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# Commodity risk assessment of *Populus alba*, *Populus nigra* and *Populus tremula* plants from the UK

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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'. This Scientific Opinion covers plant health risks posed by plants of *Populus alba, Populus nigra* and *Populus tremula* imported from the United Kingdom (UK) as: (a) 1- to 7-year-old bare root plants, (b) 3- to 15-year-old plants in pots, (c) 1- to 2-year-old cell grown plants and (d) bundles of 1- to 2-year-old cuttings/graftwood (only for *P. nigra* and *P. tremula*), taking into account the available scientific information, including the technical information provided by the UK. All pests associated with the commodity were evaluated against specific criteria for their relevance for this Opinion. Two EU protected zone quarantine pests, i.e. *Bemisia tabaci* (European populations) and *Entoleuca mammata,* fulfilled all relevant criteria and were selected for further evaluation. For the selected pests, the risk mitigation measures implemented in the technical dossier from the UK were evaluated taking into account the possible limiting factors. Expert judgements were 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 age of the plants was considered, reasoning that older trees are more likely to be infested mainly due to longer exposure time and larger size. The degree of pest freedom varies between the pests evaluated, with *E. mammata* being the pest most frequently expected on the imported plants. The Expert Knowledge Elicitation (EKE) indicated with 95% certainty that between 9730 and 10,000 per 10,000 *P. tremula* rooted plants in pots (3 to 15 year old) will be free from *E. mammata*.

**KEYWORDS**

commodity risk assessment, European Union, plant health, plant pest, poplar

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# 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 on-going, 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 asks EFSA to provide scientific opinion in the field of plant health for *Populus alba, Populus nigra* and *Populus tremula* 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 (hereafter referred to as 'the Panel') was requested to conduct a commodity risk assessment of *Populus alba, Populus nigra* and *Populus tremula* 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 assessments as presented in the EFSA standard protocols for scientific assessments (EFSA PLH Panel, 2024; Gardi et al., 2024), taking into account the available scientific information, including the technical information provided by the UK.

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, 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)

[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, p. 1–279.

and Volga Federal District (Privolzhsky federalny okrug), San Marino, Serbia, Switzerland, Türkiye, Ukraine and the United Kingdom (except Northern Ireland[5]).

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 information in the technical dossier (hereafter referred to as 'the Dossier') provided by the applicant (United Kingdom, Department for Environment Food and Rural Affairs – hereafter 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, hereafter referred to as 'EU quarantine pests') 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.
- 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.

Risk management decisions are not within EFSA's remit. Therefore, the Panel provided a rating based on expert judgement regarding 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 (hereafter called 'the Dossier') provided by DEFRA of the United Kingdom (UK) in September 2023 including the additional information provided in October and November 2024, after EFSA's request. 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.

**TABLE 1** Structure and overview of the Dossier.

| Dossier Section | Overview of contents | Filename |
|---|---|---|
| 1.1 | Technical dossier for *Populus alba* | Populus alba commodity information final |
| 1.2 | Technical dossier for *Populus nigra* | Populus nigra commodity information final |
| 1.3 | Technical dossier for *Populus tremula* | Populus tremula commodity information final |
| 2.0 | Pest list | Populus Pest List_Final |
| 3.1 | Producers sample product list for *Populus alba* | Populus_alba_producers_sample_product_list |
| 3.2 | Producers sample product list for *Populus nigra* | Populus_nigra_producers_sample_product_list |
| 3.3 | Producers sample product list for *Populus tremula* | Populus_tremula_producers_sample_product_list |

(Continues)

[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 Windsor Framework in conjunction with Annex 2 to that Framework, for the pruposes of this Opinion, references to the United Kingdom do not include Northern Ireland.

**TABLE 1** (Continued)

| Dossier Section | Overview of contents | Filename |
|---|---|---|
| 4.1 | Distribution of *Populus alba* | Populus_alba_distribution |
| 4.2 | Distribution of *Populus nigra* | Populus_nigra_distribution |
| 4.3 | Distribution of *Populus tremula* | Populus_tremula_distribution |
| 5.1 | Additional information: answers | Populus additional information 17 October 2024 |
| 5.2 | Additional information: pests | Pest_Query_Populus_2024 |
| 5.3 | Additional information: answers | Populus additional information 26 Nov 2024 |

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 1.1, 1.2, 1.3, 2.0, 3.1, 3.2, 3.3, 4.1, 4.2, 4.3, 5.1, 5.2 and 5.3).

