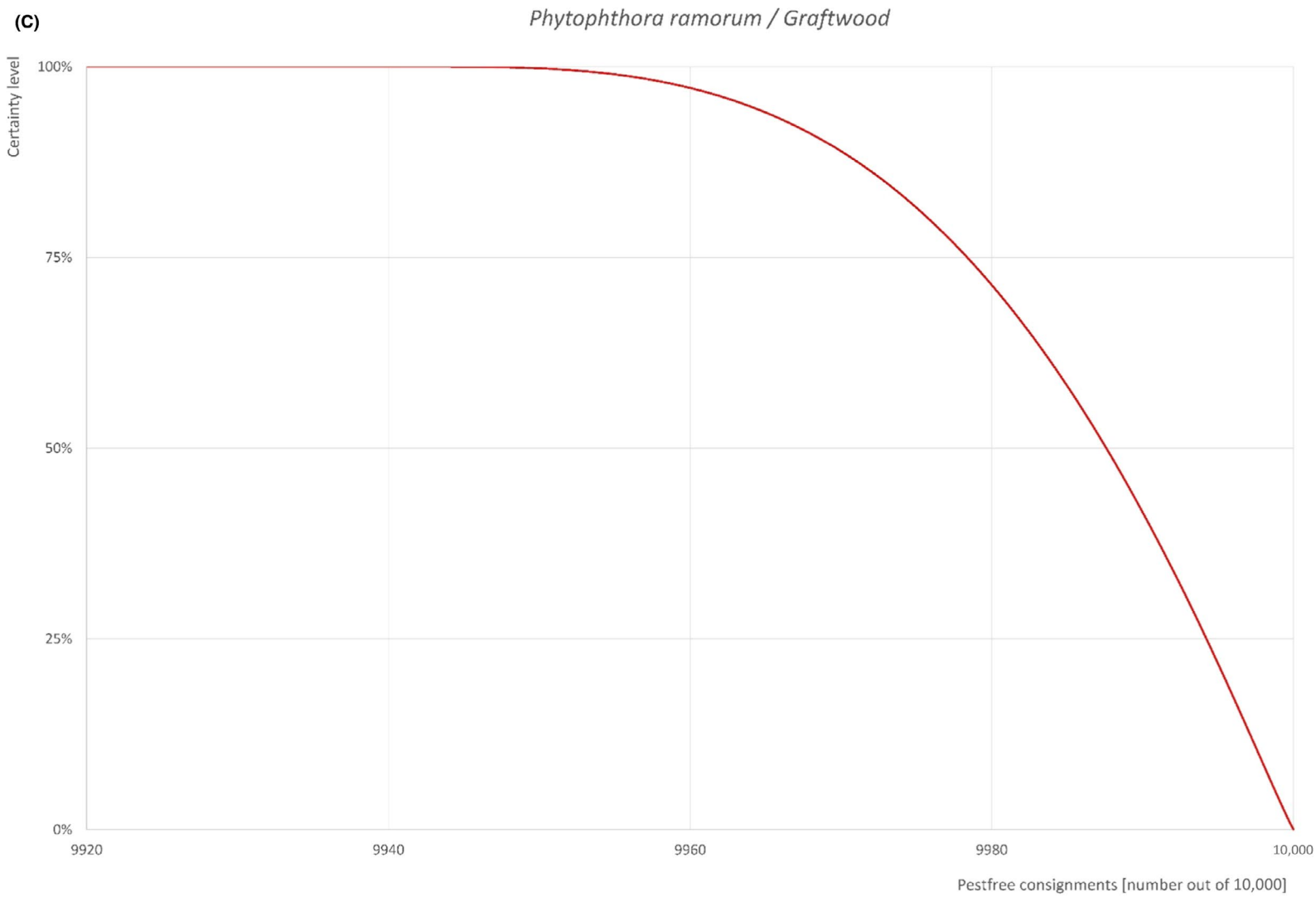


FIGURE A.2.1 (A) Elicited uncertainty of pest infection per 10,000 bundles of graftwood (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free bundles per 10,000 (i.e. = 1 − pest infection proportion expressed as percentage); (C) descending uncertainty distribution function of pest infection per 10,000 bundles.

A.2.8 | Overall likelihood of pest freedom for bundles of bare-root plants and whips (small trees).

A.2.8.1 | Reasoning for a scenario which would lead to a reasonably low number of infected bundles of bare-root plants and whips (small trees).

The scenario assumes a low pressure of the pathogen in the nurseries and in the surroundings. Younger plants are exposed to the pathogen for only short period of time and are exported as dormant plants without leaves. The scenario assumes *Alnus* spp. to be minor hosts for the pathogen. The scenario also assumes that symptoms of the disease are visible and promptly detected during inspections. The washing of the roots removes (parts of) the soil and the pathogen present in the soil.

A.2.8.2 | Reasoning for a scenario which would lead to a reasonably high number of infected bundles of bare-root plants and whips (small trees)

The scenario assumes a high pressure of the pathogen in the surrounding environment of the nurseries because suitable hosts are present. The scenario assumes that the pathogen can infect leaves, which may still be present on the plants at the time of export. The scenario also assumes that the pathogen is not detected during the inspections because of presence of asymptomatic plants or difficulties in recognising early symptoms. Grafting can increase the incidence of the pathogen (via infected buds or by woundings). The washing of the roots may not remove all the attached soil from the plants.

A.2.8.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infected bundles of bare-root plants and whips (small trees) (Median)

The scenario assumes a limited presence of the pathogen in the nurseries and in the surroundings and a limited reported susceptibility of *Alnus* spp. The pathogen is a regulated quarantine pest in the UK and under official control.

A.2.8.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/ interquartile range)

The limited information on the occurrence of the pathogen in the nurseries and the surroundings and the susceptibility of *Alnus* spp. results in high level of uncertainties.

A.2.9 | Overall likelihood of pest freedom for cell-grown plants and single plants in pots (up to 7 years old) (small trees)

A.2.9.1 | Reasoning for a scenario which would lead to a reasonably low number of infected cell-grown plants and single plants in pots (up to 7 years old) (small trees)

The scenario assumes a low pressure of the pathogen in the nurseries and in the surroundings. Younger plants are exposed to the pathogen for only short period of time and are exported as dormant plants without leaves. The scenario assumes *Alnus* spp. to be minor hosts for the pathogen. The scenario also assumes that symptoms of the disease are visible and promptly detected during inspections.

A.2.9.2 | Reasoning for a scenario which would lead to a reasonably high number of infected cell-grown plants and single plants in pots (up to 7 year old) (small trees)

The scenario assumes a high pressure of the pathogen in the surrounding environment of the nurseries because suitable hosts are present. The scenario assumes that the pathogen can infect leaves, which may still be present on the plants at the time of export. The scenario also assumes that the pathogen is not detected during the inspections because of presence of asymptomatic plants or difficulties in recognising early symptoms. Grafting can increase the incidence of the pathogen (via infected buds or by woundings).

A.2.9.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infected cell-grown plants and single plants in pots (up to 7 year old) (small trees) (Median)

The scenario assumes a limited presence of the pathogen in the nurseries and in the surroundings and a limited reported susceptibility of *Alnus* spp. The pathogen is a regulated quarantine pest in the UK and under official control.

A.2.9.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/ interquartile range)

The limited information on the occurrence of the pathogen in the nurseries and the surroundings and the susceptibility of *Alnus* spp. results in high level of uncertainties.

A.2.10 | Elicitation outcomes of the assessment of the pest freedom for *Phytophthora ramorum* on small trees

The elicited and fitted values for *P. ramorum* for pest infestation and pest freedom agreed by the Panel are shown in Tables A.2.3, A.2.4 and in Figure A.2.2.

TABLE A.2.3 Elicited and fitted values of the uncertainty distribution of pest infestation by *Phytophthora ramorum* per 10,000 plants of small trees.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0					11		20		40					80
EKE	0.404	0.984	1.94	3.86	6.49	9.92	13.6	21.8	32.1	38.5	46.6	55.3	64.8	72.4	80.0

Note: The EKE results is the *BetaGeneral* (*1.0357, 2.9697, 0, 101*) distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infected plants the pest freedom was calculated (i.e. = 10,000 – number of infected plants per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.2.4.

TABLE A.2.4 The uncertainty distribution of plants free of *Phytophthora ramorum* per 10,000 plants of of small trees calculated by Table A.2.3.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9920					9960		9980		9989					10,000
EKE results	9920	9928	9935	9945	9953	9961	9968	9978	9986	9990	9994	9996	9998	9999.0	9999.6

Note: The EKE results are the fitted values.

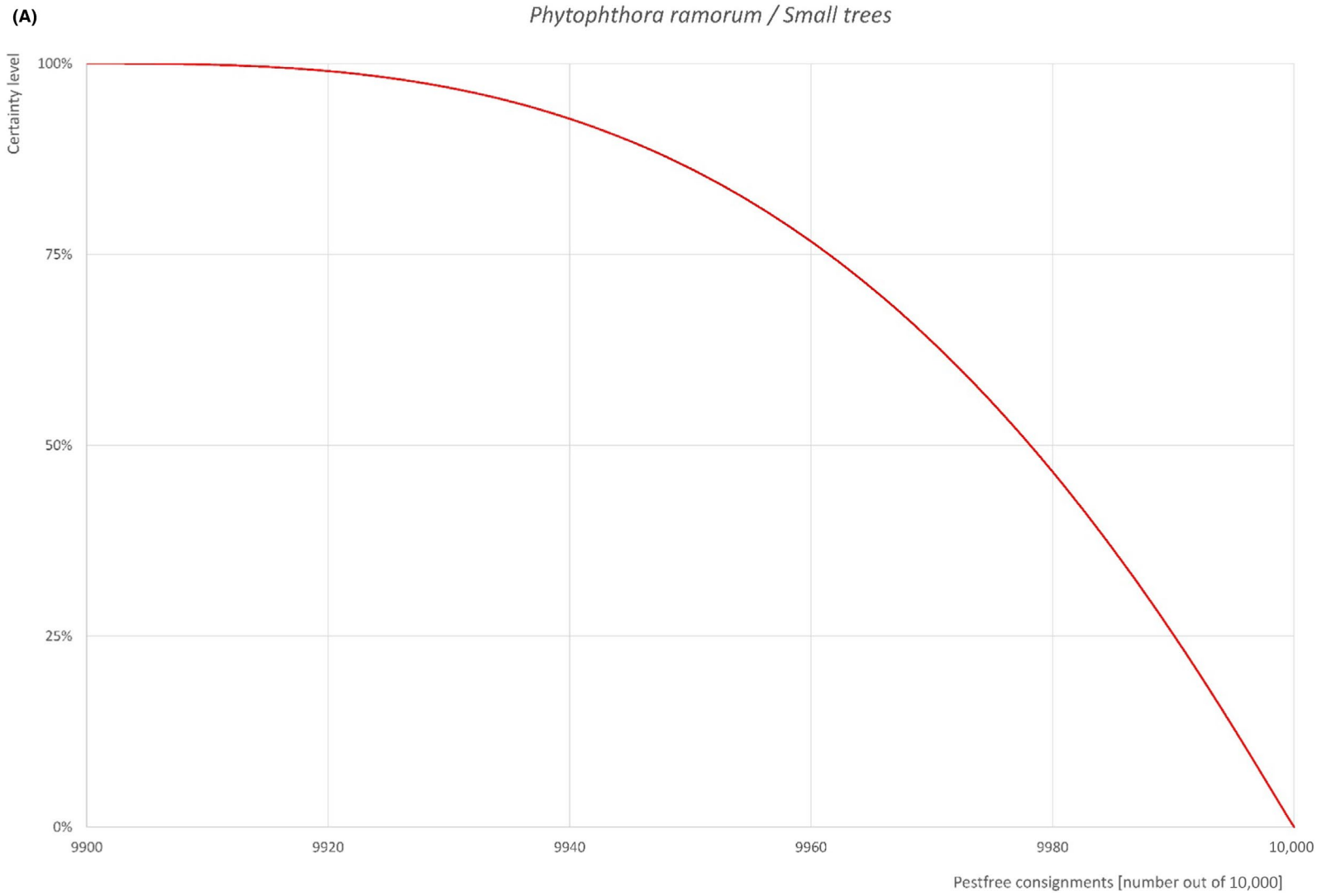


FIGURE A.2.2 (Continued)

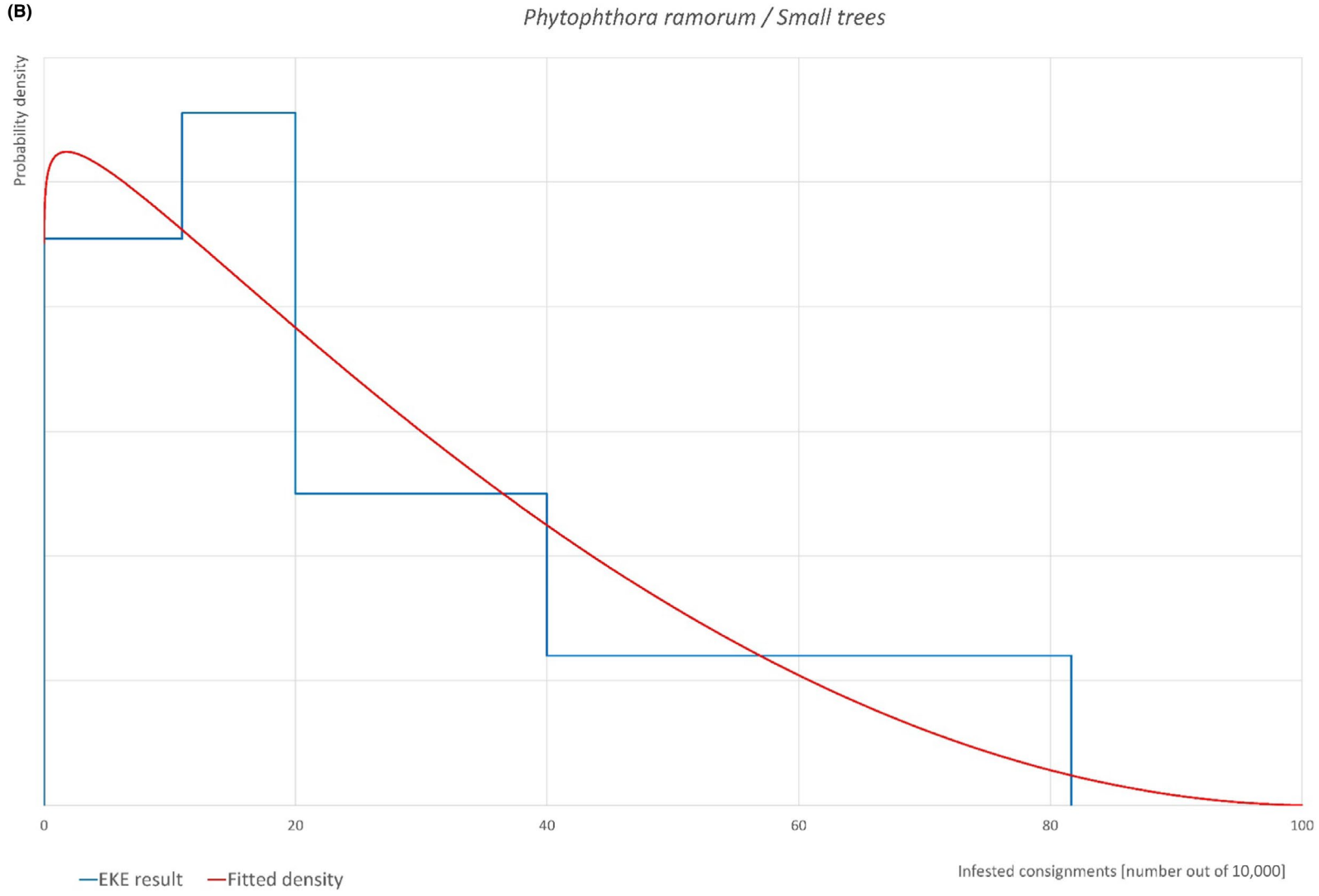


FIGURE A.2.2 (Continued)

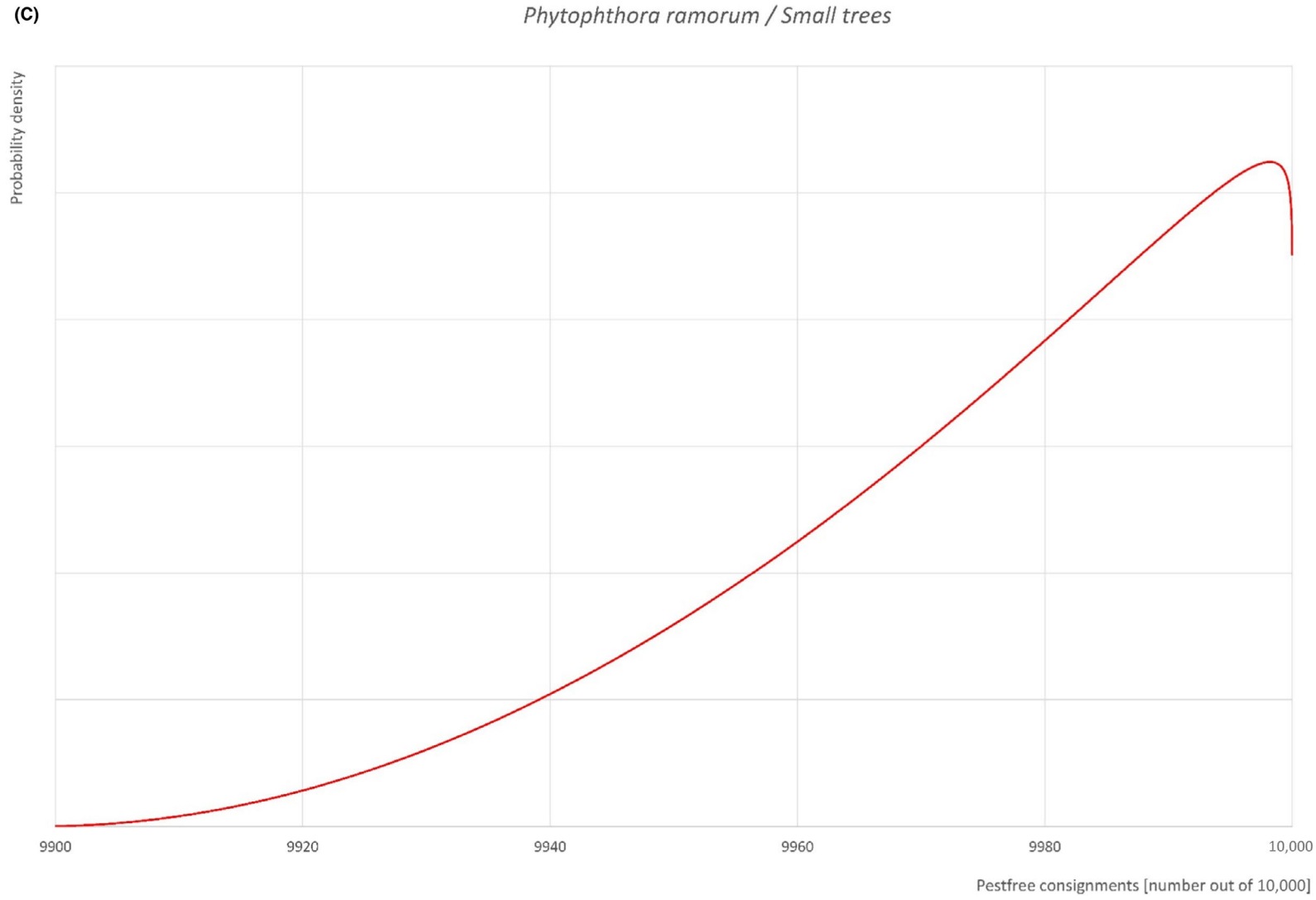


FIGURE A.2.2 (A) Elicited uncertainty of pest infection per 10,000 bare-root plants, whips and potted plants (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%,99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free bundles per 10,000 (i.e. = 1 – pest infection proportion expressed as percentage); (C) descending uncertainty distribution function of pest infection per 10,000 bundles.

A.2.11 | Reference list

APHIS USDA (Animal and Plant Health Inspection Service U.S. Department of Agriculture). (2022). *APHIS lists of proven hosts of and plants associated with Phytophthora ramorum*. https://www.aphis.usda.gov/plant_health/plant_pest_info/pram/downloads/pdf_files/usdaprlist.pdf

Blair, J. E., Coffey, M. D., Park, S. Y., Geiser, D. M., & Kang, S. (2008). A multi-locus phylogeny for *Phytophthora* utilizing markers derived from complete genome sequences. *Fungal Genetics and Biology*, *45*(3), 266–277. https://doi.org/10.1016/j.fgb.2007.10.010

Boutet, X., Vercauteren, A., Heungens, C., & Kurt, A. (2010). Mating of *Phytophthora ramorum*: Functionality and consequences. In S. J. Frankel, J. T. Kliejunas, & K. M. Palmieri (Eds.), *Proceedings of the sudden oak death fourth science symposium* (Vol. 229, pp. 97–100). US Department of Agriculture, Forest Service, Pacific Southwest Research Station.

Brasier, C. (2008). *Phytophthora ramorum* + *P. kernoviae* = international biosecurity failure. In S. J. Frankel, J. T. Kliejunas, & K. M. Palmieri (Eds.), *Proceedings of the sudden oak death third science symposium* (Vol. 214, pp. 133–139). US Department of Agriculture, USDA Forest Service, Pacific Southwest Research Station.

Brasier, C., & Kirk, S. (2004). Production of gametangia by *Phytophthora ramorum* in vitro. *Mycological Research*, *108*(7), 823–827. https://doi.org/10.1017/s0953756204000565

Brasier, C., & Webber, J. (2010). Sudden larch death. *Nature*, *466*, 824–825. https://doi.org/10.1038/466824a

Brown, A. V., & Brasier, C. M. (2007). Colonization of tree xylem by *Phytophthora ramorum*, *P. kernoviae* and other *Phytophthora* species. *Plant Pathology*, *56*(2), 227–241. https://doi.org/10.1111/j.1365-3059.2006.01511.x

CABI (Centre for Agriculture and Bioscience International). (online). *Phytophthora ramorum (Sudden Oak Death (SOD))*. https://www.cabi.org/cpc/datasheet/40991

Cave, G. L., Randall-Schadel, B., & Redlin, S. C. (2008). Risk analysis for *Phytophthora ramorum* Werres, de Cock & Man in't Veld, causal agent of sudden oak death, ramorum leaf blight, and ramorum dieback. US Department of Agriculture, Animal and Plant Health Inspection Service.

Davidson, J. M., Rizzo, D. M., Garbelotto, M., Tjosvold, S., & Slaughter, G. W. (2002). *Phytophthora ramorum* and sudden oak death in California: II. Transmission and survival. In R. B. Standiford, D. McCreary, & K. L. Purcell (Eds.), *Proceedings of the fifth symposium on oak woodlands: Oaks in California's challenging landscape* (Vol. 184, pp. 741–749). US Department of Agriculture, Forest Service, Pacific Southwest Research Station.