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

| Database | Platform/link |
|---|---|
| AHDB | https://ahdb.org.uk/ |
| Aphids on the World's Plants | https://www.aphidsonworldsplants.info/ |
| Bark and Ambrosia Beetles of the Americas | https://www.barkbeetles.info/americas_index.php |
| British Bugs | https://www.britishbugs.org.uk/index.html |
| British leafminers | https://www.leafmines.co.uk/index.htm |
| CABI Crop Protection Compendium | https://www.cabi.org/cpc/ |
| CABI Plantwise Plus | https://plantwiseplusknowledgebank.org/ |
| Checklist of the British & Irish Basidiomycota | https://basidiochecklist.science.kew.org/ |
| Current British Aphid Checklist | https://influentialpoints.com/aphid/Checklist_of_aphids_in_Britain.htm |
| Database of Insects and their Food Plants | https://dbif.brc.ac.uk/homepage.aspx |
| Descriptions of Plant Viruses | https://www.dpvweb.net/ |
| EPPO Global Database | https://gd.eppo.int/ |
| EU-Nomen | https://www.eu-nomen.eu/portal/index.php |
| FAO | https://agris.fao.org/ |
| Fera | https://www.fera.co.uk/ncppb |
| GBIF | https://www.gbif.org/ |
| Hantsmoths | https://www.hantsmoths.org.uk/index.php |
| HOSTS - a Database of the World's Lepidopteran Hostplants | https://data.nhm.ac.uk/dataset/hosts |
| Index Fungorum | https://www.indexfungorum.org/names/Names.asp |
| Insects (Insecta) of the World | https://insecta.pro/ |
| Lepidoptera and some other life forms | https://ftp.funet.fi/pub/sci/bio/life/intro.html |
| Lepidoptera and their ecology | https://www.pyrgus.de/index_en.php |
| Lepiforum e.V. | https://lepiforum.org/ |
| Mycobank | https://www.mycobank.org/ |
| Natural History Museum | https://www.nhm.ac.uk/ |
| NBN atlas | https://nbnatlas.org/ |
| NorfolkMoths | https://www.norfolkmoths.co.uk/ |
| Plant Parasites of Europe | https://bladmineerders.nl/ |
| Scalenet | https://scalenet.info/catalogue/ |
| Spider Mites Web | https://www1.montpellier.inra.fr/CBGP/spmweb/ |
| The leaf and stem mines of British flies and other isects | http://www.ukflymines.co.uk/index.php |
| The Sawflies (Symphyta) of Britain and Ireland | https://www.sawflies.org.uk/ |
| Thrips of the British Isles | https://keys.lucidcentral.org/keys/v3/british_thrips/overview.html |
| TortAI | https://idtools.org/id/leps/tortai/index.html |
| Tortricid.net | http://www.tortricidae.com/ |
| UK Beetle Recording | https://coleoptera.org.uk/home |

**TABLE 2** (Continued)

| Database | Platform/link |
|---|---|
| UKmoths | https://ukmoths.org.uk/ |
| UK Plant Health Risk Register | https://planthealthportal.defra.gov.uk/pests-and-diseases/uk-plant-health-risk-register/index.cfm |
| USDA Fungal Databases | https://fungi.ars.usda.gov/ |
| Woodland trust | https://www.woodlandtrust.org.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 *Populus alba, Populus nigra* and *Populus tremula*. The following searches were combined: (i) a general search to identify pests reported on *P. alba, P. nigra* and *P. tremula* in the databases, (ii) a search to identify any EU quarantine pest reported on *Populus* as genus and subsequently (iii) a tailored search to identify whether the above pests are present or not in the UK. The searches were run between May and June 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 *P. alba, P. nigra* and *P. tremula*. 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. This is further explained in Section 2.3.2.

**TABLE 3** Databases used by EFSA for the compilation of the pest list associated with *Populus alba, P. nigra* and *P. tremula*.

| Database | Platform/link |
|---|---|
| Aphids on World Plants | https://www.aphidsonworldsplants.info/C_HOSTS_AAIntro.htm |
| BIOTA of New Zealand | https://biotanz.landcareresearch.co.nz/ |
| CABI Crop Protection Compendium | https://www.cabi.org/cpc/ |
| Database of Insects and their Food Plants | https://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://food.ec.europa.eu/plants/plant-health-and-biosecurity/europhyt_en |
| Leaf-miners | https://www.leafmines.co.uk/html/plants.htm |
| Nemaplex | https://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/ |
| Scalenet | https://scalenet.info/associates/ |
| Scolytinae hosts and distribution database | https://www.scolytinaehostsdatabase.eu/site/it/home/ |
| Spider Mites Web | https://www1.montpellier.inra.fr/CBGP/spmweb/ |
| 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 | https://www.worldagroforestry.org/treedb2/speciesprofile.php?Spid=1749 |

Additional documents were retrieved when developing the Opinion. The available scientific information, including previous EFSA opinions on the relevant pests and diseases (see pest data sheets in Appendix A) 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-quarantine pests and other pests) that may require risk mitigation measures are identified. The EU non-quarantine 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, the implemented risk mitigation measures for each relevant pest were evaluated.

A conclusion on the pest freedom status of the commodity for each of the relevant pests was 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. Further details on the methodology used to estimate the likelihood of pest freedom are provided in Section 2.3.4.

### 2.3.1 | Commodity data

Based on the information provided by DEFRA of the UK the characteristics of the commodity were summarised.

### 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 *P. alba, P. nigra* and *P. tremula* based on information provided in the Dossier Sections 1.1, 1.2, 1.3, 2.0, 3.1, 3.2, 3.3, 4.1, 4.2, 4.3, 5.1, 5.2 and 5.3, on searches performed by the Panel, and of EU quarantine and protected zone quarantine pests associated with *Populus* as a genus. 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 plant (i.e. *Populus alba, Populus nigra, Populus tremula, Populus*) were used when searching in the EPPO Global database and CABI Crop Protection Compendium. The same strategy was applied to the other databases excluding EUROPHYT and Web of Science.

EUROPHYT was investigated by searching for the interceptions associated with *P. alba, P. nigra* and *P. tremula* imported from the whole world from 1995 to May 2020 and TRACES-NT from May 2020 to 30 November 2024, respectively. For the pests selected for further evaluation, a search in the EUROPHYT and/or TRACES-NT was performed for the interceptions from the whole world, at species level, for all the available years until 30 September 2024.

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 using searches in other databases. The established search strings are detailed in Appendix B and they were run on 14 June 2024.

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

The compiled pest list (see Microsoft Excel® in Appendix F) includes all identified pests that use as host *P. alba, P. nigra* and *P. tremula* as well as all EU quarantine pests and protected zone quarantine pests found to be associated with *Populus* as a genus.

The evaluation of the compiled pest list was done in two steps: first, the relevance of the EU-quarantine pests was evaluated (Section 4.1); second, the relevance of any other plant pest was evaluated (Section 4.2).

Pests for which limited information was available on one or more criteria used to identify them as relevant for this Opinion, e.g. on potential impact, are listed in Appendix E (List of pests that can potentially cause an effect not further assessed).

### 2.3.3 | Listing and evaluation of risk mitigation measures

All implemented risk mitigation measures were listed and evaluated. When evaluating the likelihood of pest freedom of the commodity, the following types of potential infection/infestation sources for *P. alba, P. nigra* and *P. tremula* in export nursery were considered (see also Figure 1):