Davidson, J. M., Werres, S., Garbelotto, M., Hansen, E. M., & Rizzo, D. M. (2003). Sudden oak death and associated diseases caused by *Phytophthora ramorum*. *Plant Health Progress*, *4*(1), 12. https://doi.org/10.1094/php-2003-0707-01-dg

Davidson, J. M., Wickland, A. C., Patterson, H. A., Falk, K. R., & Rizzo, D. M. (2005). Transmission of *Phytophthora ramorum* in mixed-evergreen forest in California. *Phytopathology*, *95*, 587–596. https://doi.org/10.1094/phyto-95-0587

DEFRA (Department for Environment, Food and Rural Affairs). (online). *UK risk register details for Phytophthora ramorum*. https://planthealthportal.defra.gov.uk/pests-and-diseases/uk-plant-health-risk-register/viewPestRisks.cfm?cslref=23022

DEFRA (Department for Environment, Food and Rural Affairs). (online). *Fera list of natural hosts for Phytophthora ramorum with symptom and location*. https://planthealthportal.defra.gov.uk/assets/uploads/P-ramorum-host-list-finalupdate-NOV-20-15.pdf

Denman, S., Kirk, S. A., Brasier, C. M., & Webber, J. F. (2005). In vitro leaf inoculation studies as an indication of tree foliage susceptibility to *Phytophthora ramorum* in the UK. *Plant Pathology*, *54*(4), 512–521. https://doi.org/10.1111/j.1365-3059.2005.01243.x

DiLeo, M. V., Bienapfl, J. C., & Rizzo, D. M. (2008). *Phytophthora ramorum* infects hazelnut, vine maple, blue blossom, and manzanita species in California. *Plant Health Progress*, 0118-02. https://doi.org/10.1094/php-2008-0118-02-br

EFSA Panel on Plant Health (PLH). (2011). Scientific Opinion on the pest risk analysis on *Phytophthora ramorum* prepared by the FP6 project RAPRA. *EFSA Journal*, *9*(6), 2186. https://doi.org/10.2903/j.efsa.2011.2186

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Baptista, P., Chatzivassiliou, E., Di Serio, F., Gonthier, P., Jaques Miret, J. A., Justesen, A. F., MacLeod, A., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., Parnell, S., Reignault, P. L., Stefani, E., Thulke, H.-H., Van der Werf, W., Civera, A. V., Yuen, J., … Potting, R. (2024b). Commodity risk assessment of *Cornus alba* and *Cornus sanguinea* plants from the UK. *EFSA Journal*, *22*(3), 8657. https://doi.org/10.2903/j.efsa.2024.8657

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Baptista, P., Chatzivassiliou, E., Di Serio, F., Gonthier, P., Jaques Miret, J. A., Justesen, A. F., MacLeod, A., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., Parnell, S., Reignault, P. L., Stefani, E., Thulke, H.-H., Van der Werf, W., Vicent Civera, A., Yuen, J., … Potting, R. (2024c). Commodity risk assessment of Sorbus aucuparia plants from the UK. *EFSA Journal*, *22*(6), 8837. https://doi.org/10.2903/j.efsa.2024.8837

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Baptista, P., Chatzivassiliou, E., Di Serio, F., Jaques Miret, J. A., Justesen, A. F., MacLeod, A., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., et al. (2023c). Commodity risk assessment of *Acer pseudoplatanus* plants from the UK. *EFSA Journal*, *21*(7), 8074. https://doi.org/10.2903/j.efsa.2023.8074

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Baptista, P., Chatzivassiliou, E., Di Serio, F., Jaques Miret, J. A., Justesen, A. F., MacLeod, A., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., Parnell, S., Potting, R., Reignault, P. L., Stefani, E., Thulke, H.-H., Van der Werf, W., Civera, A. V., Yuen, J., … Gonthier, P. (2024d). Commodity risk assessment of *Corylus avellana* plants from the UK. *EFSA Journal*, *22*(1), 8495. https://doi.org/10.2903/j.efsa.2024.8495

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Baptista, P., Chatzivassiliou, E., Di Serio, F., Jaques Miret, J. A., Justesen, A. F., MacLeod, A., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., Parnell, S., Potting, R., Reignault, P. L., Stefani, E., Thulke, H.-H., Van der Werf, W., Civera Vicent, A., Yuen, J., … Gonthier, P. (2023e). Commodity risk assessment of *Quercus robur* plants from the UK. *EFSA Journal*, *21*(10), 1–242. https://doi.org/10.2903/j.efsa.2023.8314

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Baptista, P., Chatzivassiliou, E., Di Serio, F., Jaques Miret, J. A., Justesen, A. F., MacLeod, A., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., Parnell, S., Potting, R., Reignault, P. L., Stefani, E., Thulke, H.-H., Van der Werf, W., Vicent Civera, A., Yuen, J., … Gonthier, P. (2023d). Commodity risk assessment of *Fagus sylvatica* plants from the UK. *EFSA Journal*, *21*(7), 1–151. https://doi.org/10.2903/j.efsa.2023.8118

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Baptista, P., Chatzivassiliou, E., Di Serio, F., Jaques Miret, J. A., Justesen, A. F., MacLeod, A., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., Parnell, S., Potting, R., Reignault, P. L., Stefani, E., Thulke, H.-H., Van der Werf, W., Vicent Civera, A., Yuen, J., … Gonthier, P. (2023a). Scientific Opinion on the commodity risk assessment of *Acer campestre* plants from the UK. *EFSA Journal*, *21*(7), 8071. https://doi.org/10.2903/j.efsa.2023.8071

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Baptista, P., Chatzivassiliou, E., Di Serio, F., Jaques Miret, J. A., Justesen, A. F., MacLeod, A., Magnusson, C. S., Milonas, P., Navas-Cortes, J. A., Parnell, S., Potting, R., Reignault, P. L., Stefani, E., Thulke, H.-H., Van der Werf, W., Vicent Civera, A., Yuen, J., … Gonthier, P. (2023b). Scientific Opinion on the commodity risk assessment of *Acer platanoides* plants from the UK. *EFSA Journal*, *21*(7), 8073. https://doi.org/10.2903/j.efsa.2023.8073

EFSA PLH Panel (EFSA Panel on Plant Health), Civera, A. V., Baptista, P., Berlin, A., Chatzivassiliou, E., Cubero, J., Cunniffe, N., de la Peña, E., Desneux, N., Di Serio, F., Filipiak, A., Hasiów-Jaroszewska, B., Jactel, H., Landa, B. B., Maistrello, L., Makowski, D., Milonas, P., Papadopulos, N. T., Potting, R., … Gonthier, P. (2024a). Commodity risk assessment of *Betula pendula* and *Betula pubescens* plants from the UK. *EFSA Journal*, *22*(11), 9051. https://doi.org/10.2903/j.efsa.2024.9051

Elliot, M., Meagher, T. R., Harris, C., Searle, K., Purse, B. V., & Schlenzig, A. (2013). The epidemiology of *Phytophthora ramorum* and *P. kernoviae* at two historic gardens in Scotland. In S. J. Frankel, J. T. Kliejunas, K. M. Palmieri, & J. M. Alexander (Eds.), *Sudden oak death fifth science symposium* (pp. 23–32). US Department of Agriculture, Forest Service, Pacific Southwest Research Station.

Englander, L., Browning, M., & Tooley, P. W. (2006). Growth and sporulation of *Phytophthora ramorum* in vitro in response to temperature and light. *Mycologia*, *98*(3), 365–373. https://doi.org/10.3852/mycologia.98.3.365

EPPO (European and Mediterranean Plant Protection Organization). (2006). EPPO standards PM 7/66 diagnostics. *Phytophthora ramorum*. *EPPO Bulletin*, *36*, 145–155.

EPPO (European and Mediterranean Plant Protection Organization). (2013). Pest risk management for *Phytophthora kernoviae* and *Phytophthora ramorum*. EPPO. http://www.eppo.int/QUARANTINE/Pest_Risk_Analysis/PRA_intro.htm

EPPO (European and Mediterranean Plant Protection Organization). (online_a). *EPPO A2 List of pests recommended for regulation as quarantine pests, version 2021-09*. https://www.eppo.int/ACTIVITIES/plant_quarantine/A2_list

EPPO (European and Mediterranean Plant Protection Organization). (online_b). *Phytophthora ramorum (PHYTRA), categorization*. https://gd.eppo.int/taxon/PHYTRA/categorization

EPPO (European and Mediterranean Plant Protection Organization). (online_c). *Phytophthora ramorum (PHYTRA), distribution*. https://gd.eppo.int/taxon/PHYTRA/distribution

EPPO (European and Mediterranean Plant Protection Organization). (online_d). *Phytophthora ramorum (PHYTRA), host plants*. https://gd.eppo.int/taxon/PHYTRA/hosts

EPPO (European and Mediterranean Plant Protection Organization). (online_e). *Phytophthora ramorum (PHYTRA), photos*. https://gd.eppo.int/taxon/PHYTRA/photos

Erwin, D. C., & Ribeiro, O. K. (1996). Phytophthora diseases worldwide. APS Press, American Phytopathological Society.

EUROPHYT. (online). *European Union Notification System for Plant Health Interceptions – EUROPHYT*. http://ec.europa.eu/food/plant/plant_health_biosecurity/europhyt/index_en.htm

Jung, T., Jung, M. H., Webber, J. F., Kageyama, K., Hieno, A., Masuya, H., Uematsu, S., Pérez-Sierra, A., Harris, A. R., Forster, J., Rees, H., Scanu, B., Patra, S., Kudláček, T., Janoušek, J., Corcobado, T., Milenković, I., Nagy, Z., Csorba, I., … Brasier, C. M. (2021). The destructive tree pathogen *Phytophthora ramorum* originates from the laurosilva forests of East Asia. *Journal of Fungi*, *7*(3), 226. https://doi.org/10.3390/jof7030226

Jung, T., Orlikowski, L., Henricot, B., Abad-Campos, P., Aday, A. G., Aguín Casal, O., & Peréz-Sierra, A. (2016). Widespread *Phytophthora* infestations in European nurseries put forest, semi-natural and horticultural ecosystems at high risk of *Phytophthora* diseases. *Forest Pathology*, *46*(2), 134–163.

Matsiakh, I., & Menkis, A. (2023). An overview of *Phytophthora* species on woody plants in Sweden and other Nordic Countries. *Microorganisms*, *11*(5), 1309.

O'Hanlon, R., Choiseul, J., Corrigan, M., Catarame, T., & Destefanis, M. (2016). Diversity and detections of *Phytophthora* species from trade and non-trade environments in Ireland. *EPPO Bulletin*, *46*(3), 594–602. https://doi.org/10.3390/microorganisms11051309

Parke, J. L., & Lewis, C. (2007). Root and stem infection of Rhododendron from potting medium infested with *Phytophthora ramorum*. *Plant Disease*, *91*, 1265–1270. https://doi.org/10.1094/pdis-91-10-1265

Poimala, A., & Lilja, A. (2013). NOBANIS – Invasive Alien Species Fact Sheet – *Phytophthora ramorum*. Database of the European Network on Invasive Alien Species. https://www.nobanis.org/globalassets/speciesinfo/p/phytophthora-ramorum/phytophthora_ramorum.pdf

Roubtsova, T. V., & Bostock, R. M. (2009). Episodic abiotic stress as a potential contributing factor to onset and severity of disease caused by *Phytophthora ramorum* in *Rhododendron* and *Viburnum*. *Plant Disease*, *93*(9), 912–918. https://doi.org/10.1094/pdis-93-9-0912

Sansford, C. E., Inman, A. J., Baker, R., Brasier, C., Frankel, S., de Gruyter, J., Husson, C., Kehlenbeck, H., Kessel, G., Moralejo, E., Steeghs, M., Webber, J., & Werres, S. (2009). *Report on the risk of entry, establishment, spread and socio-economic loss and environmental impact and the appropriate level of management for Phytophthora ramorum for the EU*. Deliverable report 28. EU sixth framework project RAPRA, 310 pp.

Shishkoff, N. (2007). Persistence of *Phytophthora ramorum* in soil mix and roots of nursery ornamentals. *Plant Disease*, *91*(10), 1245–1249. https://doi.org/10.1094/pdis-91-10-1245

A.3 | *Phytophthora siskiyouensis*

A.3.1 | Organism information

Taxonomic information	Current valid scientific name: *Phytophthora siskiyouensis* Reeser & E.M. Hansen Synonyms: - Name used in the EU legislation: - Order: Peronosporales Family: Peronosporacae Common name: No common name in EPPO GD Name used in the Dossier: *Phytophthora siskiyouensis*
Group	Oomycetes
EPPO code	PHYTSK
Regulated status	The pest is not regulated in the EU territory and not listed in Commission Implementing Regulation (EU) 2019/2072
Pest status in UK	Present (unknown distribution) (CABI, USDA; online, Defra, online)
Pest status in the EU	The pathogen is not Present in EU (CABI, USDA; online)
Host status on Alnus spp.	*P.* siskiyouensis has been reported in Alnus incana (grey alder) (Perez-Sierra et al., 2015), *A. glutinosa* (European alder) (Smith et al., 2006), *A. cordata* (Italian alder) and *A. rhombifolia* (white alder) (Rooney-Latham et al., 2009), *A. rubra* (red alder) (Navarro et al., 2015; Sims et al., 2015a, 2015b) (CABI, USDA, online) Pathogenicity tests in the UK showed *A. cordata* to be the most susceptible host species followed by *A. glutinosa* and *A. incana* (Perez-Sierra et al., 2014)
Risk Assessment information	Pest Risk Assessments are not available

(Continued)

Other relevant information for the assessment		
Biology		*P. siskiyouensis* as a member of the genus *Phytophthora* follows the Phytophthora basics. It produces several types of structures specialised for survival, dispersal or infection (Forest Phytophthoras of the World b, online). *P. siskiyouensis* can be distinguished from other *Phytophthora* species by the shape of the terminal and intercalary sporangia, and the shape of the antheridia. With its semi-papillate sporangia and predominately paragynous antheridia, *P. siskiyouensis* would be placed in Waterhouse's (1963) Group III Asexual phase: Sporangia are semi-papillate, some with two and more rarely with three papilla; persistent or caducous with variable pedicel length (2–66 µm L); ovoid, ellipsoid, reniform (or kidney), distorted shapes (26–95 L × 23–50 W µm); hyphal swellings small, often associated with sporangiophore; sporangia originated terminal but often subterminal and occasionally intercalary in unbranched or simple sympodial sporangiophores. Hyphal swellings and chlamydospores are absent Sexual phase: Homothallic. Oogonia are globose to subglobose (23–42 µm diam), occasionally much elongated or with a funnel shape tapering toward the stalk, frequently sessile and occasionally laterally intercalary; antheridia predominately paragynous, spherical, ellipsoid or ovoid, club-shaped (10–18 L × 8–13 W µm), terminal, occasionally intercalary and usually diclinous, attached anywhere on the oogonium; oospores are globose to subglobose (19–33 µm diam) and usually aplerotic. The above combination of characteristics clearly separates *P. siskiyouensis* from other known *Phytophthora* species (Abad e al., 2023a, 2023b; Forest Phytophthoras of the World b, online; ITP, online) Genetics: ITS sequences showed greatest similarity to *P. tropicalis* and *P. capsici* in phylogenetic clade 2, but consistent differences were found between *P. siskiyouensis* and these related species. *P. siskiyouensis* is distinguished morphologically from these relatives by its homothallic condition, predominately paragynous antheridia and semi-papillate sporangia on unbranched sporangiophores (Hansen et al., 2011; Reeser et al., 2007)
Symptoms	**Main type of symptoms**	The predominant symptoms on the diseased *Alnus* trees are sparse foliage, dieback in the canopy and bleeding cankers on the trunks. Cankers occur primarily at the bases of the trunks near the soil line and extend upward. When the outer bark is removed from the cankers, a cinnamon-brown margin is observed separating cream-coloured healthy tissue from dark orange-brown diseased tissue. The diseased tissue extends through the bark to the vascular cambium and sapwood interface, characteristic of *Phytophthora* diseases (Rooney-Latham et al., 2009). Symptoms include bleeding stem lesions (CABI; online). The symptoms caused by *P. siskiyouensis* on various hosts include canker, root rot, blight, dieback, leaf necrosis, twig blight (Forest Phytophthoras of the World, a)
	Presence of asymptomatic plants	No information is available concerning the presence of *P. siskiyouensis* in symptomless host plants
	Confusion with other pests	*P. siskiyouensis* symptoms include bleeding stem lesions similar to those caused by *Phytophthora alni* (CABI; online). It should be noted that *P. alni* is widespread both in the UK and EU affecting all species of alder (Forest Research, online) *P. siskiyouensis* is most readily recognised from other *Phytophthora* species by its uniquely and irregularly shaped sporangia formed in water and by the frequent occurrence of sessile and intercalary oogonia in agar. Sporangia may also be formed on some agar media with a mostly elongated obovoid shape and cymose sporangiophore reminiscent of *P. hibernalis*. Sporangia in water are characteristically reniform with off-centre semipapillae and sporangiophore attachment, the irregular sporangia are reminiscent of *P. citricola*. *P. siskiyouensis* is distinguished readily from the latter species, however, by having deciduous sporangia with variable length pedicels, variable orientation of semipapilla and sporangiophore attachment, intercalary and sessile attachment of some oogonia and mostly aplerotic oospores. *P. siskiyouensis* sporangia resemble those depicted for *P. quercina*, except that they are slightly larger, semi-papillate, weakly deciduous and are formed singly on simple, unbranched sporangiophores. Sexual structures also resemble *P. quercina*, except that oogonia may be sessile or intercalary, and antheridia may be paragynous or amphigynous. The oogonial stalk and arrangement of paragynous antheridia are similar to those described for *P. hedraiandra* (Forest Phytophthoras of the World, online_b)
Host plant range		*P. siskiyouensis* does not appear to be highly specific to alder species and is known to cause occasional symptoms on a variety of associated plants (Hansen et al., 2011) Apart from the *Alnus* species the host range of the oomycete includes Notholithocarpus densiflorus (Tanoak) and *Umbellularia californica* (Reeser et al., 2008). *P. siskiyouensis* is considered a potential weak pathogen on seedlings of other tree species, including *Citrus*, *Acacia* and *Eucalyptus* (Smith et al., 2004)

(Continued)

Reported evidence of impact	*P. siskiyouensis* is of great concern as a pathogen of Italian alder (*A. cordata*) and the native white alder (*A. rhombifolia*) in California (Rooney-Latham et al., 2009) and European alder (*A. glutinosa* (L.) Gaertn) in Australia (Smith et al., 2006) (Forest Phytophthoras of the World a, online) In the UK Plant Pest Risk Register *P. siskiyouensis* has an impact rating of 4 out of 5 (UK Plant Health Portal, online)
Evidence that the commodity is a pathway	*P. siskiyouensis* is apparently present in the nursery industry as a pathogen on horticultural alder planting stock (Forest Phytophthoras of the World b, online). *Alnus* spp. are hosts of *P. siskiyouensis* Life stages of *P. siskiyouensis* can be present on leaves, stems, branches or roots of whips, bare-root plants and potted plants. *P. siskiyouensis* can be present in soil, however potted plants contain only new growing media. Therefore, plants for planting of Alnus spp. are possible pathway for *P. siskiyouensis*
Surveillance information	No information

A.3.2 | Possibility of pest presence in the nursery

A.3.2.1 | Possibility of entry from the surrounding environment

There is a high uncertainty on the prevalence and distribution of this pathogen in the UK (unknown distribution reported in UK Pest Risk Register). There is only one report of the presence of the pathogen in the southwest of England (Perez-Sierra et al., *2015). There is a possibility that the pathogen is present in areas where the export nurseries are located. Possible pathways of the pathogen are water and soil*.

Uncertainties:

– The exact pathways are still uncertain.
– There is a high uncertainty on the prevalence and distribution of this pathogen in the UK in areas where the nurseries are located.

A.3.2.2 | Possibility of entry with new plants/seeds

Plants are produced by seeds and grafting. Seeds purchased in the UK are certified under The Forest Reproductive Material (Great Britain) Regulations 2002 (legislation.gov.uk); seedlings sourced in the UK are certified with UK Plant Passports; a small percentage of plants may be obtained from EU (Netherlands); seedlings from the EU countries are certified with phytosanitary certificates.

The pathogen is not known to be seedborne or seed transmitted, therefore not expected to enter the nursery via the seed pathway. Grafted plants (scion and buds in the case of grafting) originate from the nursery itself.

The seedling pathways is unlikely because the conditions of their production (seedbed in the greenhouse, pest free growing media) are expected to prevent the infection of seedlings.

The nurseries use virgin peat or peat-free compost (a mixture of coir, tree bark, wood fibre, etc.) as a growing media (Dossier Section 1.0).

The growing media is heat-treated by commercial suppliers during production to eliminate pests and diseases (Dossier Section 1.0).

Uncertainties:

– There are no uncertainties.

Taking into consideration the above evidence and uncertainties, the Panel considers that it is unlikely for the pathogen to enter the nurseries via seeds or seedlings of *Alnus*.

A.3.2.3 | Possibility of spread within the nursery

P. siskiyouensis has a very narrow host range and it is unlikely that other host plants than *Alnus* spp. plants, such as *Lithocarpus densiflorus* and *Umbellularia californica* are present in the nurseries.

Uncertainties:

– There are no uncertainties.

Taking into consideration the above evidence and uncertainties, the Panel considers that it is unlikely for the pathogen to spread from other host plants within the nurseries.

A.3.3 | Information from interceptions

There are no interceptions of *P. siskiyouensis* on commodities imported into the EU Member States from third countries (EUROPHYT and TRACES, online).

A.3.4 | Evaluation of the risk mitigation measures

In the table below, all risk mitigation measures currently applied in the UK are listed and an indication of their effectiveness on *Phytophthora siskiyouensis* is provided. The description of the implemented risk mitigation measures is provided in the Table 9.

No.	Risk mitigation measure	Effect on the pest	Evaluation and uncertainties
1	Registration of production sites	Yes	All nurseries are registered as professional operators with the UK NPPO, by the Animal and Plant Health Agency (APHA) and is authorised to issue UK plant passports (Dossier Section 1.0) Evaluation – Every nursery exporting to the EU is under supervision of the NPPO Uncertainties: – None
2	Certification of plant material	Yes	*Alnus cordata, A. incana* and *A. glutinosa* seeds purchased in the UK are certified under The Forest Reproductive Material (Great Britain) Regulations 2002 (legislation.gov.uk); seedlings sourced in the UK are certified with UK Plant Passports; a small percentage of plants may be obtained from EU (Netherlands); seedlings from the EU countries are certified with phytosanitary certificates. (Dossier Section 1.0) The starting material of Alnus production consists of seed and seedlings. Seeds are certified. Seedlings for production sourced in the UK are certified with UK Plant Passports; seedlings from the EU countries are certified with phytosanitary certificates Evaluation: – Despite *P. siskiyouensisis* is not a quarantine pest, it has been assessed by the UK Plant Health Risk Register and attention to its detection is adopted. Uncertainties: – None
3	Origin and treatment of growing media	Yes	Rooted plants in pots: In the production or procurement of these plants, the use of growing media is assessed for the potential to harbour and transmit plant pests. Growers most commonly use virgin peat or peat-free compost, which is a mixture of coir, tree bark, wood fibre, etc. The compost is heat-treated by commercial suppliers during production to eliminate pests and diseases. It is supplied in sealed bulk bags or shrink-wrapped bales and stored off the ground on pallets, these are completely hygienic and free from contamination. Where delivered in bulk, compost is kept in a dedicated bunker, either indoors or covered by tarpaulin outdoors, and with no risk of contamination with soil or other material (Dossier Section 1.0) Evaluation: – The measure is efficient in preventing the entry of the pathogen via the substrate into the nursery Uncertainties: – None
4	Surveillance, monitoring and sampling	Yes	Inspection is carried out at least once a year as part of the Quarantine Surveillance programme (Great Britain uses the same framework for its surveillance programme as the EU). Surveillance is based on visual inspection with samples taken from symptomatic material, and where appropriate, samples are also taken from asymptomatic material (e.g. plants, tubers, soil, watercourses) (Dossier Section 1.0) Evaluation: – The surveillance, monitoring and sampling can detect the pathogen. No results are reported Uncertainties: – The efficiency of the surveillance, monitoring and sampling
5	Hygiene measures	Yes	According to the Dossier Section 1.0, all the nurseries have plant hygiene and housekeeping rules and practices in place, which are communicated to all relevant employees Evaluation: – These measures could be effective in reducing the risk of introduction and/or spread of the pathogen Uncertainties: – The efficiency of the hygiene measures performed in the nurseries

(Continued)

No.	Risk mitigation measure	Effect on the pest	Evaluation and uncertainties
6	Irrigation water quality and/or treatments	Yes	Growers are required to assess water sources, irrigation and drainage systems used in the plant production for the potential to harbour and transmit plant pests. Water is routinely sampled and sent for analysis. No quarantine pests have been found (Dossier Section 1.0) Evaluation: – There is no disinfestation treatment applied to the irrigation water. However, irrigation water is routinely sampled and tested for quarantine pests. This procedure can reduce the risk Uncertainties: – The frequency of sampling and the method used for the detection of the pathogen
7	Application of pest control products	Yes	Crop protection is achieved using a combination of measures including approved plant protection products, biological control or physical measures. Plant protection products are only used when necessary and records of all plant protection treatments are kept (Dossier Section 1.0) Evaluation: – The listed treatments are not sufficiently effective against *Phytophthora* spp. Uncertainties: – The details about the products applied and the application scheme are unknown and the efficiency is unclear
8	Washing of the roots (bare-roots plants)	Yes	Bare-root plants are lifted from the field in winter and then root-washed on site and stored prior to export (Dossier Section 1.0) Evaluation: – The washing of the roots removes (parts of) the soil and the pathogen present in the soil Uncertainties: – The effectiveness of the washing to remove all soil with the pathogen
9	Inspections and management of plants before export	Yes	The UK NPPO carries out inspections and testing where required by the country of destination's plant health legislation, to ensure all requirements are fulfilled and a valid phytosanitary certificate with the correct additional declarations is issued Separate to any official inspection, plant material is checked by growers for plant health issues before dispatch Evaluation: – The inspections and management of plants before export can detect the pathogen Uncertainties: – Whether early symptoms caused by the pathogen on *Alnus* species are identified by visual inspections

A.3.5 | Overall likelihood of pest freedom for bundles of graftwood

A.3.5.1 | Reasoning for a scenario which would lead to a reasonably low number of infected bundles of graftwood

P. siskiyouensis has a very restricted distribution in the UK. The scenario assumes a low pressure of the pathogen in the surroundings. The plants are exposed to the pathogen for only short period of time and are exported without leaves. The scenario also assumes that symptoms of the disease are visible and promptly detected during inspections.

A.3.5.2 | Reasoning for a scenario which would lead to a reasonably high number of infected bundles of graftwood

The scenario assumes a high pressure of the pathogen in the nurseries and in the surroundings as suitable hosts are present. The scenario assumes that the pathogen infects leaves, which may still be present on the plants at the time of export. The scenario also assumes that symptoms of the disease are not easily recognisable during inspections.

A.3.5.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of bundles of graftwood (Median)

P. siskiyouensis has a very restricted distribution in the UK. The scenario assumes a limited presence of the pathogen in the surroundings.

A.3.5.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/ interquartile range)

The limited information on the occurrence of the pathogen in the nurseries and the surroundings and the susceptibility of *Alnus* spp. results in high level of uncertainties.

A.3.6 | Elicitation outcomes of the assessment of the pest freedom for *Phytophthora siskiyouensis* on graftwood

The elicited and fitted values for ***P. siskiyouensis*** for pest infestation and pest freedom agreed by the Panel are shown in Tables A.3.1, A.3.2 and in Figure A.3.1.

TABLE A.3.1 Elicited and fitted values of the uncertainty distribution of pest infestation by *Phytophthora siskiyouensis* per 10,000 bundles of graftwood.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0.00					0.25		0.50		0.75					2.00
EKE	0.0343	0.0586	0.0890	0.138	0.195	0.261	0.328	0.474	0.658	0.781	0.946	1.15	1.41	1.67	2.00

Note: The EKE results is the *BetaGeneral* (*1.7972*, *466.54*, *0*, *150*) distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infected bundles the pest freedom was calculated (i.e. = 10,000 – number of infected bundles of graftwood per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.3.2.

TABLE A.3.2 The uncertainty distribution of plants free of *Phytophthora siskiyouensis* per 10,000 bare-root plants calculated by Table A.3.1.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9998.0					9999.3		9999.5		9999.8					10,000.0
EKE results	9998	9998	9998	9998	9998	9998	9998	9998	9998	9998	9998	9998	9998	9998	9998

Note: The EKE results are the fitted values.

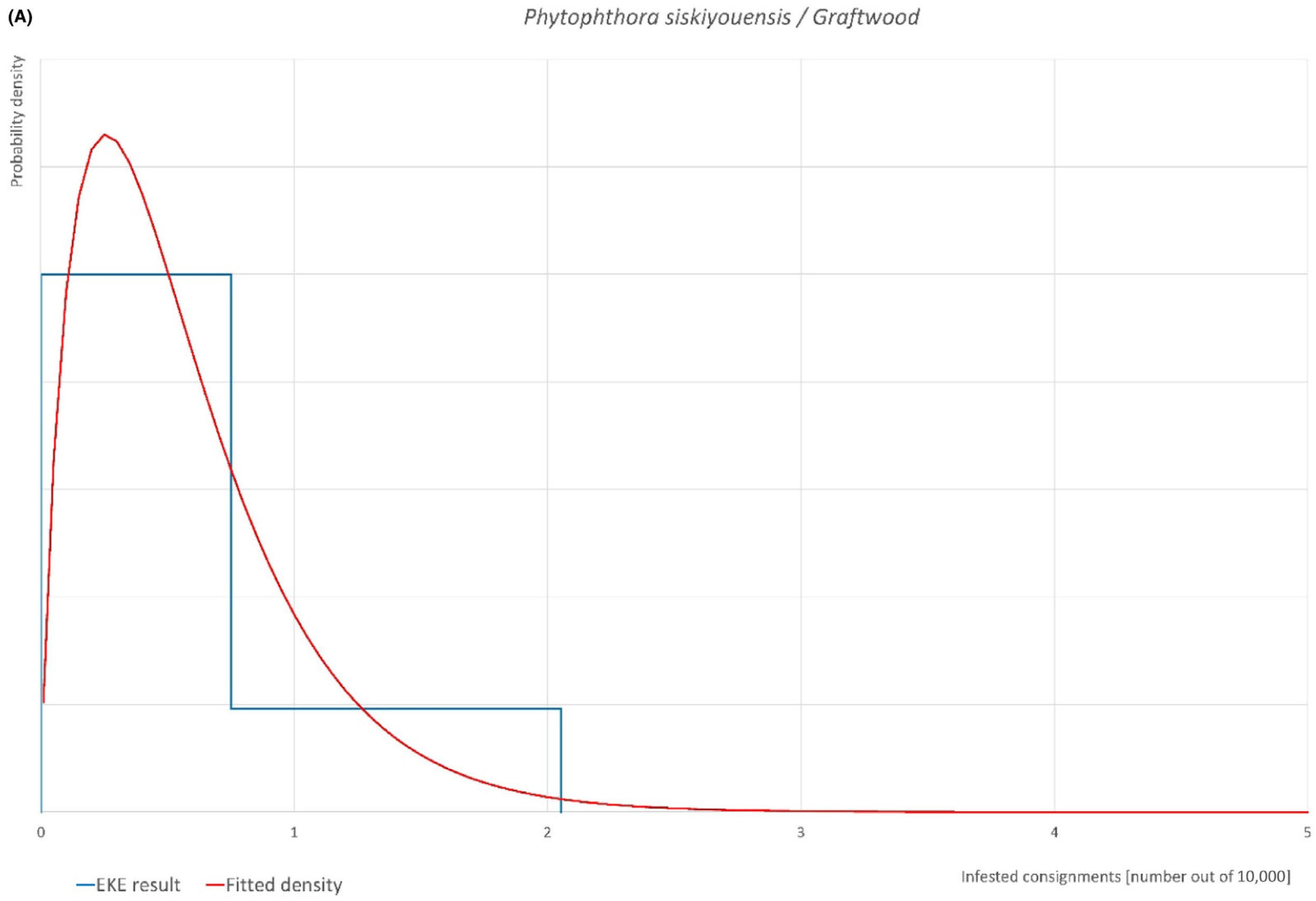


FIGURE A.3.1 (Continued)

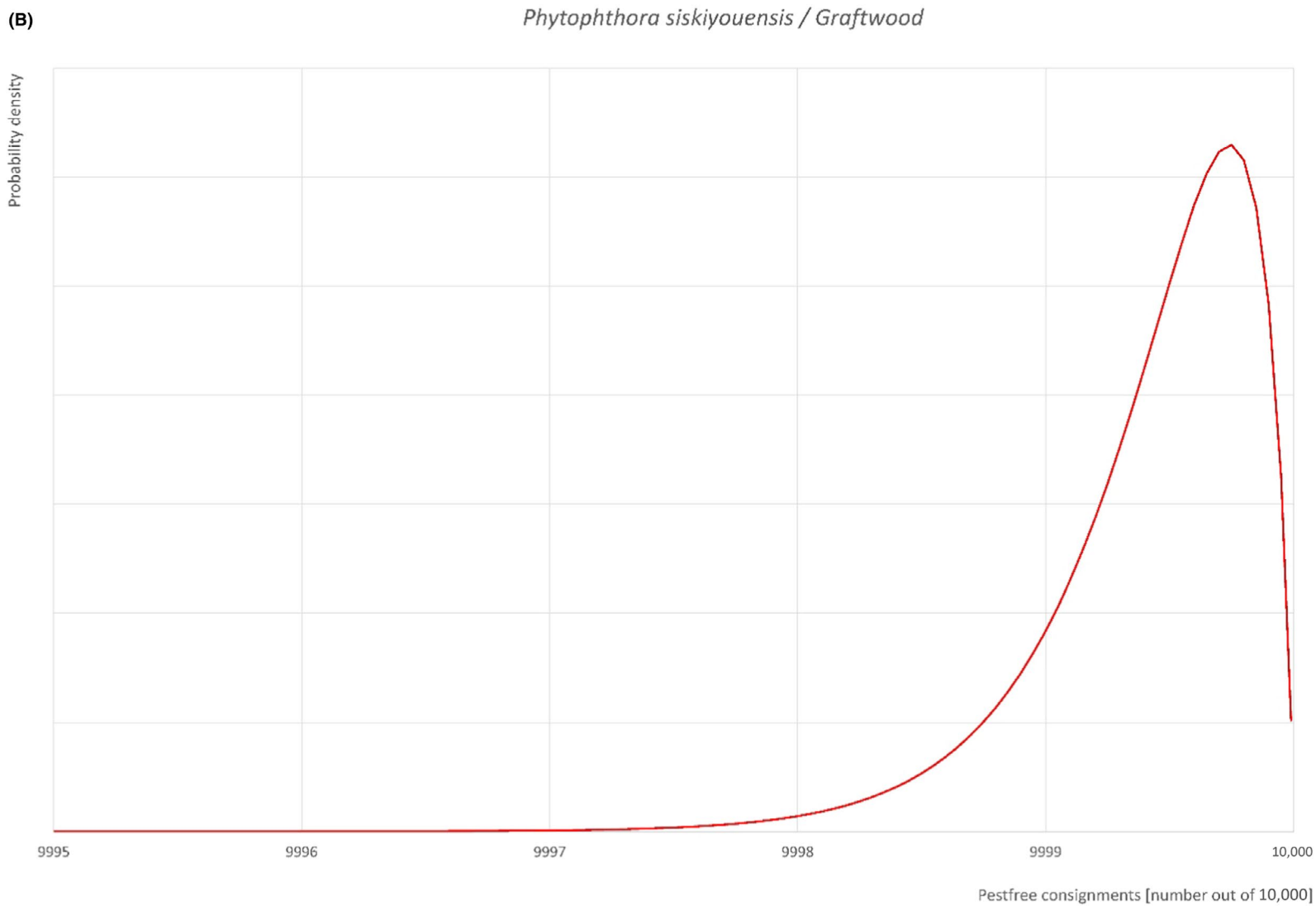


FIGURE A.3.1 (Continued)

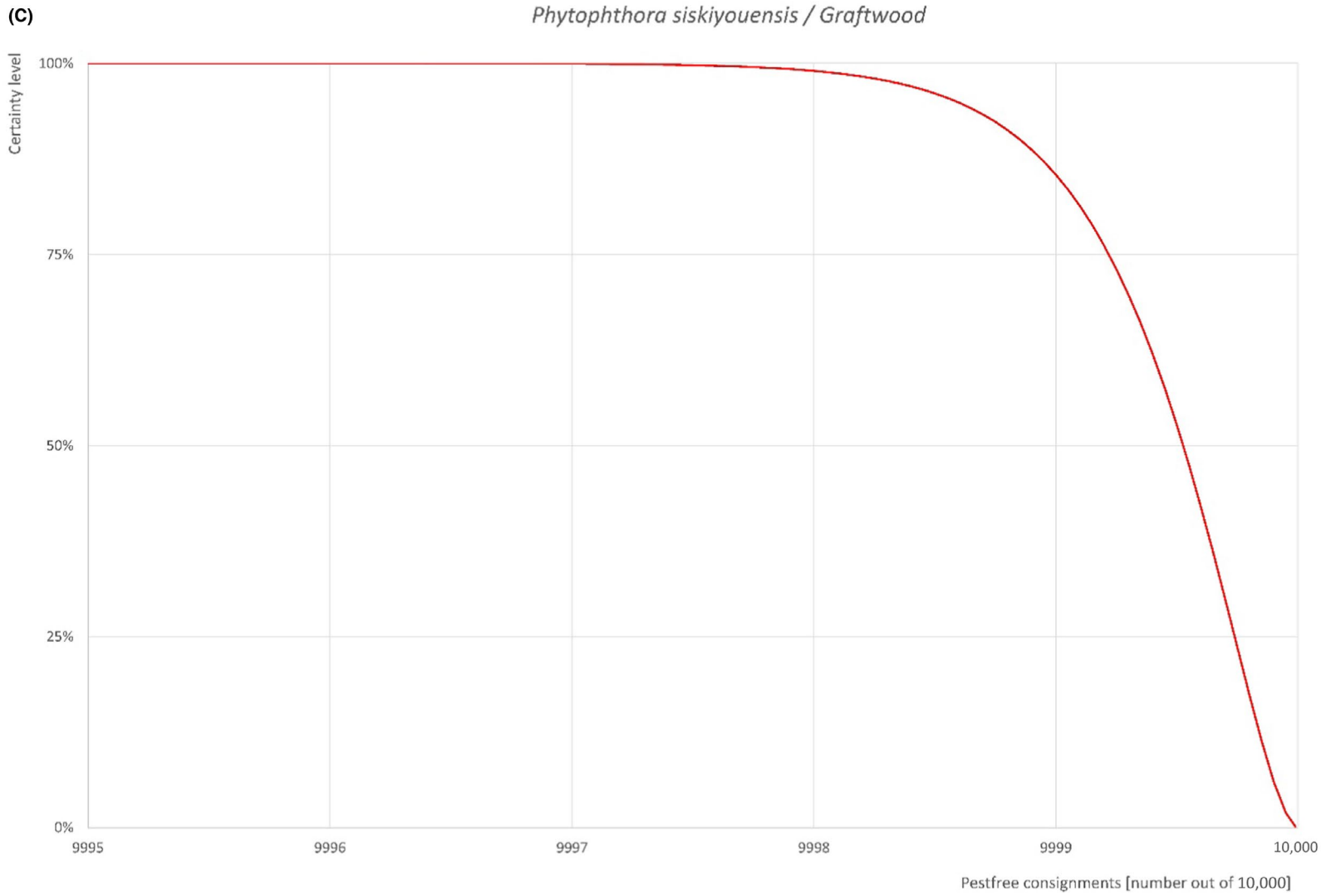


FIGURE A.3.1 (A) Elicited uncertainty of pest infection per 10,000 bundles of graftwood (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free bundles per 10,000 (i.e. = 1 − pest infection proportion expressed as percentage); (C) descending uncertainty distribution function of pestinfection per 10,000 bundles.

A.3.7 | Overall likelihood of pest freedom for bundles of bare-root plants and whips (small trees)

A.3.7.1 | Reasoning for a scenario which would lead to a reasonably low number of infected bundles of bare-root plants and whips (small trees)

The scenario assumes a low pressure of the pathogen in the nurseries and in the surroundings. Younger plants are exposed to the pathogen for only short period of time and are exported as dormant plants without leaves. The scenario assumes *Alnus* spp. to be minor hosts for the pathogen. The scenario also assumes that symptoms of the disease are visible and promptly detected during inspections. The washing of the roots removes (parts of) the soil and the pathogen present in the soil.

A.3.7.2 | Reasoning for a scenario which would lead to a reasonably high number of infected bundles of bare-root plants and whips (small trees)

The scenario assumes a high pressure of the pathogen in the surrounding environment of the nurseries because suitable hosts are present. The scenario assumes that the pathogen can infect leaves, which may still be present on the plants at the time of export. The scenario also assumes that the pathogen is not detected during the inspections because of presence of asymptomatic plants or difficulties in recognising early symptoms. Grafting can increase the incidence of the pathogen (via infected buds or by woundings). The washing of the roots may not remove all the attached soil from the plants.

A.3.7.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infected bundles of bare-root plants and whips (small trees) (Median)

The scenario assumes a limited presence of the pathogen in the nurseries and in the surroundings and a limited reported susceptibility of *Alnus* spp.

A.3.7.4. | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/ interquartile range)

The limited information on the occurrence of the pathogen in the nurseries and the surroundings and the susceptibility of *Alnus* spp. results in high level of uncertainties.

A.3.8 | Overall likelihood of pest freedom for cell-grown plants and single plants in pots (up to 7 years old) (small trees)

A.3.8.1 | Reasoning for a scenario which would lead to a reasonably low number of infected cell-grown plants and single plants in pots (up to 7 years old) (small trees)

P. siskiyouensis has a very restricted distribution in the UK. The scenario assumes a low pressure of the pathogen in the surroundings. Younger plants are exposed to the pathogen for only short period of time and are exported as dormant plants without leaves. The scenario assumes *Alnus* spp. to be minor hosts for the pathogen. The scenario also assumes that symptoms of the disease are visible and promptly detected during inspections.

A.3.8.2 | Reasoning for a scenario which would lead to a reasonably high number of infected cell-grown plants and single plants in pots (up to 7 years old) (small trees)

The scenario assumes a high pressure of the pathogen in the surrounding environment of the nurseries because suitable hosts are present. The scenario assumes that the pathogen can infect leaves, which may still be present on the plants at the time of export. The scenario also assumes that the pathogen is not detected during the inspections because of presence of asymptomatic plants or difficulties in recognising early symptoms. Grafting can increase the incidence of the pathogen (via infected buds or by woundings).

A.3.8.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of cell-grown plants and single plants in pots (up to 7 years old) (small trees) (Median)

P. siskiyouensis has a very restricted distribution in the UK. The scenario assumes a limited presence of the pathogen in the nurseries and in the surroundings and a limited reported susceptibility of *Alnus* spp.

A.3.8.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/ interquartile range)

The limited information on the occurrence of the pathogen in the nurseries and the surroundings and the susceptibility of *Alnus* spp. results in high level of uncertainties.

A.3.9 | Elicitation outcomes of the assessment of the pest freedom for *Phytophthora siskiyouensis* on small trees

The elicited and fitted values for *P. siskiyouensis* for pest infestation and pest freedom agreed by the Panel are shown in Tables A.3.3, A.3.4 and in Figure A.3.2.

TABLE A.3.3 Elicited and fitted values of the uncertainty distribution of pest infestation by *Phytophthora siskiyouensis* per 10,000 small trees.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0					2		3		5					8
EKE	0.123	0.248	0.423	0.729	1.10	1.55	1.99	2.91	3.96	4.58	5.32	6.08	6.87	7.46	8.02

Note: The EKE results is the *BetaGeneral* (*1.3292*, *2.5549*, *0*, *9.3*) distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infected plants the pest freedom was calculated (i.e. = 10,000 – number of infected plants per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.3.5.

TABLE A.3.4 The uncertainty distribution of plants free of *Phytophthora siskiyouensis* per 10,000 small trees calculated by Table A.3.4.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9992.0					9995.5		9997.0		9998.5					10,000.0
EKE results	9992.0	9992.5	9993.1	9993.9	9994.7	9995.4	9996.0	9997.1	9998.0	9998.5	9998.9	9999.3	9999.6	9999.8	9999.9

Note: The EKE results are the fitted values.