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

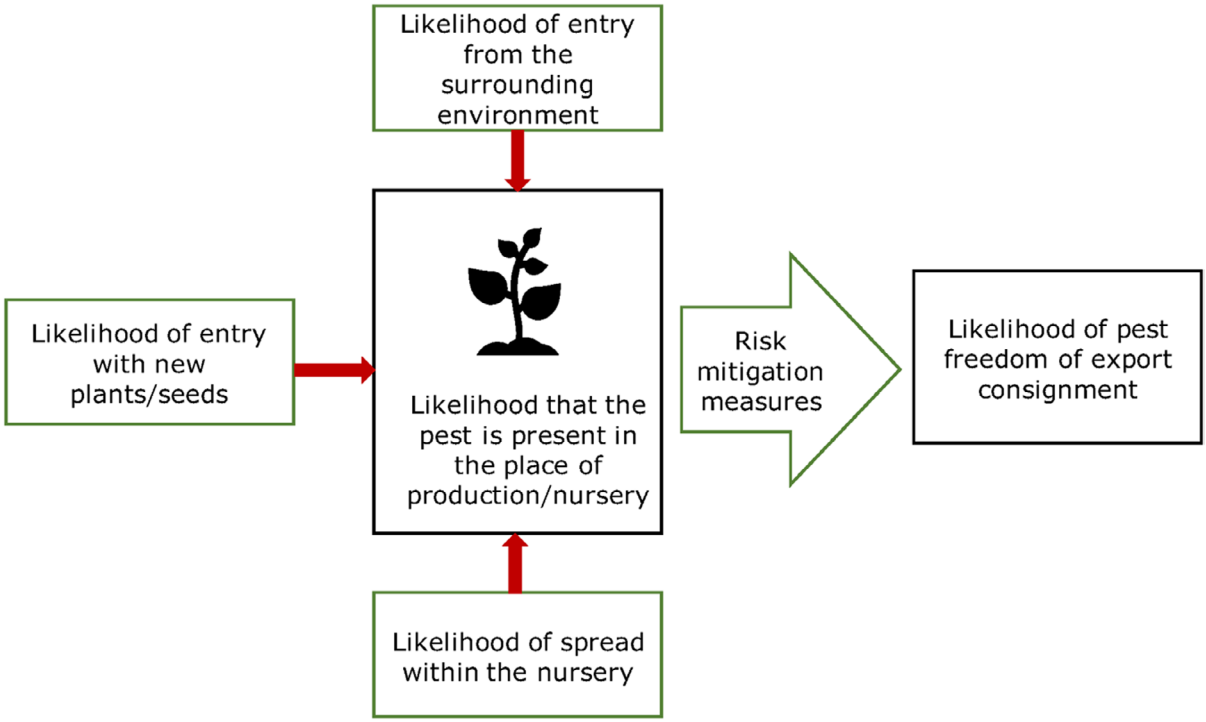


**FIGURE 1** Conceptual framework to assess likelihood that plants are exported free from relevant pests. (Source: EFSA PLH Panel, 2019).

The risk mitigation measures proposed by DEFRA of the UK were evaluated with Expert Knowledge Elicitation (EKE) according to the Guidance on uncertainty analysis in scientific assessment (EFSA Scientific Committee, 2018).

Information on the biology, likelihood of entry of the pest to the export nursery, of its spread inside the nursery and the effect of measures on the specific pests were summarised in data sheets of pests selected for further evaluation (see Appendix A).

### 2.3.4 | Expert Knowledge Elicitation

To estimate the pest freedom of the commodities an EKE was performed following EFSA guidance (Annex B.8 of EFSA Scientific Committee, 2018). The specific question for EKE was: 'Taking into account (i) the risk mitigation measures in place in the nurseries and (ii) other relevant information, how many of 10,000 commodity units, either single plants or bundles of plants will be infested with the relevant pest when arriving in the EU? A unit is defined as either single plants or bundles of plants, bare root plants or plants in pots, depending on the commodity.

For the purpose of the EKE, the commodities (see Section 3.1) were grouped as follows:

1. Cuttings/Graftwood of 1–2 years, in bundles of 10–20 items.
2. Bare root plants of 1–7 years as single trees or in bundles of 5, 10, 15, 25, 50 plants depending on the species and plant size.
3. Cell grown plants of 1–2 years as single plants or bundled in 5–10 plants depending on the plant size.
4. Single rooted plants of 3–15 years in pots.

Single plants and bundles of plants were considered together during the EKE. The following reasoning is given for not distinguishing bundles of bare root plants and bundles of cell grown plants from their respective single plants:

(i) There is no quantitative information available regarding clustering of plants during production;
(ii) Single plants are grouped in bundles after sorting;
(iii) For the pests under consideration, a cross-contamination during transport is possible;
(iv) Bundles of small plants resemble in their risk larger single plants.