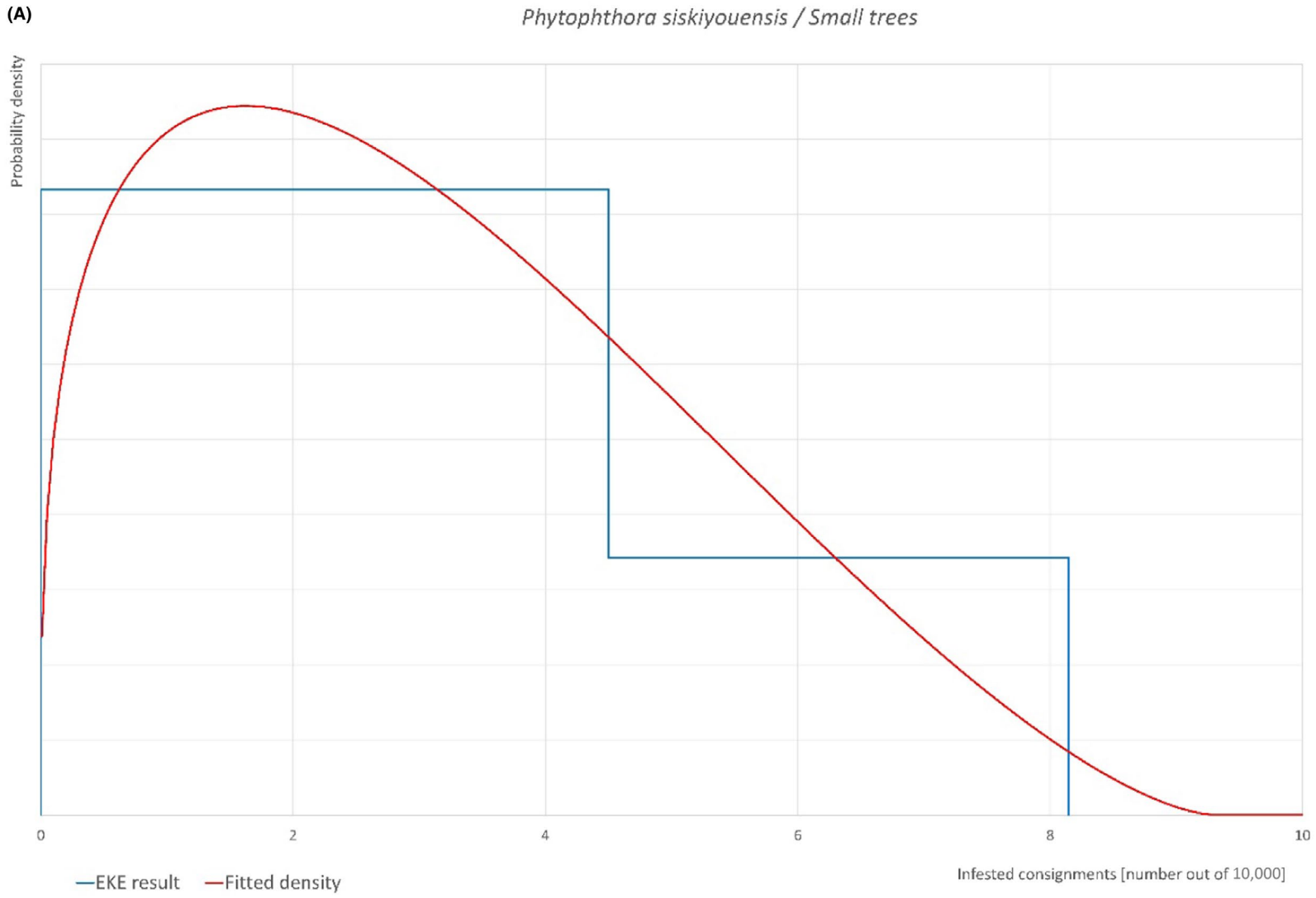


FIGURE A.3.2 (Continued)

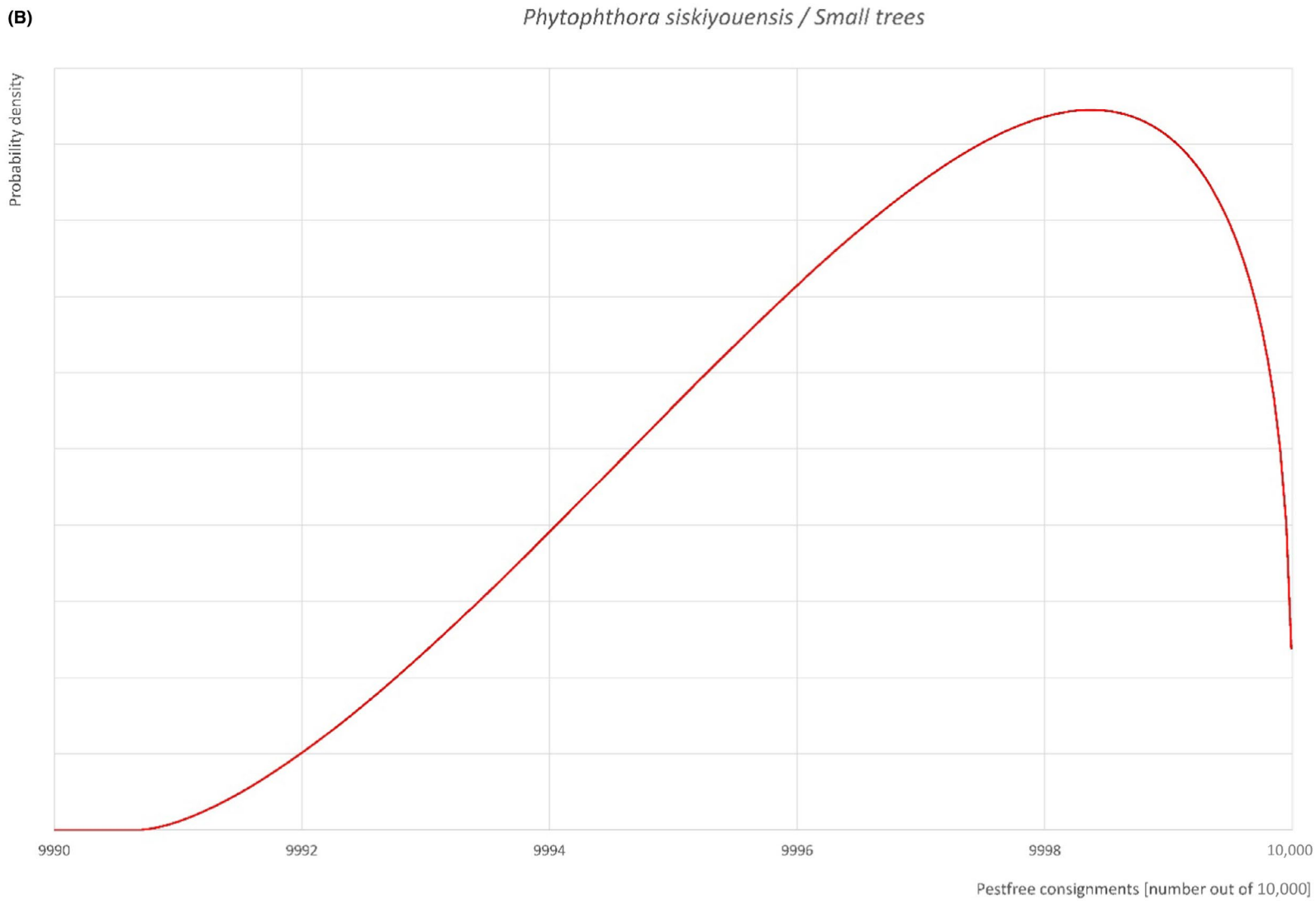


FIGURE A.3.2 (Continued)

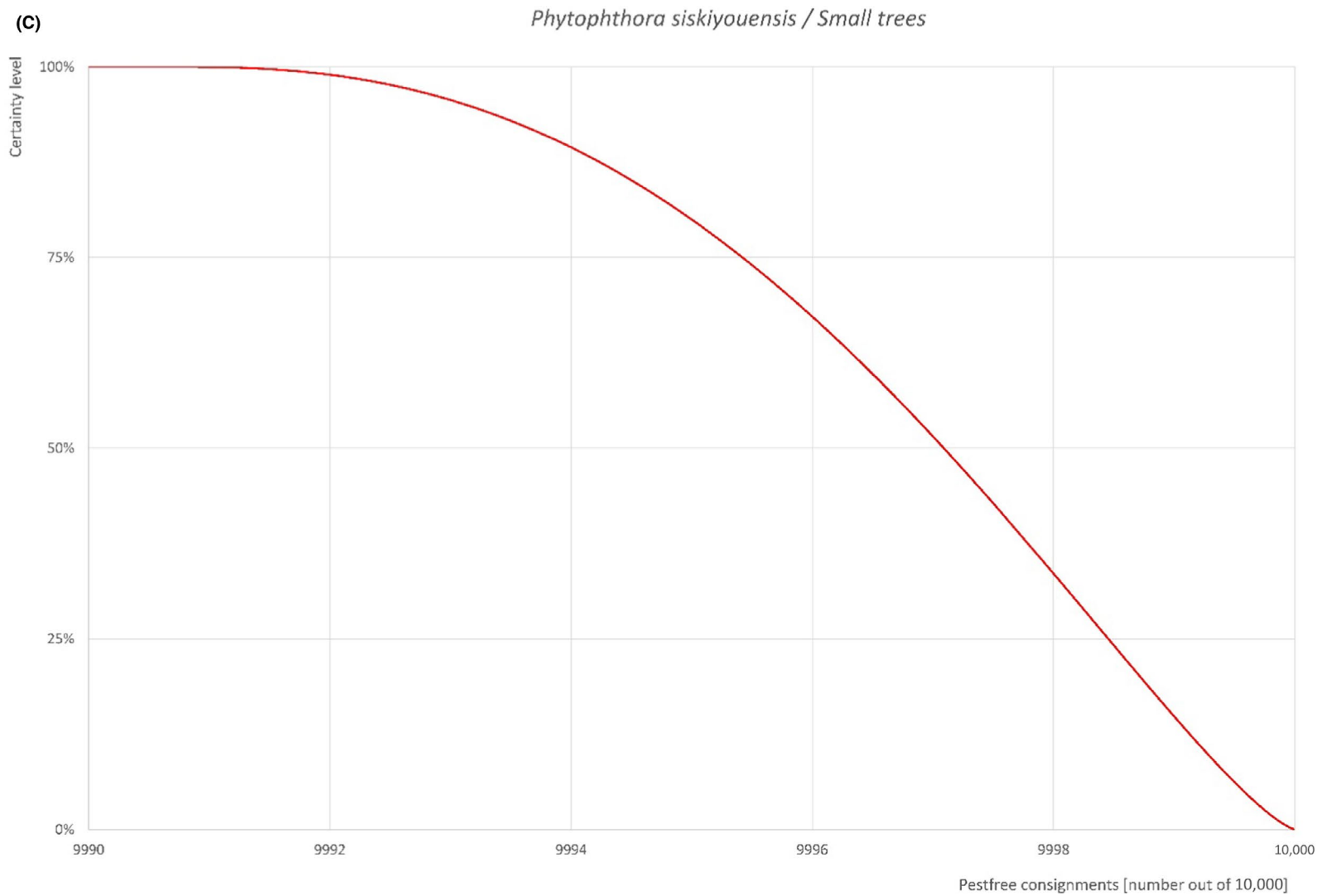


FIGURE A.3.2 (A) Elicited uncertainty of pest infection per 10,000 bundles of graftwood (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free bundles per 10,000 (i.e. = 1 – pest infection proportion expressed as percentage); (C) descending uncertainty distribution function of pestinfection per 10,000 bundle.

A.3.10 | Reference list

Abad, Z. G., Burgess, T. I., Bourret, T., Bensch, K., Cacciola, S. O., Scanu, B., Mathew, R., Kasiborski, B., Srivastava, S., Kageyama, K., Bienapfl, J. C., Verkleij, G., Broders, K., Schena, L., & Redford, A. J. (2023b). Phytophthora: Taxonomic and phylogenetic revision of the genus. *Studies in Mycology*, *106*, 259–349. https://doi.org/10.3114/sim.2023.106.05

Abad, Z. G., Burgess, T. I., Redford, A. J., Bienapfl, J. C., Srivastava, S., Mathew, R., & Jennings, K. (2023). IDphy: An international online resource for molecular and morphological identification of *Phytophthora*. *Plant Disease*, *107*(4), 987–998. https://doi.org/10.1094/PDIS-02-22-0448-FE

CABI (Centre for Agriculture & Bioscience International) *Phytophthora siskiyouensis*. https://www.cabidigitallibrary.org/doi/10.1079/cabicompendium.110465#REF-DDB-199728

CABI (Centre for Agriculture & Bioscience International) *Phytophthora siskiyouensis*. https://www.cabidigitallibrary.org/doi/full/10.5555/20153264575

EPPO (European and Mediterranean Plant Protection Organization). (online). *Phytophthora siskiyouensis* (PHYTSK). https://gd.eppo.int/taxon/PHYTSK

EUROPHYT *European Union notification system for plant health interceptions – EUROPHYT*. https://ec.europa.eu/food/plant/plant_health_biosecurity/europhyt/index_en.htm

Forest Phytophthoras of the World *a. Siskiyouensis disease. Forest phytophthoras of the world*. https://forestphytophthoras.org/species/siskiyouensis/disease

Forest Phytophthoras of the World *b. Phytophthora basics. Forest phytophthoras of the world*. https://forestphytophthoras.org/phytophthora-basics

Hansen, E. M., Reeser, P., & Rooney-Latham, S. (2011). *Phytophthora siskiyouensis*. *Forest Phytophthoras*, *1*(1). https://doi.org/10.5399/osu/fp.1.1.1826

Forest Research *Phytophthora disease of alder (Phytophthora alni)*. https://www.forestresearch.gov.uk/?s=phytophthora-disease-of-alder%2520phytophthora-alnihttps://www.forestresearch.gov.uk/?s=phytophthora-disease-of-alder%2520phytophthora-alni

ITP *Identification Technology Program*. https://idtools.org/phytophthora/index.cfm?packageID=1131&entityID=5176

Navarro, S., Sims, L., Hansen, E., & Vannini, Á. (2015). Pathogenicity to alder of *Phytophthora* species from riparian ecosystems in western Oregon. *Forest Pathology*, *45*(5), 358–366. https://doi.org/10.1111/efp.121752

Perez-Sierra, A., Kalantarzadeh, M., Sancisi-Frey, S., & Brasier, C. M. (2015). *Phytophthora siskiyouensis* causing stem lesions and cankers on *Alnus incana*. *New Disease Reports*, *31*, 172. https://doi.org/10.5197/j.2044-0588.2015.031.017

Perez-Sierra, A., Sancisi-Frey, S., Kalantarzadeh, M., & Brasier, C. (2014). *Unexpected discovery of Phytophthora siskiyouensis in the UK*. 7th Meeting IUFRO Working Party 7.02.09 Phytophthora in Forest and Natural Ecosystems, 10–14 November 2024, Esquel, Chubut, Patagonia, Argentina.

Reeser, P. W., Hansen, E. M., & Sutton, W. (2007). *Phytophthora siskiyouensis*, a new species from soil, water, myrtlewood (*Umbellularia californica*) and tanoak (*Lithocarpus densiflorus*) in southwestern Oregon. *Mycologia*, *99*(5), 639–6432.

Reser, P. W., Sutton, W., & Hansen, E. M. (2008). *Phytophthora* species causing tanoak stem cankers in Southwestern Oregon. *Plant Disease*, *92*, 1252.

Rooney-Latham, S., Blomquist, C. L., Pastalka, T., & Costello, L. (2009). Collar rot on Italian alder trees in California caused by *Phytophthora siskiyouensis*. *Plant Health Progress*, *10*. https://doi.org/10.1094/PHP-2009-0413-01-RS

Sims, L., Goheen, E., Kanaskie, A., & Hansen, E. (2015a). Alder canopy dieback and damage in western Oregon riparian ecosystems. *Northwest Science*, *89*(1), 34–46. https://doi.org/10.3955/046.089.0103

Sims, L. L., Sutton, W., Reeser, P., & Hansen, E. M. (2015b). The *Phytophthora* species assemblage and diversity in riparian alder ecosystems of western Oregon, USA. *Mycologia*, *107*, 889–902.

Smith, I. A., Cunnington, J., & Pascoe, I. (2004). *Another new? Species of Phytophthora on alder down under (Australia)*. P. of the IUFRO Res. Work. Gr. Conf. on Phytophthora Forests and Natural Ecosystems. 11–17 September 2004. Freising, Germany.

Smith, I. W., Cunnington, J., & Pascoe, I. (2006). Another new? Species of *Phytophthora* on alder 'down under' (Australia). Poster 30, Progress in Research on Phytophthora Diseases of Forest Trees. In C. Brasier, T. Jung, & W. Oβwald (Eds.), *Proceedings of the Third Meeting of the International Union of Forest Research Organizations (IUFRO) Working Party S07.02.09: Phytophthoras in forests and natural ecosystems*. Forest Research.

UK Plant Health Portal. (2024). *DEFRA*. https://planthealthportal.defra.gov.uk/pests-and-diseases/uk-plant-health-riskregister/viewPestRisks.cfm?cslref=27280

Waterhouse, G. M. (1963). *Key to the species of Phytophthora de Bary*. Mycol. Pap. 92. 22 pp. Commonwealth Mycological Institute.

APPENDIX B

Web of Science All Databases Search String 30/1/2024

In the table below the search string used in Web of Science is reported. In total, 1248 papers were retrieved. Titles and abstracts were screened, and 78 pests were added to the list of pests (see Appendix D: Table B.1).

TABLE B.1 String for *Alnus*.

Web of Science All databases	TOPIC: "Alnus incana" OR "Alnus glutinosa" OR "Alnus cordata" OR "Alnus sp." OR "Alnus spp." OR "grey alder" OR "European alder" OR "Italian alder" AND TOPIC: "pathogen*" OR "pathogenic bacteria" OR "fung*" OR "oomycet*" OR "myce*" OR "bacteri*" OR "virus*" OR "viroid*" OR "insect$" OR "mite$" OR "phytoplasm*" OR "arthropod*" OR "nematod*" OR "disease$" OR "infecti*" OR "damag*" OR "symptom*" OR "pest$" OR "vector" OR "hostplant$" OR "host plant$" OR "host" OR "root lesion$" OR "decline$" OR "infestation$" OR "damage$" OR "symptom$" OR "dieback*" OR "die back*" OR "malaise" OR "aphid$" OR "curculio" OR "thrip$" OR "cicad$" OR "miner$" OR "borer$" OR "weevil$" OR "plant bug$" OR "spittlebug$" OR "moth$" OR "mealybug$" OR "cutworm$" OR "pillbug$" OR "root feeder$" OR "caterpillar$" OR "foliar feeder$" OR "virosis" OR "viruses" OR "blight$" OR "wilt$" OR "wilted" OR "canker" OR "scab$" OR "rot" OR "rots" OR "rotten" OR "damping off" OR "damping-off" OR "blister$" OR "smut" OR "mould" OR "mold" OR "damping syndrome$" OR "mildew" OR "scald$" OR "root knot" OR "root-knot" OR "rootkit" OR "cyst$" OR "dagger" OR "plant parasitic" OR "parasitic plant" OR "plant$parasitic" OR "root feeding" OR "root$feeding" OR "acari" OR "host$" OR "gall" OR "gall$" OR "whitefly" OR "whitefl*" OR "aleyrodidae" OR "thysanoptera" OR "moths" OR "scale" OR "scale$" OR "thripidae" OR "leafhoppers" OR "leafhopper$" OR "plant pathogens" OR "fungal" OR "aphididae" OR "Scolytinae" OR "bark beetle" NOT "heavy metal$" OR "pollut*" OR "weather" OR "propert*" OR "probes" OR "spectr*" OR "antioxidant$" OR "transformation" OR "Secondary plant metabolite$" OR "metabolite$" OR "Postharvest" OR "Pollin*" OR "Ethylene" OR "Thinning" OR "fertil*" OR "Mulching" OR "Nutrient$" OR "human virus" OR "animal disease$" OR "plant extracts" OR "immunological" OR "purified fraction" OR "traditional medicine" OR "medicine" OR "mammal$" OR "bird$" OR "human disease$" OR "cancer" OR "therapeutic" OR "psoriasis" OR "blood" OR "medicinal ethnobotany" OR "Nitrogen-fixing" OR "patients" OR "Probiotic drugs" OR "Antioxidant" OR "Anti-Inflammatory" OR "plasma levels" OR "ethnomedicinal" OR "traditional uses of medicinal plants" OR "Antitumor" OR "Neuroprotective" OR "Hypoglycemic" OR "ozone sensitivity" OR "cardiotonic" NOT TOPIC: 'Abagrotis variata' OR 'Acalitus brevitarsus' OR 'Acalitus phyllereus' OR 'Acantharia sinensis' OR 'Acanthococcus spiraeae' OR 'Acanthococcus tokaedae' OR 'Acanthosoma haemorrhoidale' OR 'Acanthostigma alni' OR 'Acaphylla trinotus' OR 'Acaricalus trinotus' OR 'Aceria alniborealis' OR 'Aceria alniviridis' OR 'Aceria bistriata' OR 'Aceria longirostris' OR 'Aceria nalepai' OR 'Acerra normalis' OR 'Achatia distincta' OR 'Achatodes zeae' OR 'Achlya flavicornis' OR 'Acleistia alniella' OR 'Acleris alnivora' OR 'Acleris braunana' OR 'Acleris caliginosana' OR 'Acleris cervinana' OR 'Acleris cornana' OR 'Acleris emargana' OR 'Acleris fuscana' OR 'Acleris hudsoniana' OR 'Acleris inana' OR 'Acleris logiana placidana' OR 'Acleris maccana' OR 'Acleris notana' OR 'Acleris semiannula' OR 'Acleris senescens' OR 'Acleris umbrana' OR 'Acmaeodera revelierei' OR 'Acrobasis betulella' OR 'Acrobasis rubrifasciella' OR 'Acronicta alni' OR 'Acronicta americana' OR 'Acronicta auricoma' OR 'Acronicta barnesii' OR 'Acronicta cuspis' OR 'Acronicta dactylina' OR 'Acronicta distans' OR 'Acronicta euphorbiae' OR 'Acronicta fragilis' OR 'Acronicta funeralis' OR 'Acronicta grisea' OR 'Acronicta hastulifera' OR 'Acronicta hesperida' OR 'Acronicta impleta' OR 'Acronicta impressa' OR 'Acronicta innotata' OR 'Acronicta lanceolaria' OR 'Acronicta leporina' OR 'Acronicta lepusculina' OR 'Acronicta longa' OR 'Acronicta megacephala' OR 'Acronicta oblinita' OR 'Acronicta psi' OR 'Acronicta rumicis' OR 'Acronicta sperata' OR 'Acronicta tridens' OR 'Acrospermum compressum' OR 'Acrostalagmus luteoalbus' OR 'Actebia fennica' OR 'Actias artemis' OR 'Actias gnoma' OR 'Actias luna' OR 'Actias selene' OR 'Actias selene ningpoana' OR 'Aculus epiphyllus' OR 'Adoxophyes orana' OR 'Aegomorphus clavipes' OR 'Aegosoma scabricorne' OR 'Aethalura ignobilis' OR 'Aethalura intertexta' OR 'Aethalura punctulata' OR 'Agelastica alni' OR 'Aglia tau' OR 'Agnocoris reclairei' OR 'Agonimia repleta' OR 'Agonopterix argillacea' OR 'Agrilus angustulus' OR 'Agrilus graminis' OR 'Agrilus hastulifer' OR 'Agrilus roscidus' OR 'Agrilus viridis' OR 'Agriopis aurantiaria' OR 'Agriopis marginaria' OR 'Agroathelia rolfsii' OR 'Agrochola litura' OR 'Agrochola lota' OR 'Agrochola pulchella' OR 'Agrochola purpurea' OR 'Agromyza alnivora' OR 'Alatospora acuminata' OR 'Alcis repandata' OR 'Alder yellows phytoplasma' OR 'Alebra albostriella' OR 'Alebra wahlbergi' OR 'Aleucis distinctata' OR 'Aleurocanthus spiniferus' OR 'Aleurodiscus aurantius' OR 'Allygus mixtus' OR 'Allygus modestus' OR 'Alnecium auctum' OR 'Alnetoidea alneti' OR 'Alosterna tabacicolor' OR 'Alsophila aescularia' OR 'Alsophila japonensis' OR 'Alternaria alternata' OR 'Alternaria botrytis' OR 'Alternaria chartarum' OR 'Altica bimarginata' OR 'Altica tamaricis' OR 'Alysidium resinae' OR 'Amaurodon mustialaensis' OR 'Amniculicola parva' OR 'Amorbia humerosana' OR 'Amorpha juglandis' OR 'Ampedus cinnabarinus' OR 'Ampedus elongantulus' OR 'Ampedus nigerrimus' OR 'Ampedus nigrinus' OR 'Ampedus pomonae' OR 'Ampedus pomorum' OR 'Ampedus rufipennis' OR 'Ampedus sanguinolentus' OR 'Amphinema byssoides' OR 'Amphipyra perflua' OR 'Amphipyra pyramidoides' OR 'Amphirosellinia evansii' OR 'Amphisphaeria umbrina' OR 'Anacampsis innocuella' OR 'Anacampsis niveopulvella' OR 'Anaesthetis testacea' OR 'Anagoga occiduaria' OR 'Anaplectoides pressus' OR 'Anavitrinella pampinaria' OR 'Andropolia aedon' OR 'Andropolia contacta' OR 'Angerona prunaria' OR 'Anguillosporella vermiformis' OR 'Anguillosporella vermiformis' OR 'Angustimassarina alni' OR 'Anisandrus maiche' OR 'Anomoloma myceliosum' OR 'Anoplodera sexguttata' OR 'Anoplophora chinensis' OR 'Anoplophora glabripennis' OR 'Anoplus plantaris' OR 'Anoplus roboris' OR 'Anoplus setulosus' OR 'Antepione thisoaria' OR 'Antheraea polyphemus polyphemus' OR 'Anthonomus undulatus' OR 'Anthostoma ellisii' OR 'Anthostoma gastrinum' OR 'Anthostoma melanotes' OR 'Antrodia albida' OR 'Antrodia heteromorpha' OR 'Antrodia sinuosa' OR 'Antrodiella genistae' OR 'Antrodiella semisupina' OR 'Apamea auranticolor' OR 'Apamea castanea' OR 'Apatelodes torrefacta' OR 'Apatura ilia' OR 'Apatura iris' OR 'Aphelenchoides

(Continued)

composticola' OR 'Aphelenchus avenae' OR 'Aphis spiraecola' OR 'Aphrophora alni' OR 'Apiognomonia alniella' OR 'Apioporthella bavarica' OR 'Apiospora arundinis' OR 'Apiosporopsis carpinea' OR 'Aplosporella alnicola' OR 'Apocheima hispidaria' OR 'Apoda limacodes' OR 'Apodachlya brachynema' OR 'Apoderus coryli' OR 'Apoplymus pectoralis' OR 'Apotomis bifida' OR 'Apotomis funerea' OR 'Apterona paludella' OR 'Aptinothrips elegans' OR 'Aracima muscosa' OR 'Aradus betulae' OR 'Arboridia erecta' OR 'Arboridia parvula' OR 'Arboridia ribauti' OR 'Archiearis infans oregonensis' OR 'Archips argyrospila' OR 'Archips breviplicanus' OR 'Archips cerasivorana' OR 'Archips crataegana' OR 'Archips fuscocupreanus' OR 'Archips mortuana' OR 'Archips negundana' OR 'Archips podana' OR 'Archips rosana' OR 'Archips viola' OR 'Archips xylosteana' OR 'Arctia caja' OR 'Arctia caja americana' OR 'Arctia caja waroi' OR 'Arctorthezia cataphracta' OR 'Arcyria stipata' OR 'Argyresthia brockeella' OR 'Argyresthia calliphanes' OR 'Argyresthia goedartella' OR 'Argyrotaenia ljungiana' OR 'Argyrotaenia mariana' OR 'Argyrotaenia velutinana' OR 'Armillaria altimontana' OR 'Armillaria cepistipes' OR 'Armillaria gallica' OR 'Armillaria mellea' OR 'Armillaria nabsnona' OR 'Armillaria ostoyae' OR 'Armillaria puiggarii' OR 'Armillaria sinapina' OR 'Armillaria singular' OR 'Arocatus longiceps' OR 'Arocatus melanocephalus' OR 'Arocatus roeselii' OR 'Aromia moschata' OR 'Arthopyrenia didymelloides' OR 'Arthopyrenia grisea' OR 'Artomyces pyxidatus' OR 'Ascocoryne cylichnium' OR 'Ascocoryne sarcoides' OR 'Ascospirella lutea' OR 'Ascotremella faginea' OR 'Aseptis binotata' OR 'Aspergillus nidulans' OR 'Aspergillus niger" OR 'Aspidiotus nerii' OR 'Asterococcus oblatus' OR 'Asteroma alneum' OR 'Asteroma alniellum' OR 'Asteroma alnigena' OR 'Asteromassaria alni' OR 'Asteromassaria macrospora' OR 'Asteromella alnicola' OR 'Asteromella ulmi' OR 'Astetholida lucida' OR 'Astrosphaeriella applanata' OR 'Asymmetrasca decedens' OR 'Atemelia torquatella' OR 'Athelia arachnoidea' OR 'Athelia decipiens' OR 'Athelia epiphylla' OR 'Athelia nivea' OR 'Atheliachaete sanguinea' OR 'Atopospora betulina' OR 'Attelabus nitens' OR 'Aureobasidium pullulans' OR 'Auricularia auricula-judae' OR 'Autographa ampla' OR 'Autographa corusca' OR 'Bactrodesmium biformatum' OR 'Bactrodesmium obovatum' OR 'Baeopelma foersteri' OR 'Baileya doubledayi' OR 'Baileya ophthalmica' OR 'Baltazaria galactina' OR 'Barbatosphaeria barbirostris' OR 'Barrmaelia oxyacanthae' OR 'Basidiodendron cinereum' OR 'Basilarchia arthemis' OR 'Basilarchia arthemis arthemis' OR 'Basilarchia arthemis rubrofasciata' OR 'Batia lambdella' OR 'Bertia moriformis' OR 'Besma quercivoraria' OR 'Betacallis alnicolens' OR 'Betulaphis quadrituberculata' OR 'Bibarrambla allenella' OR 'Bipolaris oryzae' OR 'Biscogniauxia bartholomaei' OR 'Biscogniauxia mediterranea' OR 'Biscogniauxia nummularia' OR 'Biscogniauxia repanda' OR 'Bispora effusa' OR 'Biston betularia' OR 'Biston betularia cognataria' OR 'Biston strataria' OR 'Bjerkandera adusta' OR 'Blastobasis decolorella' OR 'Blepharidopterus angulatus' OR 'Blepharidopterus dubius' OR 'Blepharita adusta' OR 'Boeremia exigua' OR 'Boernerina alni' OR 'Boernerina alni ssp. Insularia' OR 'Boernerina depressa' OR 'Boernerina occidentalis' OR 'Boernerina variabilis' OR 'Bohemannia quadrimaculella' OR 'Bombardia bombarda' OR 'Botryobasidium candicans' OR 'Botryobasidium pruinatum' OR 'Botryobasidium ramosissimum' OR 'Botryobasidium subcoronatum' OR 'Botryobasidium vagum' OR 'Botryobasidium vagum" OR 'Botryodiplodia alni' OR 'Botrytis cinerea' OR 'Bourdotigloea concisa' OR 'Bourdotigloea dura' OR 'Bourdotigloea grisea' OR 'Bourdotigloea vestita' OR 'Brachysporiella dennisii' OR 'Brachysporiella pulchra' OR 'Brachysporium bloxamii' OR 'Brachysporium britannicum' OR 'Brachysporium fusiforme' OR 'Brachysporium polyseptatum' OR 'Brenneria alni' OR 'Brenneria salicis' OR 'Brevipalpus californicus' OR 'Brevipalpus lewisi' OR 'Brevipalpus obovatus' OR 'Brunnipila calyculiformis' OR 'Bryobia praetiosa' OR 'Bucculatrix cidarella' OR 'Bucculatrix locuples' OR 'Bucculatrix thoracella' OR 'Bulbillomyces farinosus' OR 'Byctiscus betulae' OR 'Byssomerulius corium' OR 'Byssosphaeria alnea' OR 'Cabera exanthemata' OR 'Cabera purus' OR 'Cabera pusaria' OR 'Cactodera betulae' OR 'Cacumisporium capitulatum' OR 'Cadophora melinii' OR 'Calaphis alni' OR 'Callidium violaceum' OR 'Callimorpha dominula' OR 'Callistosporium luteo-olivaceum' OR 'Calliteara pudibunda' OR 'Calocera cornea' OR 'Caloptilia alni' OR 'Caloptilia alnicolella' OR 'Caloptilia elongella' OR 'Caloptilia falconipennella' OR 'Caloptilia glutinella' OR 'Caloptilia invariabilis' OR 'Caloptilia issikii' OR 'Caloptilia pulchella' OR 'Caloptilia pulverea' OR 'Calosphaeria cryptospora' OR 'Calycellina lachnobrachya' OR 'Calycellina leucella' OR 'Calycina alniella' OR 'Calycina alniella' OR 'Calycina citrina' OR 'Calyptella capula' OR 'Camaropella lutea' OR 'Camaropella microspora' OR 'Camarops polysperma' OR 'Campaea margaritaria' OR 'Campaea perlata' OR 'Camposporium cambrense' OR 'Campylospora parvula' OR 'Canephora hirsuta' OR 'Capitotricha bicolor' OR 'Capitotricha scabrovillosa' OR 'Capnodium citri' OR 'Capronia pilosella' OR 'Capua vulgana' OR 'Carpatolechia proximella' OR 'Catocala elocata' OR 'Cavariella aquatica' OR 'Cellypha subgelatinosa' OR 'Celypha rivulana' OR 'Cenangium graddonii' OR 'Cenopalpus lanceolatisetae' OR 'Centrotus cornutus' OR 'Ceraceomyces tessulatus' OR 'Cerambyx scopolii' OR 'Cerastis rubricosa' OR 'Ceratocystiopsis synnemata' OR 'Ceratocystis piceae' OR 'Ceratostomella rostrata' OR 'Cerioporus leptocephalus' OR 'Cerioporus scutellatus' OR 'Cerioporus squamosus' OR 'Cerioporus varius' OR 'Ceriosporopsis cambrensis' OR 'Ceriporia purpurea' OR 'Ceriporia reticulata' OR 'Ceriporia rhodella' OR 'Ceriporia spissa' OR 'Ceriporia viridans' OR 'Ceriporiopsis mucida' OR 'Cerrena unicolor' OR 'Chaenothecopsis savonica' OR 'Chaetomium cochliodes' OR 'Chaetospermum chaetosporum' OR 'Chaetosphaerella phaeostroma' OR 'Chaetosphaeria myriocarpa' OR 'Chaetosphaeria preussii' OR 'Chaetosphaeria pygmaea' OR 'Chaetothyrium setosum' OR 'Chalara alnicola' OR 'Chalara aurea' OR 'Chalara cylindrica' OR 'Chalara inflatipes' OR 'Cheimophila salicella' OR 'Cheiromycella foliicola' OR 'Cheirospora alni' OR 'Chilecomadia valdiviana' OR 'Chionaspis alnus' OR 'Chionaspis lintneri' OR 'Chionaspis ortholobis' OR 'Chionaspis salicis' OR 'Chionaspis wistariae' OR 'Chlorencoelia versiformis' OR 'Chloridium caesium' OR 'Chloridium cylindrosporum' OR 'Chlorociboria aeruginascens' OR 'Chlorociboria aeruginosa' OR 'Chloroclysta miata' OR 'Chloroclysta siterata' OR 'Chloroclysta truncata' OR 'Chlorophanus pollinosus' OR 'Chlorophorus glabromaculatus' OR 'Chlorophorus varius' OR 'Chlorosea nevadaria' OR 'Chondrostereum purpureum' OR 'Choreutis betuliperda' OR 'Choreutis diana' OR 'Choristoneura conflictana' OR 'Choristoneura diversana' OR 'Choristoneura rosaceana' OR 'Choristoneura zapulata' OR 'Chromaphis hirsutustibus' OR 'Chrysobothris affinis' OR 'Chrysobothris femorata' OR 'Chrysobothris mali' OR 'Chrysomela aenea' OR 'Chrysomela lapponica' OR 'Chytriomyces confervae' OR 'Ciboria acerina' OR 'Ciboria alni' OR 'Ciboria amentacea' OR 'Ciboria caucus' OR 'Ciboria seminicola' OR 'Ciboria tenuistipes' OR 'Ciboria viridifusca' OR 'Cicadella viridis' OR 'Cimbex connatus' OR 'Cimbex femoratus' OR 'Cimbex luteus' OR 'Cinereomyces lindbladii' OR 'Cingilia catenaria' OR 'Cistella xylita' OR 'Cixius cunicularius' OR 'Cixius nervosus' OR 'Cixius similis' OR 'Cixius stigmaticus' OR 'Cladara atroliturata' OR 'Cladonia caespiticia' OR 'Cladosporium allicinum' OR 'Cladosporium alneum' OR 'Cladosporium alnicola' OR 'Cladosporium cladosporioides' OR 'Cladosporium epiphyllum' OR 'Cladosporium herbarum' OR 'Cladosporium inversicolor' OR 'Cladosporium laxicapitulatum' OR 'Cladosporium lignicola' OR 'Cladosporium macrocarpum' OR 'Cladosporium oxysporum' OR 'Cladosporium sphaerospermum' OR 'Clathrosphaerina zalewskii' OR 'Clavatospora longibrachiata' OR 'Clepsis melaleucana' OR 'Clepsis persicana' OR 'Clethrobius comes' OR 'Clitopilus ardosiacus' OR 'Clostera albosigma' OR 'Clostera inclusa' OR 'Closterotomus fulvomaculatus' OR 'Clytus arietis' OR 'Cochylis nana' OR 'Coeliodes rubicundus'

(Continued)

OR 'Clostera inclusa' OR 'Closterotomus fulvomaculatus' OR 'Clytus arietis' OR 'Cochylis nana' OR 'Coeliodes rubicundus' OR 'Coleophora ahenella' OR 'Coleophora alniella' OR 'Coleophora alnifoliae' OR 'Coleophora anatipenella' OR 'Coleophora binderella' OR 'Coleophora comptoniella' OR 'Coleophora fuscedinella' OR 'Coleophora limosipennella' OR 'Coleophora milvipennis' OR 'Coleophora orbitella' OR 'Coleophora persimplexella' OR 'Coleophora pruniella' OR 'Coleophora serratella' OR 'Coleophora siccifolia' OR 'Coleophora violacea' OR 'Coleotechnites alnifructella' OR 'Colletotrichum gloeosporioides' OR 'Colocasia coryli' OR 'Colocasia flavicornis' OR 'Colocasia flavicornis electa' OR 'Comstockaspis perniciosa' OR 'Conferticium ochraceum' OR 'Coniochaeta dakotensis' OR 'Coniochaeta hoffmannii' OR 'Coniochaeta ligniaria' OR 'Coniochaeta ligniaria' OR 'Coniochaeta pulveracea' OR 'Coniochaeta subcorticalis' OR 'Coniochaeta velutina' OR 'Coniomela rimincola' OR 'Coniophora arida var. arida' OR 'Coniophora olivacea' OR 'Coniophora puteana' OR 'Coniortodes salicellus' OR 'Coniothyrium fuckelii' OR 'Conistra vaccinii' OR 'Coprinellus micaceus' OR 'Coprinopsis alnivora' OR 'Cordana boothii' OR 'Cordana pauciseptata' OR 'Corinectria fuckeliana' OR 'Cornicuariella urceola' OR 'Coronicium alboglaucum' OR 'Coronophora angustata' OR 'Coronophora annexa' OR 'Coronophora gregaria' OR 'Coronophora ovipara' OR 'Corticium boreoroseum' OR 'Corticium confine' OR 'Corticium roseocarneum' OR 'Corticium roseum' OR 'Corynesporopsis quercicola' OR 'Coryneum sydowianum' OR 'Cosmospora cymosa' OR 'Cosmospora diminuta' OR 'Cosmospora viridescens' OR 'Cossus cossus' OR 'Craniophora ligustri' OR 'Crepidotus alnicola' OR 'Crepidotus cesatii' OR 'Crepidotus fulvotomentosus' OR 'Crepidotus haerens' OR 'Crepidotus mollis' OR 'Crepidotus occidentalis' OR 'Crepidotus ochraceus' OR 'Crepidotus pseudoflammeus' OR 'Crepidotus submollis' OR 'Crepidotus subverrucisporus' OR 'Criconema annuliferum' OR 'Criconemoides parvus' OR 'Cristinia coprophila' OR 'Crocallis elinguaria' OR 'Croesus septentrionalis' OR 'Croesus varus' OR 'Crustodontia chrysocreas' OR 'Crustomyces subabruptus' OR 'Cryphonectria parasitica' OR 'Cryphonectria radicalis' OR 'Cryptoblabes bistriga' OR 'Cryptocephalus bipunctatus' OR 'Cryptocephalus coryli' OR 'Cryptocephalus decemmaculatus' OR 'Cryptocephalus pusillus' OR 'Cryptocoryneum condensatum' OR 'Cryptodiaporthe pyrrhocystis' OR 'Cryptodiaporthe tiliacea' OR 'Cryptorhynchus lapathi' OR 'Cryptosporella alnicola' OR 'Cryptosporella alni-cordatae' OR 'Cryptosporella alni-rubrae' OR 'Cryptosporella alni-sinuatae' OR 'Cryptosporella alni-tenuifoliae' OR 'Cryptosporella amistadensis' OR 'Cryptosporella betulae' OR 'Cryptosporella femoralis' OR 'Cryptosporella jaklitschii' OR 'Cryptosporella marylandica' OR 'Cryptosporella multicontinentalis' OR 'Cryptosporella pacifica' OR 'Cryptosporella suffusa' OR 'Cryptosporium neesii' OR 'Cryptosympodula appendiculata' OR 'Cryptovalsaria americana' OR 'Cryptovalsaria rossica' OR 'Crypturaphis grassii' OR 'Crystallicutis serpens' OR 'Cubamyces lactineus' OR 'Cucullia intermedia' OR 'Cucullia lucifuga' OR 'cucumber mosaic virus' OR 'Cucurbitaria alni' OR 'Cucurbitaria fraxini' OR 'Curculio betulae' OR 'Curculio rubidus' OR 'Curvularia lunata' OR 'Cyanosporus caesius' OR 'Cyanostolus aeneus' OR 'Cyathicula amenti' OR 'Cyathicula microspora' OR 'Cyclophora albipunctata' OR 'Cyclophora pendularia' OR 'Cyclophora pendulinaria' OR 'Cydia leguminana' OR 'Cylindrium elongatum' OR 'Cylindrobasidium evolvens' OR 'Cylindrobasidium laeve' OR 'Cylindrotrichum clavatum' OR 'Cyphella fasciculata' OR 'Cyphella fulva' OR 'Cyrtoclytus capra' OR 'Cystostereum pini-canadensis' OR 'Cytidia salicina' OR 'Cytidiella albida' OR 'Cytospora ceratosperma' OR 'Cytospora coenobitica' OR 'Cytospora diatrypa' OR 'Cytospora diatrypoides' OR 'Cytospora leucosperma' OR 'Cytospora leucostoma' OR 'Cytospora melanodiscus' OR 'Cytospora notastroma' OR 'Cytospora populina' OR 'Cytospora pulcherrima' OR 'Cytospora stenospora' OR 'Cytospora truncata' OR 'Cytospora umbrina' OR 'Cytosporella antarctica' OR 'Cytosporina ludibunda' OR 'Dacrymyces capitatus' OR 'Dacrymyces chrysospermus' OR 'Dacrymyces stillatus' OR 'Dactylaria candidula' OR 'Dactylaria obtriangularia' OR 'Daedaleopsis confragosa' OR 'Daedaleopsis nipponica' OR 'Daedaleopsis tricolor' OR 'Daldinia andina' OR 'Daldinia barkalovii' OR 'Daldinia childiae' OR 'Daldinia concentrica' OR 'Daldinia decipiens' OR 'Daldinia lloydii' OR 'Daldinia loculata' OR 'Daldinia occidentalis' OR 'Daldinia petriniae' OR 'Daldinia vernicosa' OR 'Dasineura tortilis' OR 'Dasychira vagans grisea' OR 'Dasyscyphella dryina' OR 'Dematioscypha catenate' OR 'Dematioscypha dematiicola' OR 'Dematioscypha olivacea' OR 'Dematioscypha richonis' OR 'Dematophora necatrix' OR 'Dendrocorticium violaceum' OR 'Dendrophoma merizophila' OR 'Dendrophora erumpens' OR 'Dendropleella multiseptata' OR 'Dendrorycter marmaroides' OR 'Dendrothrips degeeri' OR 'Dendrothrips ornatus' OR 'Dendrothrips saltatrix' OR 'Denticollis linearis' OR 'Dentocorticium portoricense' OR 'Deporaus betulae' OR 'Deroplia genei' OR 'Diacrisia sannio' OR 'Dialonectria episphaeria' OR 'Diaporthe alnea' OR 'Diaporthe eres' OR 'Diaporthe nivosa' OR 'Diaporthe padi var. padi' OR 'Diaporthe rudis' OR 'Diaporthe valsiformis' OR 'Diaporthe verrucella' OR 'Diarsia esurialis' OR 'Diaspidiotus aesculi' OR 'Diaspidiotus alni' OR 'Diaspidiotus gigas' OR 'Diaspidiotus ostreaeformis' OR 'Diaspidiotus wuenni' OR 'Diatrype bullata' OR 'Diatrype disciformis' OR 'Diatrype macounii' OR 'Diatrype megastoma' OR 'Diatrype stigma' OR 'Diatrypella betulina' OR 'Diatrypella decorata' OR 'Diatrypella discoidea' OR 'Diatrypella favacea' OR 'Diatrypella placenta' OR 'Diatrypella rimosa' OR 'Dibeloniella citrinella' OR 'Dicerca aenea' OR 'Dicerca alni' OR 'Dicerca berolinensis' OR 'Dichostereum effuscatum' OR 'Dichostereum pallescens' OR 'Dichotomopilus funicola' OR 'Diderma radiatum' OR 'Didymosphaeria dochmia' OR 'Didymosphaeria nana' OR 'Didymosphaeria oblitescens' OR 'Didymosphaeria oregonensis' OR 'Diplococcium lawrencei' OR 'Diplococcium spicatum' OR 'Diplodia alni' OR 'Diplodia cavanillesiana' OR 'Diplodia seriata' OR 'Diptacus dipterochelus' OR 'Diptacus sacramentae' OR 'Ditiola peziziformis' OR 'Ditopella aseptatospora' OR 'Ditopella biseptata' OR 'Ditopella cryptosphaeria' OR 'Ditopella ditopa' OR 'Ditopellopsis alni' OR 'Ditylenchus intermedius' OR 'Ditylenchus myceliophagus' OR 'Diurnea fagella' OR 'Diurnea lipsiella' OR 'Dolba hyloeus' OR 'Donkioporia expansa' OR 'Dothidea collecta' OR 'Dothiora europaea' OR 'Dothiorella guttulata' OR 'Dothiorella sarmentorum' OR 'Drepana arcuata' OR 'Drepana bilineata' OR 'Drepana curvatula' OR 'Drepana falcataria' OR 'Drymochares truquii' OR 'Drymus brunneus' OR 'Dryocoetinus alni' OR 'Dryocoetinus villosus' OR 'Durandiella alni" OR 'Durella melanochlora' OR 'Dysstroma citrata' OR 'Dysstroma truncata' OR 'Dysstroma walkerata' OR 'Eacles imperialis' OR 'Eacles imperialis imperialis' OR 'Echinosphaeria strigosa' OR 'Ectoedemia minimella' OR 'Ectopsocus petersi' OR 'Ectropis crepuscularia' OR 'Ectropis excellens' OR 'Edwardsiana alnicola' OR 'Edwardsiana bergmani' OR 'Edwardsiana candidula' OR 'Edwardsiana crataegi' OR 'Edwardsiana geometrica' OR 'Edwardsiana gratiosa' OR 'Edwardsiana helva' OR 'Edwardsiana hippocastani' OR 'Edwardsiana lanternae' OR 'Edwardsiana lethierryi' OR 'Edwardsiana menzbieri' OR 'Edwardsiana plebeja' OR 'Edwardsiana plurispinosa' OR 'Edwardsiana rosae' OR 'Edwardsiana sardoa' OR 'Edwardsiana soror' OR 'Edwardsiana spinigera' OR 'Efibula avellanea' OR 'Egira crucialis' OR 'Egira hiemalis' OR 'Egira rubrica' OR 'Egira simplex' OR 'Eilema griseola' OR 'Elasmostethus interstinctus' OR 'Elasmostethus minor' OR 'Elasmucha antennata' OR 'Elasmucha fieberi' OR 'Elasmucha grisea' OR 'Electrophaes corylata' OR 'Ellisembia coronate' OR 'Elmerina caryae' OR 'Elodes marginata' OR 'Elpiste lorquinaria' OR 'Empoasca decedens' OR 'Enargia decolor' OR 'Encoelia furfuracea' OR 'Endoclita auratus' OR 'Endoclita undulifer' OR 'Endophragmiella angustispora' OR 'Endophragmiella collapsa' OR 'Endophragmiella ovoidea' OR 'Endophragmiella pallescens' OR 'Endromis versicolora' OR 'Ennomos alniaria' OR