The uncertainties associated with the EKE were taken into account and quantified in a probability distribution fitted to the elicited percentiles, 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 EKE results were reported in terms of the likelihood of pest freedom, calculated by 1 minus the likelihood to be infested. 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 commodities to be imported from the UK to the EU are cuttings/graftwood, bare root plants, cell grown plants and rooted plants up to 15 years in pots of *P. alba* (common names: white poplar, silver-leaved poplar; Family: Salicaceae), *P. nigra* (common names: black poplar; Family: Salicaceae) and *P. tremula* (common names: aspen, european aspen, trembling poplar; Family: Salicaceae) as described in the details below:

1. **Cuttings/Graftwood** (only for *P. nigra* and *P. tremula*): the age of cuttings/graftwood is between 1 and 2 years (Dossier Sections 1.2 and 1.3). The diameter is between 0.8 and 1.2 cm. They are grouped in bundles of 10–20 items. Cuttings/Graftwoods are strong young shoots bearing buds which are suitable for use in chip budding or grafting. The shoots are approximately between 35 and 40 cm long and will typically have 9, 10 or more buds present (Dossier Sections 1.2, 1.3 and 5.1).
2. **Bare root plants**: the age of plants is between 1 and 7 years (Dossier Sections 1.1, 1.2, 1.3 and 5.1). The diameter is between 0.5 and 4 cm and height is between 50 and 200 cm. Bare root plants may have some leaves at the time of export, in particular when exported in early winter (Dossier Sections 1.1, 1.2, 1.3 and 5.1). Bare root plants will be exported as single trees or in bundles of 5, 10, 15, 25, 50. (Dossier Sections 1.1, 1.2 and 5.1).
3. **Cell grown plants**: the age of plants is between 1 and 2 years. The diameter is between 0.5 and 1 cm and height between 40 and 60 cm. Cell grown plants are plants grown in cells at one plant per cell, using EU-compliant growing media. These may be grown in greenhouses initially but are subsequently grown outdoors in containers in metal frames above the ground. Cell grown plants may be traded as individual plants or as bundles. Typically, bundles will include 5–10 plants depending on the size of plant. The cell grown plants may be exported with leaves based on the picture 'cell grown plants bundled ready for dispatch' provided by the applicant country (Dossier Sections 1.1, 1.2, 1.3 and 5.1).
4. **Rooted plants in pots**: the age of plants is between 3 and 15 years (Dossier Section 5.1). The diameter is between 1.5 and 12 cm and height between 1 m and 10 m. Rooted plants in pots may be either grown in EU-compliant growing media in pots for their whole life, or initially grown in the field before being lifted, root-washed to remove any soil and then potted in EU-compliant growing media. The trees will be lifted from the field a minimum of one growing season prior to export at no more than 6 years old. The plants in pots may be exported with leaves, depending on the timing of the export (Dossier Sections 1.1, 1.2, 1.3 and 5.1).

The growing media used is either virgin peat or peat-free compost (a mixture of coir, tree bark, wood fibre, etc.) complying with the requirements for growing media as specified in the Annex VII of the Commission Implementing Regulation 2019/2072. This growing media is certified and heat-treated by commercial suppliers during production to eliminate pests and diseases (Dossier Sections 1.1, 1.2 and 1.3).

According to ISPM 36 (FAO, 2019), the commodities can be classified as 'bare root plants' and 'rooted plants in pots'.

The yearly average trade volume of the different commodities to the EU is reported in Dossier Sections 1.1, 1.2 and 1.3 and summarised in Table 4. The trade of these commodities will mainly be to Northern Ireland and the Republic of Ireland.

**TABLE 4** Trade volumes of *Populus alba*, *Populus nigra* and *Populus tremula* commodities.

| Type of plant | Number of items | Seasonal timing |
|---|---|---|
| ***Populus alba*** | | |
| Bare root plants | 20,000 | November to April |
| Rooted plants in pots (including cell grown plants) | 25,000 | Mainly September to May |
| ***Populus nigra*** | | |
| Cuttings/graftwood | 500 | January to March |
| Bare root plants | 10,000 | November to April |
| Rooted plants in pots (including cell-grown plants) | 20,000 | Mainly September to May |
| ***Populus tremula*** | | |
| Cuttings/graftwood | 500 | January to March |
| Bare root plants | 50,000 | November to April |
| Rooted plants in pots (including cell grown plants) | 20,000 | Mainly September to May |

According to the Dossier Sections 1.1, 1.2 and 1.3, the intended use of the commodities is as follows. Plants are supplied directly to professional operators and traders. Uses may include propagation, growing-on, onward trading or onward sales to final customers but will generally fall into the following categories:

Tree production and further growing-on by professional operators;
Landscapers and garden centres, for woodland and ornamental/landscape planting;
Direct sales to final users as ornamentals.