(Continued)

'Ennomos autumnaria' OR 'Ennomos erosaria' OR 'Ennomos fuscantaria' OR 'Ennomos magnaria' OR 'Ennomos quercinaria' OR 'Entoleuca mammata' OR 'Eopyrenula leucoplaca' OR 'Eotetranychus carpini' OR 'Eotetranychus kankitus' OR 'Eotetranychus pallidus' OR 'Eotetranychus tiliarium' OR 'Eotetranychus uncatus' OR 'Epicoccum nigrum' OR 'Epinotia albangulana' OR 'Epinotia corylana' OR 'Epinotia cruciana' OR 'Epinotia demarniana' OR 'Epinotia immundana' OR 'Epinotia rectiplicana' OR 'Epinotia rubicana' OR 'Epinotia solandriana' OR 'Epinotia sordidana' OR 'Epinotia subuculana' OR 'Epinotia tenerana' OR 'Epinotia tetraquetrana' OR 'Epinotodonta fumosa' OR 'Epione paralellaria' OR 'Epione repandaria' OR 'Epiphegia microcarpa' OR 'Epiphyas postvittana' OR 'Epirrita autumnata' OR 'Epirrita christyi' OR 'Epirrita dilutata' OR 'Episimus argutana' OR 'Epitrimerus longitarsus' OR 'Erannis defoliaria' OR 'Erannis golda' OR 'Erannis tiliaria' OR 'Erannis tiliaria vancouverensis' OR 'Erastia aurantiaca' OR 'Ergates faber' OR 'Eriocampa ovata' OR 'Eriocampa umbratica' OR 'Eriocrania alpinella' OR 'Eriogaster arbusculae' OR 'Eriogaster lanestris' OR 'Eriophyes alniincanae' OR 'Eriophyes axillaris' OR 'Eriophyes euryporus' OR 'Eriophyes inangulis' OR 'Eriophyes laevis' OR 'Erysiphe aggregata' OR 'Erysiphe amanoi' OR 'Erysiphe aquilegiae' OR 'Erysiphe betulina' OR 'Erysiphe miyabei' OR 'Erysiphe miyabei' OR 'Erysiphe penicillata' OR 'Erysiphe pisi' OR 'Erysiphe salicis' OR 'Erysiphe vernalis' OR 'Erythricium laetum' OR 'Erythroneura angusta' OR 'Estigmene acrea' OR 'Euantennaria alaskensis' OR 'Euceraphis betulae' OR 'Euceraphis betulijaponicae' OR 'Euceraphis caerulescens' OR 'Euceraphis gillettei' OR 'Euceraphis ontakensis' OR 'Euchlaena marginaria' OR 'Euchlaena marginaria albertanensis' OR 'Euchoeca nebulata' OR 'Euclea delphinii' OR 'Eucolaspis brunnea' OR 'Eufidonia discospilata' OR 'Eulecanium alnicola' OR 'Eulecanium ciliatum' OR 'Eulecanium douglasi' OR 'Eulecanium tiliae' OR 'Eulia ministrana' OR 'Eulithis destinata' OR 'Eulithis testata' OR 'Eulithis xylina' OR 'Eulithis xylina speciosa' OR 'Eupithecia anticaria' OR 'Eupithecia columbiata' OR 'Eupithecia columbiata columbiata' OR 'Eupithecia columbiata holbergata' OR 'Eupithecia exiguata' OR 'Eupithecia fletcherata' OR 'Eupithecia gelidata' OR 'Eupithecia harrisonata' OR 'Eupithecia lachrymosa' OR 'Eupithecia maestosa' OR 'Eupithecia misturata' OR 'Eupithecia multistrigata' OR 'Eupithecia perfusca' OR 'Eupithecia pseudotsugata' OR 'Eupithecia ravocostaliata' OR 'Eupithecia satyrata dodata' OR 'Eupithecia sheppardata' OR 'Eupithecia strattonata' OR 'Eupithecia subfuscata' OR 'Euplexia benesimilis' OR 'Euplexia lucipara' OR 'Euproctis similis' OR 'Eupsilia tristigmata' OR 'Eupterycyba jucunda' OR 'Eurhadina concinna' OR 'Eurhadina pulchella' OR 'Eurhadina ribauti' OR 'Eurois astricta' OR 'Eurois occulta' OR 'Eutrichosiphum alnicola' OR 'Eutrichosiphum alnifoliae' OR 'Eutrichosiphum alnisuctum' OR 'Eutrichosiphum nepalensis' OR 'Eutrichosiphum raychaudhurii' OR 'Eutrichosiphum tattakanum' OR 'Eutypa flavovirens' OR 'Eutypa lata' OR 'Eutypa stenopora' OR 'Eutypella acericola' OR 'Eutypella alnifraga' OR 'Eutypella alpina' OR 'Eutypella cerviculata' OR 'Eutypella glandulosa' OR 'Eutypella leprosa' OR 'Eutypella persica' OR 'Eutypella stellulata' OR 'Eutypella tetraploa' OR 'Euura glutinosae' OR 'Euura pavida' OR 'Euura umbrata' OR 'Euura viridis' OR 'Euwallacea fornicatus sensu lato' OR 'Euwallacea fornicatus sensu stricto' OR 'Euwallacea kuroshio' OR 'Evora hemidesma' OR 'Exaeretia ciniflonella' OR 'Excipularia fusispora' OR 'Exidia cartilaginea' OR 'Exidia crenata' OR 'Exidia glandulosa' OR 'Exidia repanda' OR 'Exidia saccharina' OR 'Exidiopsis effusa' OR 'Exidiopsis molybdea' OR 'Exocentrus adspersus' OR 'Exocentrus punctipennis' OR 'Exochalara longissima' OR 'Fagocyba alnisuga' OR 'Fagocyba cruenta' OR 'Falcaria lacertinaria' OR 'Favolus alveolaris' OR 'Fellhanera gyrophorica' OR 'Fenestella fenestrate" OR 'Fenestella leucostoma' OR 'Fenestella minor' OR 'Fenestella princeps' OR 'Fenestella subvestita' OR 'Feniseca tarquinius novascotiae' OR 'Fenusa dohrnii' OR 'Fenusa pumila' OR 'Fenusella nana' OR 'Fibricium rude' OR 'Fibroporia destructor' OR 'Fibroporia vaillantii' OR 'Filosporella versimorpha' OR 'Fishia evelina' OR 'Flagelloscypha minutissima' OR 'Flagellospora curvula' OR 'Flammula alnicola' OR 'Flammulaster carpophilus' OR 'Flammulina velutipes' OR 'Fomes fomentarius' OR 'Fomitiporia punctata' OR 'Fomitopsis pinicola' OR 'Fonscolombia rotunda' OR 'Furcula bicuspis' OR 'Fusarium arthrosporioides' OR 'Fuscoporia contigua' OR 'Fuscoporia ferrea' OR 'Fuscoporia ferruginosa' OR 'Fuscoporia gilva' OR 'Galerina pallidispora' OR 'Galerucella lineola' OR 'Galerucella solarii' OR 'Galerucella tenella' OR 'Gamsomyces longisporus' OR 'Ganoderma applanatum' OR 'Ganoderma australe' OR 'Gastrosarus nigricollis' OR 'Gazalina chrysolopha' OR 'Geometra papilionaria' OR 'Globisporangium intermedium' OR 'Gloeocystidiellum luridum' OR 'Gloeocystidiellum porosellum' OR 'Gloeocystidiellum porosum' OR 'Gloeodontia columbiensis' OR 'Gloeophyllum odoratum' OR 'Gloeophyllum sepiarium' OR 'Gloeoporus ambiguus' OR 'Gloeoporus pannocinctus' OR 'Gloeosporium alnicola' OR 'Gloeosporium cylindrospermum' OR 'Gloiothele citrina' OR 'Gloiothele lactescens' OR 'Gluphisia septentrionis' OR 'Glyphina betulae' OR 'Glyphina jacutensis' OR 'Glyphium corrugatum' OR 'Glyphium elatum' OR 'Gnomonia alnea' OR 'Gnomonia gnomon' OR 'Gnomonia nervisequa' OR 'Gnomonia perversa' OR 'Gnomoniella alnobetulae' OR 'Gnomoniella gnomon' OR 'Gnomoniella tubaeformis' OR 'Godronia cassandrae' OR 'Godronia fuliginosa' OR 'Gomphinaria amoena' OR 'Gonioctena flavicornis' OR 'Gonioctena interposita' OR 'Gonioctena pallida' OR 'Gonioctena viminalis' OR 'Gonocerus acuteangulatus' OR 'Gossyparia spuria' OR 'Grammoptera ruficornis' OR 'Grammoptera ustulata' OR 'Grapevine flavescence dorée phytoplasma' OR 'Graphium penicillioides' OR 'Greenidea manii' OR 'Greenidea myricae' OR 'Gretchena dulciana' OR 'Gretchena semialba' OR 'Gretchena watchungana' OR 'Grynobius planus' OR 'Guepiniopsis alpina' OR 'Guignardia alnigena' OR 'Gymnopus androsaceus' OR 'Gyrodon lividus' OR 'Gyrophanopsis polonensis' OR 'Halysidota tessellaris' OR 'Hannabura alnicola' OR 'Hannabura alnosa' OR 'Hapalopilus rutilans' OR 'Hapalopilus rutilans' OR 'Haploa confusa' OR 'Haploporus odorus' OR 'Hedya dimidioalba' OR 'Hedya nubiferana' OR 'Helicobasidium mompa' OR 'Helicogloea pellucida' OR 'Helicogloea pinicola' OR 'Helicogloea septifera' OR 'Helicoma microscopicum' OR 'Helicoma muelleri' OR 'Helicosporium vegetum' OR 'Helicotylenchus anhelicus' OR 'Helicotylenchus digonicus' OR 'Helicotylenchus dihystera' OR 'Helicotylenchus erythrinae' OR 'Heliococcus bohemicus' OR 'Heliozela resplendella' OR 'Helminthosphaeria odontiae' OR 'Helminthosporium italicum' OR 'Helminthosporium lusitanicum' OR 'Helminthosporium velutinum' OR 'Hemichroa australis' OR 'Hemichroa crocea' OR 'Hemicriconemoides californianus' OR 'Hemicriconemoides mangiferae' OR 'Hemicycliophora typica' OR 'Hemileuca nevadensis-complex' OR 'Hemimycena crispata' OR 'Hemithea aestivaria' OR 'Hendersoniopsis thelebola' OR 'Hericium coralloides' OR 'Hericium erinaceus' OR 'Herminia grisealis' OR 'Hesium domino' OR 'Hesperumia sulphuraria' OR 'Heterarthrus vagans' OR 'Heterobasidion annosum' OR 'Heterobasidion parviporum' OR 'Heterocampa biundata' OR 'Heterocordylus tumidicornis' OR 'Heteroradulum spinulosum' OR 'Hilberina breviseta' OR 'Hilberina rufa' OR 'Hohenbuehelia atrocoerulea' OR 'Hohenbuehelia constans var. alni' OR 'Hohenbuehelia petaloides' OR 'Hohenbuehelia spathulata' OR 'Homoglaea hircina' OR 'Homonopsis rubens' OR 'Homophron naucoria' OR 'Homorthodes communis' OR 'Homostegia obscura' OR 'Hoplotylus femina' OR 'Hoplotylus silvaticus' OR 'Humicola fuscoatra' OR 'Hyalodendriella betulae' OR 'Hyalopeziza alni' OR 'Hyalopeziza digitipila' OR 'Hyalopeziza millepunctata' OR 'Hyalophora cecropia' OR 'Hyalophora columbia' OR 'Hyalophora columbia gloveri' OR 'Hyalophora euryalus' OR 'Hyaloscypha albohyalina' OR 'Hyaloscypha carpinacea' OR 'Hyaloscypha fuckelii' OR 'Hyaloscypha hyalina' OR 'Hyaloscypha spinulosa' OR 'Hydnomerulius pinastri' OR 'Hydnoporia corrugata' OR 'Hydnoporia fuscescens' OR 'Hydnoporia olivacea' OR

(Continued)

'Hydnoporia tabacina' OR 'Hydrelia flammeolaria' OR 'Hydrelia sylvata' OR 'Hydria undulata' OR 'Hydriomena furcata' OR 'Hydriomena impluviata' OR 'Hydriomena irata' OR 'Hydriomena nubilofasciata' OR 'Hydriomena pluviata' OR 'Hydriomena renunciata' OR 'Hydriomena ruberata' OR 'Hydrocina chaetocladia' OR 'Hygrophoropsis aurantiaca' OR 'Hylecoetus dermestoides' OR 'Hylotrupes bajulus' OR 'Hymenochaete cinnamomea' OR 'Hymenochaete pinnatifida' OR 'Hymenochaete spreta' OR 'Hymenochaetopsis intricata' OR 'Hymenoscyphus albopunctus' OR 'Hymenoscyphus calyculus' OR 'Hymenoscyphus caudatus' OR 'Hymenoscyphus epiphyllus' OR 'Hymenoscyphus fastidiosus' OR 'Hymenoscyphus flavofuscescens' OR 'Hymenoscyphus imberbis' OR 'Hymenoscyphus rufescens' OR 'Hymenoscyphus tetracladius' OR 'Hymenoscyphus vernus' OR 'Hypagyrtis unipunctata' OR 'Hypatima rhomboidella' OR 'Hypena sordidula' OR 'Hyphantria cunea' OR 'Hyphoderma amoenum' OR 'Hyphoderma cristulatum' OR 'Hyphoderma litschaueri' OR 'Hyphoderma obtusiforme' OR 'Hyphoderma pilosum' OR 'Hyphoderma setigerum' OR 'Hyphoderma tenue' OR 'Hyphodermella corrugate' OR 'Hyphodiscosia mirabilis' OR 'Hyphodiscus hymeniophilus' OR 'Hyphodontia alutaria' OR 'Hyphodontia arguta' OR 'Hyphodontia barba-jovis' OR 'Hyphodontia pallidula' OR 'Hyphodontia quercina' OR 'Hyphodontia spathulata' OR 'Hyphodontia stipata' OR 'Hypochnicium bombycinum' OR 'Hypochnicium geogenium' OR 'Hypochnicium punctulatum' OR 'Hypochnicium sphaerosporum' OR 'Hypocrea aureo-viridis' OR 'Hypocrea gelatinosa' OR 'Hypomecis punctinalis' OR 'Hypomecis roboraria' OR 'Hypomyces gamsii' OR 'Hypospila californica' OR 'Hypothenemus eruditus' OR 'Hypoxylon fragiforme' OR 'Hypoxylon fuscum' OR 'Hypoxylon howeanum' OR 'Hypoxylon julianii' OR 'Hypoxylon macrosporum' OR 'Hypoxylon peckianum' OR 'Hypoxylon rubiginosum' OR 'Hypoxylon vogesiacum' OR 'Hyppa brunneicrista' OR 'Hyppa xylinoides' OR 'Hypsizygus elongatipes' OR 'Hysterium angustatum' OR 'Hysterium pulicare' OR 'Hysterographium fraxini' OR 'Idiocerus stigmaticalis' OR 'Idiocerus vitreus' OR 'Idiodonus cruentatus' OR 'Illinoia alni' OR 'Illinoia wilhelminae' OR 'Immersiella caudata' OR 'Incurvaria pectinea' OR 'Inonotus hispidus' OR 'Inonotus luteoumbrinus' OR 'Inonotus mikadoi' OR 'Inonotus obliquus' OR 'Ipimorpha retusa' OR 'Irantylenchus vicinus' OR 'Iridopsis emasculata' OR 'Iridopsis larvaria' OR 'Irpex cremicolor' OR 'Irpex lacteus' OR 'Irpex owensii' OR 'Ischnoderma resinosum' OR 'Isotomus speciosus' OR 'Itame anataria' OR 'Itame bitactata' OR 'Itame exauspicata' OR 'Itame loricaria julia' OR 'Jaapiella clethrophila' OR 'Jackrogersella cohaerens' OR 'Jackrogersella multiformis' OR 'Jattaea taediosa' OR 'Jodis lactearia' OR 'Jodis urosticta' OR 'Jumillera hypophlaea' OR 'Junewangia globulosa' OR 'Junghuhnia nitida' OR 'Junghuhnia subfimbriata' OR 'Karstenula alnicola' OR 'Kirschsteiniothelia atra' OR 'Kirschsteiniothelia recessa' OR 'Kleidocerys privignus' OR 'Kleidocerys resedae' OR 'Kneiffia subalutacea' OR 'Kretzschmaria deusta' OR 'Kretzschmaria zonata' OR 'Kuehneromyces mutabilis' OR 'Kybos mucronatus' OR 'Kybos smaragdula' OR 'Kybos strobli' OR 'Lacanobia contigua' OR 'Lacanobia radix' OR 'Lacanobia suasa' OR 'Lacanobia subjuncta' OR 'Lacanobia thalassina' OR 'Lachnum alneum' OR 'Lachnum hyalopus' OR 'Lachnum roridum' OR 'Lachnum virgineum' OR 'Lacinipolia cuneata' OR 'Lactarius lilacinus' OR 'Laetiporus sulphureus' OR 'Lambdina fiscellaria' OR 'Lambdina fiscellaria lugubrosa' OR 'Lambdina fiscellaria somniaria' OR 'Lamia textor' OR 'Lamprodila decipiens' OR 'Lamprodila mirifica' OR 'Lamprotettix nitidulus' OR 'Laothoe populi' OR 'Lasiocampa quercus' OR 'Lasiodiplodia theobromae' OR 'Lasionycta perplexa' OR 'Lasiosphaeria ovina' OR 'Lasiosphaeria pallida' OR 'Lasiosphaeris hirsuta' OR 'Lasiosphaeris hispida' OR 'Latgerina orizabaensis' OR 'Latgerina orizabaensis ssp. Mexicana' OR 'Laxitextum bicolor' OR 'Ledra aurita' OR 'Leiopus linnei' OR 'Leiopus nebulosus' OR 'Lentinellus cochleatus' OR 'Lentinellus flabelliformis' OR 'Lentinellus micheneri' OR 'Lentinus arcularius' OR 'Lentinus brumalis' OR 'Lentinus substrictus' OR 'Lentithecium aquaticum' OR 'Lenzites betulinus' OR 'Lenzites saepiaria' OR 'Lenzites trabea' OR 'Lepidosaphes alnicola' OR 'Lepidosaphes conchiformis' OR 'Lepidosaphes kashicola' OR 'Lepidosaphes tubulorum' OR 'Lepidosaphes ulmi' OR 'Lepidosaphes ussuriensis' OR 'Lepidosaphes yanagicola' OR 'Lepiota clypeolaria' OR 'Lepraria lobificans' OR 'Leptogium hildenbrandii" OR 'Leptographium alneum' OR 'Leptographium piriforme' OR 'Leptographium tardum' OR 'Leptographium trypodendri' OR 'Leptosphaeria lonicerina' OR 'Leptosphaeria vagabunda' OR 'Leptosporomyces galzinii' OR 'Leptothyrium alneum' OR 'Leptoxyphium fumago' OR 'Leptura aethiops' OR 'Leptura annularis' OR 'Leptura aurulenta' OR 'Leptura quadrifasciata' OR 'Lepyrus capucinus' OR 'Leucobrephos brephoides' OR 'Leucoptera malifoliella' OR 'Libythea celtis' OR 'Licrostroma subgiganteum' OR 'Lindbergina aurovittata' OR 'Lindtneria chordulata' OR 'Lindtneria leucobryophila' OR 'Linnavuoriana intercedens' OR 'Liothrips pragensis' OR 'Liparthrum mandibulare' OR 'Lirimiris truncata' OR 'Litholomia napaea' OR 'Lithomoia solidaginis' OR 'Lithophane amanda' OR 'Lithophane consocia' OR 'Lithophane dilatocula' OR 'Lithophane fagina' OR 'Lithophane furcifera' OR 'Lithophane furcifera suffusa' OR 'Lithophane georgii' OR 'Lithophane innominata' OR 'Lithophane merckii' OR 'Lithophane petulca' OR 'Lithophane pexata' OR 'Lithophane socia' OR 'Lithophane thaxteri' OR 'Lithophane vivida' OR 'Lobesia reliquana' OR 'Lobophora nivigerata' OR 'Lobulomyces poculatus' OR 'Lochmaea caprea' OR 'Lomanaltes eductalis' OR 'Lomographa semiclarata' OR 'Lomographa temerata' OR 'Longidorus aetnaeus' OR 'Longidorus distinctus' OR 'Longidorus elongatus' OR 'Longidorus iliturgiensis' OR 'Longidorus paralaskaensis' OR 'Lophiostoma aquaticum' OR 'Lophiostoma glabrotunicatum' OR 'Lophiostoma rugulosum' OR 'Lophiotrema boreale' OR 'Lophocampa argentata' OR 'Lophocampa caryae' OR 'Lophocampa maculata' OR 'Lophocosma atriplaga' OR 'Lopholeucaspis japonica' OR 'Loweomyces fractipes' OR 'Lunulospora curvula' OR 'Luperus flavipes' OR 'Luperus longicornis' OR 'Luperus luperus' OR 'Luperus viridipennis' OR 'Lycia hirtaria' OR 'Lycia pomonaria' OR 'Lycia rachelae' OR 'Lycia ursaria' OR 'Lycogala epidendrum' OR 'Lycoperdon excipuliforme' OR 'Lycophotia phyllophora' OR 'Lycorma delicatula' OR 'Lygocoris contaminatus' OR 'Lygocoris pabulinus' OR 'Lygocoris rugicollis' OR 'Lygocoris viridis' OR 'Lymantria dispar' OR 'Lymantria monacha' OR 'Lymantria obfuscata' OR 'Lyomyces crustosus' OR 'Lyomyces pruni' OR 'Lyomyces sambuci' OR 'Lyonetia alniella' OR 'Lyonetia saliciella' OR 'Macaria alternata' OR 'Macaria notata' OR 'Macrodiaporthe occulta' OR 'Macrolabis alnicola' OR 'Macroleptura thoracica' OR 'Macrophomina phaseolina' OR 'Macrophya montana' OR 'Macrotyphula phacorrhiza' OR 'Maireina ochracea' OR 'Malacosoma americanum' OR 'Malacosoma californica' OR 'Malacosoma californica californica' OR 'Malacosoma californica pluvialis' OR 'Malacosoma disstria' OR 'Malacosoma neustria' OR 'Marasmiellus phaeophyllus' OR 'Marasmiellus roseipallens' OR 'Margaritispora aquatica' OR 'Massaria alpina' OR 'Massaria ulmi' OR 'Massarina eburnea' OR 'Massarina leucosarca' OR 'Massariovalsa megalospora' OR 'Megacoelum infusum' OR 'Megacollybia platyphylla' OR 'Megalocystidium leucoxanthum' OR 'Megalocystidium leucoxanthum' OR 'Megapenthes lugens' OR 'Melampsoridium alni' OR 'Melampsoridium betulinum' OR 'Melampsoridium hiratsukanum' OR 'Melanchra adjuncta' OR 'Melanchra assimilis' OR 'Melanchra persicariae' OR 'Melanchra pisi' OR 'Melanconiopsis megalospora' OR 'Melanconis alni' OR 'Melanconis marginalis' OR 'Melanconis pacifica' OR 'Melanconis stilbostoma' OR 'Melanconium apiocarpum' OR 'Melanconium bicolor' OR 'Melanconium magnum' OR 'Melanconium sphaeroideum' OR 'Melangyna arctica' OR 'Melanolophia canadaria' OR 'Melanolophia imitata' OR 'Melanolophia signataria' OR 'Melanomma pulvis-pyrius' OR 'Melanophila acuminata' OR 'Melanopsamma pomiformis' OR 'Melanopsamma pomiformis' OR