## 3.2 | Description of the production areas

There are four nurseries specified the technical dossier from the UK producing the commodities (Dossier Sections 1.1, 1.2 and 1.3). *Populus* species are grown in Great Britain in line with the Plant Health (Amendment etc.) (EU Exit) Regulations 2020[6] and the Plant Health (Phytosanitary Conditions) (Amendment) (EU Exit) Regulations 2020.[7] These regulations are broadly similar to the EU phytosanitary regulations. All plants within the UK nurseries are grown under the same phytosanitary measures, meeting the requirements of the UK Plant Passporting regime (Dossier Sections 1.1, 1.2 and 1.3).

The size of the nurseries is between 8 and 150 ha for container stock (plants in pots) and up to 325 ha for field-grown stock (Dossier Sections 1.1, 1.2 and 1.3).

The nurseries also grow other plant species as shown in the Appendix C. The minimum and maximum proportion of *Populus* compared to the other plant species grown in the nurseries is between 0.5% and 1% for *P. alba* and *P. nigra*, and between 0.5% and 3% for *P. tremula* (Dossier Sections 1.1, 1.2 and 1.3). The following plant species may be grown in some of the nurseries: *Castanea sativa, Larix* spp., *Fagus sylvatica, Fagus* spp., *Malus* spp., *Quercus petraea, Quercus pubescens, Quercus robur, Quercus* spp., *Rosa* spp., *Sorbus* spp., *Ulmus* spp. and *Viburnum* spp. (Dossier Section 5.1). There are nurseries which also produce plants for the local market, and there is no distancing between production areas for the export and the local market (Dossier Sections 1.1, 1.2 and 1.3).

Non-cultivated herbaceous plants grow on less than 1% of the nursery area. The predominant species is rye grass (*Lolium* spp.). Other identified species include dandelions (*Taraxacum officinale*), hairy bittercress (*Cardamine hirsuta*), common daisy (*Bellis perennis*), creeping cinquefoil (*Potentilla reptans*) and bluebells (*Hyacinthoides non-scripta*). These are all extremely low in number (Dossier Sections 1.1, 1.2 and 1.3). In access areas, non-cultivated herbaceous plants are kept to a minimum and only exist at nursery boundaries.

There are hedges surrounding the export nurseries 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 Sections 1.1, 1.2 and 1.3).

The minimum distance in a straight line, between the growing area in the nurseries and the closest *P. alba* plants in the local surroundings is 10 metres and the closest *P. nigra* or *P. tremula* plants in the local surroundings is 20 metres (Dossier Sections 1.1, 1.2 and 1.3).

Nurseries are predominately situated in rural areas. The surrounding land 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 (Dossier Sections 1.1, 1.2 and 1.3).

Arable crops present around the nurseries are rotated in line with good farming practices 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 Sections 1.1, 1.2 and 1.3).

Pastures present around the nurseries are predominantly ryegrass (*Lolium* spp.) (Dossier Sections 1.1, 1.2 and 1.3).

Woodland is present around the nurseries. Woodlands tend to be a standard UK mixed woodland, with a range of the 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 platanoides*) and field maple (*Acer campestre*). The nearest woodland to one of the nurseries borders the boundary fence (Dossier Sections 1.1, 1.2 and 1.3).

It is not possible to identify the plant species growing within the gardens of private dwellings around the nurseries (Dossier Sections 1.1, 1.2 and 1.3).

The following plant species may be grown within a 2 km zone surrounding the nurseries: *Brassica* spp. (cultivated species), *Camellia* spp., *Castanea sativa*, *Larix kaempferi*, *Larix* spp., *Fagus sylvatica*, *Fagus* spp., *Malus* spp., *Morus* spp., *Quercus petraea*, *Quercus pubescents*, *Quercus robur*, *Quercus* spp., *Rhododendron* spp., *Rosa* spp., *Rubus* spp., *Solanum lycopersicum*, *Sorbus* spp., *Taraxacum officinalis*, *Ulmus* spp., *Urtica dioica* and *Viburnum* spp. (Dossier Section 5.1).

Based on the global Köppen–Geiger climate zone classification (World Maps of Köppen-Geiger climate classification), the climate of the production areas of *P. alba, P. nigra* and *P. tremula* in the UK is classified as Cfb, i.e. main climate (C): warm temperate; precipitation (f): fully humid; temperature (b): warm summer.