(Continued)

'Melasmia alni' OR 'Meliscaevae auricollis' OR 'Melogramma campylosporum' OR 'Meloidodera sitkhotealiniensis' OR 'Melzericium udicola' OR 'Menispora caesia' OR 'Menispora ciliata' OR 'Menispora glauca' OR 'Merismodes anomala' OR 'Merismodes anomala' OR 'Merismodes connivens' OR 'Merismodes fasciculata' OR 'Merlinius brevidens' OR 'Merlinius microdorus' OR 'Merlinius tartuensis' OR 'Mesites tardii' OR 'Mesocallis alnicola' OR 'Mesocallis obtusirostris' OR 'Mesocallis pteleae' OR 'Mesocallis taoi' OR 'Mesogona oxalina' OR 'Mesosa curculionoides' OR 'Mesosa nebulosa' OR 'Mesothea incertata viridipennata' OR 'Metarranthis duaria' OR 'Metendothenia atropunctana' OR 'Metriotes lutarea' OR 'Microascus brevicaulis' OR 'Microdiplodia alni' OR 'Micropeltella grummanniana' OR 'Microporus longisporus' OR 'Microsebacina microbasidia' OR 'Mimas tiliae' OR 'Mimocoris rugicollis' OR 'Miris striatus' OR 'Mitrula borealis' OR 'Mitrula lunulatospora' OR 'Mniotype adusta' OR 'Mniotype bathensis' OR 'Mniotype miniota' OR 'Mollisia alnicola' OR 'Mollisia amenticola' OR 'Mollisia caespiticia" OR 'Mollisia cinerea' OR 'Mollisia ramealis' OR 'Mollisia uda' OR 'Mollisia ventosa' OR 'Mollitrichosiphum montanum' OR 'Mollitrichosiphum nandii' OR 'Mollitrichosiphum niitakaensis' OR 'Mollitrichosiphum tenuicorpus' OR 'Moniliopsis foliicola' OR 'Monochaetia alnea' OR 'Monosoma pulverata' OR 'Monosteira unicostata' OR 'Monostichella alni' OR 'Monosynamma bohemanni' OR 'Monsoma pulveratum' OR 'Morimus asper' OR 'Mormo maura' OR 'Morrisonia latex' OR 'Mycena abramsii' OR 'Mycena algeriensis' OR 'Mycena alnicola' OR 'Mycena citrinomarginata' OR 'Mycena galericulata' OR 'Mycena galericulata' OR 'Mycena haematopus' OR 'Mycena leaiana' OR 'Mycena longiseta' OR 'Mycena maculata' OR 'Mycena rhenana' OR 'Mycena viridimarginata' OR 'Mycenella margaritispora' OR 'Mycoacia aurea' OR 'Mycoacia fuscoatra' OR 'Mycoacia gilvescens' OR 'Mycoacia uda' OR 'Mycoaciella bispora' OR 'Mycobernardia incrustans' OR 'Mycocalia denudata' OR 'Mycoglaena alni' OR 'Mycoleptodon dichroum' OR 'Mycomicrothelia confusa' OR 'Mycopappus alni' OR 'Mycosphaerella alnicola' OR 'Mycosphaerella alni-viridis' OR 'Mycosphaerella conglomerata' OR 'Mycosphaerella incomperta' OR 'Mycosphaerella latebrosa' OR 'Mycosphaerella maculiformis' OR 'Mycosphaerella perparva' OR 'Mycosphaerella punctiformis' OR 'Mycterothrips consociatus' OR 'Mycterothrips latus' OR 'Mycterothrips salicis' OR 'Myelopsis minutularia' OR 'Myrmaecium rubricosum' OR 'Mytilodiscus alnicola' OR 'Myxofusicoccum alni' OR 'Myxosporium roumeguerei' OR 'Nadata gibbosa' OR 'Naematelia aurantia' OR 'Naenia typica' OR 'Natantiella ligneola' OR 'Nathrius brevipennis' OR 'Nealgedonia extricalis' OR 'Nealgedonia extricalis dionalis' OR 'Nectria cinnabarina' OR 'Nectria lugdunensis' OR 'Necydalis major' OR 'Nellymyces megaceros' OR 'Nemania diffusa' OR 'Nemania serpens' OR 'Nematinus abdominalis' OR 'Nematinus acuminatus' OR 'Nematinus bilineatus' OR 'Nematinus fuscipennis' OR 'Nematinus luteus' OR 'Nematinus steini' OR 'Nematinus willigkiae' OR 'Nematocampa filamentaria' OR 'Nematogonum ferrugineum' OR 'Nematus alniastri' OR 'Nematus capreae' OR 'Nematus latipes' OR 'Nematus oligospilus' OR 'Nematus pavidus' OR 'Nematus polyspilus' OR 'Nematus septentrionalis' OR 'Nematus umbratus' OR 'Nemoria mimosaria' OR 'Neobetulaphis chaetosiphon' OR 'Neobetulaphis pusilla' OR 'Neobulgaria pura' OR 'Neocrepidodera peirolerii' OR 'Neocucurbitaria rhamni' OR 'Neodasyscypha cerina' OR 'Neofusicoccum ribis' OR 'Neohelicosporium griseum' OR 'Neolygus contaminatus' OR 'Neolygus viridis' OR 'Neonectria coccinea' OR 'Neonectria ditissima' OR 'Neonectria major' OR 'Neonectria punicea' OR 'Neopulvinaria innumerabilis innumerabilis' OR 'Neottiella vitellina' OR 'Neozephyrus helenae' OR 'Neozephyrus japonica' OR 'Neozephyrus taiwanus' OR 'Neozephyrus taxila japonicus' OR 'Neurospora sitophila' OR 'Neurospora tetraspora' OR 'Nipaecoccus vectis' OR 'Nipterella parksii' OR 'Nipterella parksii' OR 'Nites betulella' OR 'Nites grotella' OR 'Nitschkia grevillii' OR 'Nivellia sanguinosa' OR 'Nola clethrae' OR 'Nola confusalis' OR 'Nola minna' OR 'Notodonta dromedarius' OR 'Notodonta stigmatica' OR 'Notodonta ziczac' OR 'Nymphalis antiopa' OR 'Nymphalis vaualbum' OR 'Oberea linearis' OR 'Occultocarpon ailaoshanense' OR 'Ocellaria aurantiaca' OR 'Ochropacha duplaris' OR 'Octospora sydowii' OR 'Odonestis pruni' OR 'Odontia calcicola' OR 'Odonticium septocystidia' OR 'Odontopera bidentata' OR 'Odontoplatys bidentulus' OR 'Odontosia carmelita' OR 'Odontosia sieversii' OR 'Oemona hirta' OR 'Oestlundiella flava' OR 'Ohleria rugulosa' OR 'Oidium betulacearum' OR 'Olethreutes albiciliana' OR 'Olethreutes appendiceum' OR 'Olethreutes brunneopurpuratum' OR 'Olethreutes fraternana' OR 'Olethreutes submissana' OR 'Oligia illocata' OR 'Oligocentria pallida' OR 'Oligocentria semirufescens' OR 'Oligonychus biharensis' OR 'Oligonychus coffeae' OR 'Oligonychus mcgregori' OR 'Oligonychus perseae' OR 'Oligonychus punicae' OR 'Oligonychus ununguis' OR 'Oliveonia pauxilla' OR 'Ombrophila janthina' OR 'Oncopodiella robusta' OR 'Oncopodiella trigonella' OR 'Oncopsis alni' OR 'Oncopsis flavicollis' OR 'Oncopsis planiuscula' OR 'Onnia tomentosa' OR 'Operophtera fagata' OR 'Operophtera occidentalis' OR 'Ophiognomonia alni-cordatae' OR 'Ophiognomonia alni-viridis' OR 'Ophiognomonia apiospora' OR 'Ophiognomonia bugabensis' OR 'Ophiognomonia gardiennetii' OR 'Ophiognomonia ibarakiensis' OR 'Ophiognomonia intermedia' OR 'Ophiognomonia ischnostyla' OR 'Ophiognomonia michiganensis' OR 'Ophiognomonia multirostrata' OR 'Ophiognomonia naganoensis' OR 'Ophiognomonia pseudoischnostyla' OR 'Ophiognomonia setacea' OR 'Ophiognomonia trientensis' OR 'Ophiognomonia tucumanensis' OR 'Ophiostoma pseudokarelicum' OR 'Ophiostoma signatum' OR 'Ophiostoma sparsiannulatum' OR 'Orbilia crenatomarginata' OR 'Orbilia leucostigma' OR 'Orbilia pyrifera' OR 'Orbilia xanthostigma' OR 'Orchestes jota' OR 'Orchestes testaceus' OR 'Orgyia antiqua' OR 'Orgyia antiqua badia' OR 'Orgyia antiqua nova' OR 'Orgyia leucostigma' OR 'Orgyia leucostigma intermedia' OR 'Orgyia leucostigma plagiata' OR 'Orgyia recens' OR 'Orgyia vetusta' OR 'Orientus ishidae' OR 'Orthosia cerasi' OR 'Orthosia gothica' OR 'Orthosia hibisci' OR 'Orthosia incerta' OR 'Orthosia opima' OR 'Orthosia rubescens' OR 'Orthotaenia undulana' OR 'Orthotylus flavinervis' OR 'Orthotylus interpositus' OR 'Orthotylus marginalis' OR 'Ossiannilssonola callosa' OR 'Osteina obducta' OR 'Otiorhynchus apenninus' OR 'Otiorhynchus armadillo' OR 'Otiorhynchus aurifer' OR 'Otiorhynchus carinatopunctatus' OR 'Otiorhynchus coecus' OR 'Otiorhynchus desertus' OR 'Otiorhynchus fagi' OR 'Otiorhynchus fullo' OR 'Otiorhynchus morio' OR 'Otiorhynchus multipunctatus' OR 'Otiorhynchus pyrenaeus' OR 'Otiorhynchus scaber' OR 'Otiorhynchus singularis' OR 'Otiorhynchus tenebricosus' OR 'Otiorhynchus uncinatus' OR 'Ourapteryx obtusicauda' OR 'Ourapteryx sambucaria' OR 'Oxycarenus modestus' OR 'Oxymirus cursor' OR 'Oxyporus corticola' OR 'Oxyporus populinus' OR 'Oxyporus ravidus' OR 'Pachyella hydrophila' OR 'Pachytodes cerambyciformis' OR 'Palatinate grapevine yellows' OR 'Palomena prasina' OR 'Palthis angulalis' OR 'Pamphilius fumipennis' OR 'Pamphilius kontuniemii' OR 'Pamphilius nigrifemoratus' OR 'Pamphilius pallipes' OR 'Pamphilius vafer' OR 'Pamphilius varius' OR 'Pandemis canadana' OR 'Pandemis cerasana' OR 'Pandemis corylana' OR 'Pandemis dumetana' OR 'Pandemis heparana' OR 'Pandemis limitata' OR 'Panellus longinquus' OR 'Panellus oralis' OR 'Panellus ringens' OR 'Panellus ringens' OR 'Panellus stipticus' OR 'Panonychus ulmi' OR 'Pantilius tunicatus' OR 'Panus conchatus' OR 'Panus rudis' OR 'Papestra cristifera' OR 'Papestra invalida' OR 'Papestra quadrata' OR 'Papilio eurymedon' OR 'Papilio glaucus' OR 'Papilio glaucus canadensis' OR 'Papilio glaucus glaucus' OR 'Papilio rutulus' OR 'Paracolax tristalis' OR 'Paracrania chrysolepidella' OR 'Paradarisa consonaria' OR 'Paradarisa extersaria' OR 'Paradiarsia littoralis' OR 'Paralongidorus maximus' OR 'Paranthrene asilipennis' OR 'Paranthrene tabaniformis' OR 'Parasaissetia nigra' OR 'Parasyrphus nigritarsis' OR 'Paratrichodorus pachydermus' OR

(Continued)

'Paratrichodorus ramblensis' OR 'Paratrichodorus teres' OR 'Paratrichodorus tunisiensis' OR 'Paratylenchus hamatus' OR 'Paratylenchus macrophallus' OR 'Paratylenchus projectus' OR 'Paratylenchus straeleni' OR 'Paratylenchus veruculatus' OR 'Parectropis similaria' OR 'Parlatoria crypta' OR 'Parornix alni' OR 'Parthenolecanium corni' OR 'Passalora alni' OR 'Passalora bacilligera' OR 'Passalora microsperma' OR 'Passalora nepalensis' OR 'Patinella flavobrunnea' OR 'Pechipogo strigilata' OR 'Pellidiscus pallidus' OR 'Pelosia muscerda' OR 'Penicillago nodositata' OR 'Peniophora albobadia' OR 'Peniophora aurantiaca' OR 'Peniophora cinerea' OR 'Peniophora erikssonii' OR 'Peniophora incarnata' OR 'Peniophora pithya' OR 'Peniophora polygonia' OR 'Peniophora pseudoversicolor' OR 'Peniophora quercina' OR 'Peniophora rhodochroa' OR 'Peniophora roumeguerii' OR 'Peniophora versiformis' OR 'Peniophora violaceolivida' OR 'Peniophorella guttulifera' OR 'Peniophorella praetermissa' OR 'Peniophorella pubera' OR 'Pentarthrum huttoni' OR 'Pentastiridius beieri' OR 'Pentatoma rufipes' OR 'Perconia strigillaria' OR 'Perenniporia amylodextrinoidea' OR 'Perenniporia tenuis' OR 'Perenniporia tenuis' OR 'Peridea gigantea' OR 'Peridroma saucia' OR 'Pero gigantea' OR 'Pero hubneraria' OR 'Pero morrisonaria' OR 'Perrotia flammea' OR 'Pertusaria carneopallida' OR 'Pertusaria pupillaris' OR 'Pestalotia alnea' OR 'Pestalotiopsis glandicola' OR 'Pestalotiopsis microspora' OR 'Peyronellaea obtusa' OR 'Pezicula alni' OR 'Pezicula alnicola' OR 'Pezicula cinnamomea' OR 'Pezicula frangulae' OR 'Pezicula heterochroma' OR 'Pezicula livida' OR 'Phaeoacremonium croatiense' OR 'Phaeoacremonium fraxinopennsylvanicum' OR 'Phaeoacremonium iranianum' OR 'Phaeoacremonium minimum' OR 'Phaeocalicium compressulum' OR 'Phaeohelotium nobile' OR 'Phaeoisaria sparsa' OR 'Phaeomarasmius erinaceus' OR 'Phaeophlebiopsis ravenelii' OR 'Phaeosaccardinula penzigii' OR 'Phaeosphaerella borealis' OR 'Phaeotremella frondosa' OR 'Phalera bucephala' OR 'Phanerochaete affinis' OR 'Phanerochaete burtii' OR 'Phanerochaete carnosa' OR 'Phanerochaete laevis' OR 'Phanerochaete sordida' OR 'Phanerochaete velutina' OR 'Phellinopsis conchata' OR 'Phellinus igniarius' OR 'Phellinus laevigatus' OR 'Phellinus lundellii' OR 'Phellinus prunicola' OR 'Phellinus viticola' OR 'Phenacoccus aceris' OR 'Pheosia gnoma' OR 'Phialocephala compacta' OR 'Phialophora verrucosa' OR 'Phigalia pilosaria' OR 'Phlebia albomellea' OR 'Phlebia cinnabarina' OR 'Phlebia cystidiata' OR 'Phlebia ludoviciana' OR 'Phlebia radiata' OR 'Phlebia rufa' OR 'Phlebia tremellosa' OR 'Phloeospora dearnessii' OR 'Phloeosporella borealis' OR 'Phlogophora meticulosa' OR 'Phlogophora periculosa' OR 'Phlyctaenia coronata tertialis' OR 'Pholiota adiposa' OR 'Pholiota alniphila' OR 'Pholiota aurivella' OR 'Pholiota aurivelloides' OR 'Pholiota occidentalis var. occidentalis' OR 'Pholiota populnea' OR 'Pholiota terrestris' OR 'Phoma pomorum var. pomorum' OR 'Phomopsis rhodophila' OR 'Phragmoporthe conformis' OR 'Phragmoporthe ploettneriana' OR 'Phragmotrichum rivoclarinum' OR 'Phragmotrichum vassiljevae' OR 'Phyllactinia alni' OR 'Phyllactinia alnicola' OR 'Phyllactinia fraxini' OR 'Phyllactinia guttata" OR 'Phyllobius alpinus' OR 'Phyllobius arborator' OR 'Phyllobius argentatus' OR 'Phyllobius calcaratus' OR 'Phyllobius fessus' OR 'Phyllobius glaucus' OR 'Phyllobius maculicornis' OR 'Phyllobius pomaceus' OR 'Phyllobius pyri' OR 'Phyllobius viridicollis' OR 'Phyllocoptes alniborealis' OR 'Phyllocoptes alniincanae' OR 'Phyllocoptes punctatus' OR 'Phyllodesma americana' OR 'Phyllonorycter alaskana' OR 'Phyllonorycter alni' OR 'Phyllonorycter alnicolella' OR 'Phyllonorycter alnivorella' OR 'Phyllonorycter alpina' OR 'Phyllonorycter auronitens' OR 'Phyllonorycter chrysella' OR 'Phyllonorycter durangensis' OR 'Phyllonorycter faginella' OR 'Phyllonorycter froelichiella' OR 'Phyllonorycter groenlieni' OR 'Phyllonorycter hancola' OR 'Phyllonorycter incanella' OR 'Phyllonorycter kisoensis' OR 'Phyllonorycter klemannella' OR 'Phyllonorycter longispinata' OR 'Phyllonorycter maculata' OR 'Phyllonorycter messaniella' OR 'Phyllonorycter nepalensis' OR 'Phyllonorycter populifoliella' OR 'Phyllonorycter rajella' OR 'Phyllonorycter stettinensis' OR 'Phyllonorycter strigulatella' OR 'Phyllonorycter suaveolentis' OR 'Phyllonorycter takagii' OR 'Phyllonorycter tristrigella' OR 'Phyllonorycter vulturella' OR 'Phyllosticta allantospora' OR 'Phyllosticta alnea' OR 'Phyllosticta alnigena' OR 'Phyllosticta alni-glutinosae' OR 'Phyllosticta alniperda' OR 'Phyllosticta capitalensis' OR 'Phyllosticta carpini' OR 'Phyllosticta frangulae' OR 'Phyllotopsis nidulans' OR 'Phylus coryli' OR 'Phylus plagiatus' OR 'Phymatodes alni' OR 'Phymatotrichopsis omnivore" OR 'Physalospora abdita' OR 'Physarum leucophaeum' OR 'Physarum nutans' OR 'Physatocheila costata' OR 'Physisporinus vitreus' OR 'Phytobia cambii' OR 'Phytobia carbonaria' OR 'Phytocoris longipennis' OR 'Phytocoris populi' OR 'Phytocoris reuteri' OR 'Phytophthora acerina' OR 'Phytophthora alni' OR 'Phytophthora alni subsp. alni' OR 'Phytophthora amnicola' OR 'Phytophthora asparagi' OR 'Phytophthora bilorbang' OR 'Phytophthora cactorum' OR 'Phytophthora cambivora' OR 'Phytophthora chlamydospora' OR 'Phytophthora cinnamomi' OR 'Phytophthora citricola' OR 'Phytophthora crassamura' OR 'Phytophthora cryptogea' OR 'Phytophthora europaea' OR 'Phytophthora gallica' OR 'Phytophthora gonapodyides' OR 'Phytophthora gregata' OR 'Phytophthora inundata' OR 'Phytophthora lacustris' OR 'Phytophthora megasperma' OR 'Phytophthora multivora' OR 'Phytophthora parsiana' OR 'Phytophthora plurivora' OR 'Phytophthora polonica' OR 'Phytophthora pseudocryptogea' OR 'Phytophthora pseudosyringae' OR 'Phytophthora quercina' OR 'Phytophthora rosacearum' OR 'Phytophthora siskiyouensis' OR 'Phytophthora syringae' OR 'Phytoptus laevis' OR 'Phytoptus nalepai' OR 'Picipes badius' OR 'Picipes melanopus' OR 'Picipes tubaeformis' OR 'Pilidium lythri' OR 'Pirex concentricus' OR 'Plagiognathus arbustorum' OR 'Plagiosterna aenea' OR 'Plagiostoma jensenii' OR 'Plagiostoma salicellum' OR 'Plagiostoma samuelsii' OR 'Plagodis alcoolaria' OR 'Plagodis phlogosaria' OR 'Plagodis phlogosaria approximaria' OR 'Plagodis pulveraria' OR 'Planistromella conglomeratiformis' OR 'Platarctia parthenos' OR 'Platycampus luridiventris' OR 'Platychora alni' OR 'Platynota nigrocervina' OR 'Platypus cylindrus' OR 'Platypus simulans' OR 'Plemyria georgii' OR 'Plemyria rubiginata' OR 'Pleohelicoon richonis' OR 'Pleomassaria holoschista' OR 'Pleospora alnea' OR 'Pleospora alnicola' OR 'Pleospora pygmaea' OR 'Pleuroflammula tuberculosa' OR 'Pleurophragmium varieseptatum' OR 'Pleurotus cornucopiae' OR 'Pleurotus limpidus' OR 'Pleurotus ostreatus' OR 'Plicatura nivea' OR 'Plicaturopsis crispa' OR 'Pluteus latifolius' OR 'Pluteus nanus' OR 'Pluteus romellii' OR 'Pluteus semibulbosus' OR 'Pochazia shantungensis' OR 'Pococera aplastella' OR 'Podofomes mollis' OR 'Podofomes stereoides' OR 'Podosphaera clandestina' OR 'Poecilium alni' OR 'Poecilocampa populi' OR 'Pogonocherus hispidulus' OR 'Pogonocherus hispidus' OR 'Polia bombycina' OR 'Polia imbrifera' OR 'Polia nimbosa' OR 'Polia purpurissata' OR 'Polydrusus amoenus' OR 'Polydrusus cervinus' OR 'Polydrusus corruscus' OR 'Polydrusus flavipes' OR 'Polydrusus formosus' OR 'Polydrusus fulvicornis' OR 'Polydrusus impressifrons' OR 'Polydrusus picus' OR 'Polydrusus pilosulus' OR 'Polydrusus pilosus' OR 'Polydrusus prasinus' OR 'Polydrusus pterygomalis' OR 'Polydrusus sericeus' OR 'Polydrusus sparsus' OR 'Polydrusus tereticollis' OR 'Polydrusus undatus' OR 'Polygonia faunus' OR 'Polygonia faunus faunus' OR 'Polygonia oreas' OR 'Polygonia satyrus' OR 'Polyozellus humicola' OR 'Polyporus lepideus' OR 'Polyporus pargamenus' OR 'Polyporus picipes' OR 'Popillia japonica' OR 'Poria conferta' OR 'Poria tenuis var. tenuis' OR 'Poriella subacida' OR 'Porodaedalea pini' OR 'Porophilomyces poricola' OR 'Porostereum spadiceum' OR 'Porotheleum fimbriatum' OR 'Postia immitis' OR 'Postia tephroleuca' OR 'Praetumpfia obducens' OR 'Pratylenchus crenatus' OR 'Pratylenchus flakkensis' OR 'Pratylenchus neglectus' OR 'Pratylenchus penetrans' OR 'Pratylenchus vulnus' OR 'Prinobius myardi' OR 'Prionus coriarius' OR 'Probole amicaria' OR 'Prochoerodes transversata' OR 'Prociphilus

(Continued)

baicalensis' OR 'Prociphilus mexicanus' OR 'Prociphilus tessellatus' OR 'Propolis farinosa' OR 'Prosthemium alni' OR 'Prosthemium stellare' OR 'Protantigius superans' OR 'Protantigius superans ginzii' OR 'Protitame matilda' OR 'Protitame virginalis' OR 'Protodiaspis parvula' OR 'Psallus ambiguus' OR 'Psallus betuleti' OR 'Psallus haematodes' OR 'Psallus henschi' OR 'Psallus perrisi' OR 'Psallus salicis' OR 'Psallus variabilis' OR 'Psallus varians' OR 'Psathyrella alboalutacea' OR 'Psathyrella candidissima' OR 'Psathyrella griseifolia' OR 'Psathyrella immaculata' OR 'Psathyrella maculata' OR 'Psepholax sulcatus' OR 'Pseudaonidia duplex' OR 'Pseudaulacaspis celtis' OR 'Pseudaulacaspis prunicola prunicola' OR 'Pseuderannis lomozemia' OR 'Pseudociboria umbrina' OR 'Pseudococcus comstocki' OR 'Pseudocosmospora pithoides' OR 'Pseudoglaea olivata' OR 'Pseudoips praninana' OR 'Pseudoloxops coccineus' OR 'Pseudomonas syringae pv. Syringae' OR 'Pseudopityophthorus pruinosus' OR 'Pseudorthodes irrorata' OR 'Pseudosciaphila duplex' OR 'Pseudosigmoidea alnicola' OR 'Pseudotelphusa belangerella' OR 'Pseudothyatira cymatophoroides' OR 'Pseudotrichia mutabilis' OR 'Pseudovalsaria ferruginea' OR 'Pseudovalsella thelebola' OR 'Psyche casta' OR 'Psyche crassiorella' OR 'Psyche rotunda' OR 'Psylla alni' OR 'Psylla alpina' OR 'Psylla cordata' OR 'Psylla foersteri' OR 'Psylla fusca' OR 'Pterocallis albida' OR 'Pterocallis alni' OR 'Pterocallis alnifoliae' OR 'Pterocallis alnijaponicae' OR 'Pterocallis essigi' OR 'Pterocallis maculata' OR 'Pterocallis nigrostriata' OR 'Pterocallis pseudoalni' OR 'Pterocallis rhombifoliae' OR 'Pterostoma palpina' OR 'Ptilinus pectinicornis' OR 'Ptilodon capucina' OR 'Ptilodon robusta' OR 'Puccinia coronata' OR 'Pulvinaria borchsenii' OR 'Pulvinaria costata' OR 'Pulvinaria idesiae' OR 'Pulvinaria inconspiqua' OR 'Pulvinaria occidentalis' OR 'Pulvinaria regalis' OR 'Pulvinaria vitis' OR 'Punctularia strigosozonata' OR 'Pycnopeziza americana' OR 'Pyrenopeziza benesuada' OR 'Pyrenopeziza benesuada' OR 'Pyrenopeziza foliicola' OR 'Pyrigemmula aurantiaca' OR 'Pyrrhia umbra' OR 'Pyrrhoglossum recedens' OR 'Racodium therryanum' OR 'Radulomyces confluens' OR 'Radulomyces molaris' OR 'Ramaricium albo-ochraceum' OR 'Ramichloridium anceps' OR 'Ramphus pulicarius' OR 'Ramularia alnicola' OR 'Ramularia iwateyamensis' OR 'Ramularia taleshina' OR 'Ramularia unterseheri' OR 'Ranulospora alni' OR 'Raphia frater' OR 'Rectipilus fasciculatus' OR 'Refractohilum achromaticum' OR 'Repetophragma wroblewskii' OR 'Resinicium bicolor' OR 'Resinicium praeteritum' OR 'Resinomycena saccharifera' OR 'Resinoporia crassa' OR 'Resupinatus conglobatus' OR 'Reticularia lycoperdon' OR 'Rhabdospora maculans' OR 'Rhagium bifasciatum' OR 'Rhagium mordax' OR 'Rhagium sycophanta' OR 'Rhaphigaster nebulosa' OR 'Rheumaptera hastata' OR 'Rheumaptera subhastata albodecorata' OR 'Rhizina undulata' OR 'Rhizobium rhizogenes' OR 'Rhizoctonia ochracea' OR 'Rhizoctonia pseudocornigera' OR 'Rhizoctonia solani' OR 'Rhizoctonia stridii' OR 'Rhizonemella sequoioae' OR 'Rhodofomes cajanderi' OR 'Rhogogaster chlorosoma' OR 'Rhogogaster punctulata' OR 'Rhogogaster scalaris' OR 'Rhogogaster viridis' OR 'Rhynchaenus alni' OR 'Rhynchaenus iota' OR 'Rhynchaenus stigma' OR 'Rhynchaenus testaceus' OR 'Rhynchites nanus' OR 'Rhynchites tomentosus' OR 'Rhytidodus decimusquartus' OR 'Rhytisma salicinum' OR 'Ribautiana cruciata' OR 'Ribautiana debilis' OR 'Ribautiana tenerrima' OR 'Ribautiana ulmi' OR 'Rigidoporus microporus' OR 'Rigidoporus undatus' OR 'Ropalopus clavipes' OR 'Ropalopus femoratus' OR 'Ropalopus ungaricus' OR 'Rosalia alpina' OR 'Rosellinia abscondita' OR 'Rosellinia aquila' OR 'Rosellinia callosa' OR 'Rosellinia corticium' OR 'Rosellinia desmazieri' OR 'Rosellinia helvetica' OR 'Rosellinia marcucciana' OR 'Rosellinia nectrioides' OR 'Rosellinia thelena' OR 'Rotylenchus buxophilus' OR 'Rutpela maculata' OR 'Rutstroemia bolaris' OR 'Rutstroemia conformata' OR 'Ruzenia spermoides' OR 'Sabra harpagula' OR 'Sabulodes aegrotata' OR 'Sabulodes caberata' OR 'Saccothecium sepincola' OR 'Salebriopsis albicilla' OR 'Saperda carcharias' OR 'Saperda octopunctata' OR 'Saperda populnea' OR 'Saperda scalaris' OR 'Saphanus piceus' OR 'Sarcodontia delectans' OR 'Sarcomyxa serotina' OR 'Sarcoscypha austriaca' OR 'Sarocladium strictum' OR 'Saturnia atlantica' OR 'Saturnia pavonia' OR 'Saturnia pyri' OR 'Satyrium w-album' OR 'Schizophyllum amplum' OR 'Schizophyllum commune' OR 'Schizopora paradoxa' OR 'Schizotetranychus alni' OR 'Schizothyrium jamaicense' OR 'Schizura concinna' OR 'Schizura ipomoeae' OR 'Schizura unicornis' OR 'Sclerococcum stygium' OR 'Sclerotium nervale' OR 'Scolioneura betuleti' OR 'Scoliopteryx libatrix' OR 'Scolytus intricatus' OR 'Scolytus rugulosus' OR 'Scopinella caulincola' OR 'Scopulariopsis asperula' OR 'Scopulariopsis brumptii' OR 'Scopuloides rimosa' OR 'Scorias spongiosa' OR 'Scutellinia hirta' OR 'Scutellinia scutellata' OR 'Scytalidium lignicola' OR 'Scytinostroma portentosum' OR 'Scytinostroma protrusum subsp. protrusum' OR 'Sebacina burtii' OR 'Sebacina epigaea var. epigaea' OR 'Sebacina grisea' OR 'Sebacina incrustans' OR 'Sebacina macrospora' OR 'Seimatosporium alneum' OR 'Selatosomus bipustulatus' OR 'Selenia alciphearia' OR 'Selenia dentaria' OR 'Selenia lunularia' OR 'Selenia tetralunaria' OR 'Semiothisa aemulataria' OR 'Semiothisa alternaria' OR 'Semiothisa granitata-group' OR 'Semiothisa hebetata' OR 'Semiothisa neptaria' OR 'Semiothisa ulsterata' OR 'Septobasidium aligerum' OR 'Septobasidium bogoriense' OR 'Septonema secedens' OR 'Septonema subramosum' OR 'Septoria alni' OR 'Septoria alnicola' OR 'Septoria alnifolia' OR 'Septoria frangulae' OR 'Septoria taleshana' OR 'Septoria weiriana' OR 'Septotrullula bacilligera' OR 'Sertulicium niveocremeum' OR 'Sesia apiformis' OR 'Setagrotis pallidicollis' OR 'Setagrotis planifrons' OR 'Sicya crocearia' OR 'Sicya macularia' OR 'Sidera lenis' OR 'Sierraphytoptus alnivagrans' OR 'Sinodendron cylindricum' OR 'Sirodothis inversa' OR 'Sistotrema brinkmannii' OR 'Sistotrema brinkmannii' OR 'Sistotrema farinaceum' OR 'Sistotrema porulosum' OR 'Skeletocutis alutacea' OR 'Skeletocutis semipileata' OR 'Skeletocutis subincarnata' OR 'Smerinthus ocellata' OR 'Solitanea mariae' OR 'Spadicoides atra' OR 'Spadicoides bina' OR 'Spadicoides klotzschii' OR 'Sparganothis pettitana' OR 'Sparganothis reticulatana' OR 'Speudotettix subfusculus' OR 'Sphaceloma alni' OR 'Sphaerobolus stellatus' OR 'Sphaeronema alni' OR 'Sphinx 'gordius' OR 'Sphinx luscitiosa' OR 'Spilonota ocellana' OR 'Spilosoma lutea' OR 'Spilosoma virginica' OR 'Spiramater grandis' OR 'Spiramater lutra' OR 'Spodoptera ornithogalli' OR 'Spongiporus perdelicatus' OR 'Sporendocladia fumosa' OR 'Sporidesmium folliculatum' OR 'Stachybotrys echinatus' OR 'Stanjehughesia hormiscioides' OR 'Stathmopoda pedella' OR 'Stauropus fagi' OR 'Steccherinum alaskense' OR 'Steccherinum bourdotii' OR 'Steccherinum fimbriatellum' OR 'Steccherinum fimbriatum' OR 'Steccherinum fimbriatum' OR 'Steccherinum laeticolor' OR 'Steccherinum ochraceum' OR 'Steccherinum ochraceum' OR 'Stegania cararia' OR 'Stenocephalopsis subalutacea' OR 'Stenocorus meridianus' OR 'Stenocybe pullatula' OR 'Stenopterus flavicornis' OR 'Stenopterus rufus' OR 'Stephanitis pyri' OR 'Stereum complicatum' OR 'Stereum frustulatum' OR 'Stereum gausapatum' OR 'Stereum hirsutum' OR 'Stereum ochraceoflavum' OR 'Stereum ostrea' OR 'Stereum rugosum' OR 'Stereum sanguinolentum' OR 'Stereum subtomentosum' OR 'Sterrhopterix standfussi' OR 'Sthenarus rotermundi' OR 'Sthenopis argenteomaculatus' OR 'Stictoleptura scutellata' OR 'Stigmella alnetella' OR 'Stigmella canadensis' OR 'Stigmella confusella' OR 'Stigmella continuella' OR 'Stigmella glutinosae' OR 'Stigmella lapponica' OR 'Stigmella luteella' OR 'Stigmella marginicolella' OR 'Stigmella microtheriella' OR 'Stigmella rubescens' OR 'Stilbella byssiseda' OR 'Stilbella clavispora' OR 'Stomaphis alni' OR 'Stomaphis quercus' OR 'Stomaphis radicicola' OR 'Stomaphis wojciechowski' OR 'Strangalia attenuata' OR 'Strangalia aurulenta' OR 'Strangalia quadrifasciata' OR 'Stromatium auratum' OR 'Strossmayeria alnicola' OR 'Strossmayeria atriseda' OR 'Strossmayeria bakeriana' OR 'Stygnocoris sabulosus' OR 'Subacronicta megacephala' OR 'Subulicystidium longisporum' OR 'Svrcekomyces pallidus'

(Continued)

OR 'Symphytocarpus flaccidus' OR 'Symydobius aliarius' OR 'Symydobius alniarius ssp. Nipponicus' OR 'Symydobius kabae' OR 'Symydobius minutus' OR 'Symydobius oblongus' OR 'Symydobius quednaui' OR 'Synanthedon culiciformis' OR 'Synanthedon mesiaeformis' OR 'Synanthedon multitarsus' OR 'Synanthedon pseudoscoliaeforme' OR 'Synanthedon spheciformis' OR 'Synanthedon talischense' OR 'Synanthedon tenue' OR 'Synaxis jubararia' OR 'Syndemis afflictana' OR 'Syngrapha epigaea' OR 'Szczepkamyces campestris' OR 'Tachyerges pseudostigma' OR 'Tachyerges stigma' OR 'Tacparia detersata' OR 'Taeniolella alta' OR 'Taeniolella stilbospora' OR 'Taeniolella stricta' OR 'Taeniolina scripta' OR 'Takahashia japonica' OR 'Taoia chuansiensis' OR 'Taoia indica' OR 'Tapesia fusca' OR 'Tapesia lividofusca' OR 'Tapesia mollisioides' OR 'Tapesia villosa' OR 'Taphrina alni' OR 'Taphrina epiphylla' OR 'Taphrina japonica' OR 'Taphrina macrophylla' OR 'Taphrina occidentalis' OR 'Taphrina populina' OR 'Taphrina robinsoniana' OR 'Taphrina rugosa' OR 'Taphrina sadebeckii' OR 'Taphrina tosquinetii' OR 'Taphrina viridis' OR 'Taphrorychus siculus' OR 'Taphrorychus villifrons' OR 'Tectella patellaris' OR 'Tegonotus borealis' OR 'Tegonotus heptacanthus' OR 'Tegonotus keiferi' OR 'Tegonotus platynaspis' OR 'Tegonotus trouessarti' OR 'Teichospora winteriana' OR 'Teleiodes proximella' OR 'Temnocerus coeruleus' OR 'Temnocerus nanus' OR 'Tenthredo ferruginea' OR 'Tenthredo velox' OR 'Tenuiappendicula alnicola' OR 'Tetheella fluctuosa' OR 'Tetrachaetum elegans' OR 'Tetracis cachexiata' OR 'Tetracis crocallata' OR 'Tetranychus urticae' OR 'Tetranycopsis horridus' OR 'Thallophaga hyperborea' OR 'Thecotheus rivicola' OR 'Thelephora atra' OR 'Thelephora ellisii' OR 'Thelephora wakefieldiae' OR 'Thrips alni' OR 'Thrips calcaratus' OR 'Thrips major' OR 'Thrips minutissimus' OR 'Thrips viminalis' OR 'Thyridaria macrostomoides' OR 'Thyridium vestitum' OR 'Thyronectria coryli' OR 'Tinocallis ulmicola' OR 'Tinocallis zelkovae' OR 'Tomasellia diffusa' OR 'Tomentella badia' OR 'Tomentella bryophila' OR 'Tomentella cinerascens' OR 'Tomentella coerulea' OR 'Tomentella crinalis' OR 'Tomentella donkii' OR 'Tomentella ferruginea' OR 'Tomentella fuscocinerea' OR 'Tomentella lapida' OR 'Tomentella lilacinogrisea' OR 'Tomentella puberula' OR 'Tomentella punicea' OR 'Tomentella viridis' OR 'Tortilispora aurantiaca' OR 'Tortricidia testacea' OR 'Tortrix viridana' OR 'Torula herbarum' OR 'Torula lucifuga' OR 'Trametes cinnabarina' OR 'Trametes coccinea' OR 'Trametes cubensis' OR 'Trametes gibbosa' OR 'Trametes hirsuta' OR 'Trametes lacerata' OR 'Trametes pubescens' OR 'Trametes vernicipes' OR 'Trametes versicolor' OR 'Trechispora candidissima' OR 'Trechispora farinacea' OR 'Trechispora mollusca' OR 'Trematosphaeria pertusa' OR 'Tremella mesenterica' OR 'Tremex fuscicornis' OR 'Trichaptum abietinum' OR 'Trichaptum biforme' OR 'Trichaptum byssogenum' OR 'Trichaptum laricinum' OR 'Trichiosoma lucorum' OR 'Trichiosoma vitellina' OR 'Trichiura crataegi' OR 'Trichius fasciatus' OR 'Trichocladium asperum' OR 'Trichoderma alni' OR 'Trichoderma brunneoviride' OR 'Trichoderma citrinum' OR 'Trichoderma crystalligenum' OR 'Trichoderma estonicum' OR 'Trichoderma flavipes' OR 'Trichoderma lixii' OR 'Trichoderma patella' OR 'Trichoderma strictipile' OR 'Trichoderma thelephoricola' OR 'Trichoderma viride' OR 'Trichoderma voglmayrii' OR 'Trichodorus californicus' OR 'Trichodorus giennensis' OR 'Trichodorus sparsus' OR 'Trichoferus campestris' OR 'Trichoferus holosericeus' OR 'Tricholomopsis streetsii' OR 'Trichopteryx carpinata' OR 'Trichosphaeria pilosa' OR 'Trichothecium roseum' OR 'Tricladium angulatum' OR 'Tricladium splendens' OR 'Trionymus thulensis' OR 'Triposporium pannosum' OR 'Trirachys sartus' OR 'Tritomegas bicolor' OR 'Truncatella angustata' OR 'Trypodendron domesticum' OR 'Trypodendron signatum' OR 'Trypophloeus alni' OR 'Trypophloeus asperatus' OR 'Tubaria furfuracea' OR 'Tubulicrinis glebulosus' OR 'Tulasnella bifrons' OR 'Tulasnella pallida' OR 'Tulasnella violea' OR 'Tydeus californicus' OR 'Tydeus caudatus' OR 'Tylenchorhynchus dubius' OR 'Tylenchus davainei' OR 'Tylenchus vulgaris' OR 'Tympanis alnea' OR 'Tympanis pseudoalnea' OR 'Tympanis truncatula' OR 'Typhlocyba quercus' OR 'Typhula contorta' OR 'Typhula erythropus' OR 'Typhula fistulosa' OR 'Tyromyces chioneus' OR 'Tyromyces galactinus' OR 'Ulmicola spinipes' OR 'Umbelopsis vinacea' OR 'Uncinula miyabei var. alnicola' OR 'Uncinula miyabei var. hermaphroditica' OR 'Unguiculella foliicola' OR 'Valsa americana' OR 'Valsa ceratophora' OR 'Valsa diatrypoides' OR 'Valsa frangulae' OR 'Valsa inconspicua' OR 'Valsa minutella' OR 'Valsa salicina' OR 'Valsa truncata' OR 'Valsalnicola oxystoma' OR 'Valsaria moroides' OR 'Valsella alnicola' OR 'Valsella furva' OR 'Vararia investiens' OR 'Varicosporium elodeae' OR 'Veluticeps abietina' OR 'Venturia alnea' OR 'Venturia ditricha' OR 'Venusia cambrica' OR 'Venusia comptaria' OR 'Venusia pearsalli' OR 'Verrucaria hydrela' OR 'Vibrissea filisporia' OR 'Vibrissea truncorum' OR 'Violella fucata' OR 'Vitreoporus dichrous' OR 'Volucrispora aurantiaca' OR 'Vuilleminia alni' OR 'Vuilleminia comedens' OR 'Watsonalla binaria' OR 'Watsonalla uncinula' OR 'Wuestneia paucispora' OR 'Xanthoporia radiata' OR 'Xanthorhoe defensaria' OR 'Xanthorhoe fluctuata' OR 'Xanthorhoe spadicearia' OR 'Xanthotype urticaria' OR 'Xenasma rimicola' OR 'Xenasmatella vaga' OR 'Xestia infimatis' OR 'Xestia smithii' OR 'Xestobium rufovillosum' OR 'Xiphinema globosum' OR 'Xiphinema pachtaicum' OR 'Xiphinema pyrenaicum' OR 'Xiphydria camelus' OR 'Xiphydria longicollis' OR 'Xiphydria megapolitana' OR 'Xiphydria picta' OR 'Xiphydria prolongata' OR 'Xylaria corniformis' OR 'Xylaria cornu-damae' OR 'Xylaria digitata' OR 'Xylaria hypoxylon' OR 'Xylaria polymorpha' OR 'Xylaria subterranea' OR 'Xyleborinus alni' OR 'Xyleborinus attenuatus' OR 'Xyleborinus saxesenii' OR 'Xyleborus dispar' OR 'Xyleborus pfeili' OR 'Xyleborus saxeseni' OR 'Xylena cineritia' OR 'Xylena curvimacula' OR 'Xylena exsoleta' OR 'Xylena nupera' OR 'Xylena thoracica' OR 'Xylococculus betulae' OR 'Xylococcus japonicus' OR 'Xylodon asper' OR 'Xylodon brevisetus' OR 'Xylodon flaviporus' OR 'Xylodon radula' OR 'Xylodon rimosissimus' OR 'Xylomelasma sordida' OR 'Xylosandrus crassiusculus' OR 'Xylosandrus germanus' OR 'Xylosphaera berteroi' OR 'Xyloterus domesticum' OR 'Xyloterus signatum' OR 'Xylotrechus ibex' OR 'Xylotrechus namanganensis' OR 'Xylotrechus rusticus' OR 'Xylotrechus stebbingi' OR 'Xylotype arcadia' OR 'Ypsolopha parenthesella' OR 'Zale minerea' OR 'Zale minerea norda' OR 'Zalerion maritima' OR 'Zethenia albonotaria' OR 'Zeuzera pyrina' OR 'Zonocyba bifasciata' OR 'Zosteropoda hirtipes' OR 'Zygina angusta' OR 'Zygina flammigera' OR 'Zygina rhamni' OR 'Zygina suavis' OR 'Zygina tiliae'

APPENDIX C

List of pests that can potentially cause an effect not further assessed

N.	Pest name	EPPO code	Group	Pest present in the UK	Pest present in the EU	*Alnus* confirmed as a host (reference)	Pest can be associated with the commodity (NA = not assessed)	Impact	Justification for inclusion in this list
1	*Eriophyes axillaris*	ERPHSI	Acari	Yes	No	*A. glutinosa* (Database of Insects and their Food Plants, online)	Yes	Uncertain	No information on impact
2	*Melampsoridium alni*	MELMLI	Fungi	Uncertain	Limited	*Alnus* spp. (USDA Fungal Database)	Yes	Uncertain	Uncertainty about presence in UK (one record from 1961)
3	*Pestalotiopsis microspora*	PESTDC	Fungi	Uncertain	Limited	*A. rubra* (USDA Fungal Database)	Yes	Yes	Uncertainty on the presence in the UK (only one record in GBIF)
4	*Septoria alnicola*	SEPTAP	Fungi	Yes	Limited	*A. glutinosa*, *Alnus* sp. (USDA Fungal Database)	Yes	Uncertain	No information on impact of this species

APPENDIX D

Excel file with the pest list of *Alnus* species

Appendix D can be found in the online version of this output in the 'Supporting Information section'.