## 3.3 | Production and handling processes

### 3.3.1 | Source of planting material

The starting material of the commodities is a mix of seeds and seedlings depending on the nursery (Dossier Sections 1.1, 1.2 and 1.3).

Seeds purchased in the UK are certified under the Forest Reproductive Material (Great Britain) Regulations 2002. Seedlings sourced in the UK are certified with the UK Plant Passports. A small percentage of seedlings are obtained from EU countries (the Netherlands, Belgium, France) and they are certified with phytosanitary certificates (Dossier Sections 1.1, 1.2 and 1.3).

[6]Plant Health (Amendment etc.) (EU Exit) Regulations 2020 of 14 December 2020, No. 1482, 80 pp. https://www.legislation.gov.uk/uksi/2020/1482/contents/made

[7]Plant Health (Phytosanitary Conditions) (Amendment) (EU Exit) Regulations 2020, No. 1527, 276 pp. https://www.legislation.gov.uk/uksi/2020/1527/contents/made

None of the nurseries expected to export to the EU produce plants from grafting, they use only seed, seedlings and cuttings, therefore there are no mother plants of *P. alba*, *P. nigra* or *P. tremula* present in the nurseries (Dossier Sections 1.1, 1.2 and 1.3).

### 3.3.2 | Production cycle

Plants are either grown in containers (cells, pots, tubes, etc.) or in the field. Cell grown plants can be grown in greenhouses; however, most plants will be field-grown or field-grown in containers (Dossier Sections 1.1 and 1.2). The minimum distance between greenhouses and production fields of *Populus* is 30 m (Dossier Section 5.2).

As the plants are intended for outdoor cultivation it is normally only the early growth stages that are maintained under protection, such as young plants where there is an increased vulnerability due 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 Sections 1.1, 1.2, 1.3 and 5.1).

Rooted plants in pots may be either grown in EU-compliant growing media in pots for their whole life, or initially grown in the field before being lifted, root-washed to remove the soil and then potted in EU-compliant growing media. Trees will be lifted from the field, root-washed to remove the soil and transplanted into pots at least one growing season before export (Dossier Section 5.1).

Specimen trees may either be grown in pots in EU-compliant media their whole life or be initially grown in the field, lifted at no more than 6 years old, root-washed and subsequently grown from that point on in pots in EU-compliant growing media (Dossier Sections 1.1, 1.2, 1.3 and 5.1). Trees will be lifted from the field, root-washed to remove the soil and transplanted into pots at least one growing season before export (Dossier Section 5.1).

Pruning is done on the commodities 1, 2 and 4 described above in 3.1 Pruning frequency depends on growth, age of plant, nursery and customer preference. Cell grown plants are not pruned (Dossier Sections 1.1, 1.2, 1.3 and 5.1).

According to the Dossier Sections 1.1, 1.2 and 1.3, bare root plants are harvested in winter to be able to lift plants from the field, and because this is the best time to move dormant plants. Rooted plants in pots can be moved at any point in the year to fulfil customer demand.

The growing media is virgin peat or peat-free compost. 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 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 Sections 1.1, 1.2 and 1.3).

Overhead, sub irrigation or drip irrigation is applied. Water used for irrigation can be drawn from several sources, the mains supply, bore holes or from rainwater collection or watercourses (Dossier Sections 1.1, 1.2 and 1.3). Additional information on water used for irrigation is provided in Appendix D. Regardless of the source of the water used to irrigate, none of the nurseries are known to have experienced the introduction of a pest/disease because of contamination of the water supply (Dossier Sections 1.1, 1.2 and 1.3).

Growers are required to assess whether water sources, irrigation and drainage systems used in plant production could harbour and transmit plant pests. Water is routinely sampled and sent for analysis (Dossier Sections 1.1, 1.2 and 1.3).

Growers must have an appropriate programme of weed management in place in the nursery (Dossier Sections 1.1, 1.2 and 1.3).

General hygiene measures are undertaken as part of routine nursery production, including disinfection of tools and equipment between batches/lots and different plant species. The tools are dipped in a disinfectant solution and wiped with a clean cloth between trees to reduce the risk of viral and bacterial transfer between subjects. There are various disinfectants available, with Virkon S (active substance: potassium peroxymonosulfate and sodium chloride) being a common example (Dossier Sections 1.1, 1.2 and 1.3).

Growers keep records to allow traceability for all plant material handled. These records must allow a consignment or consignment in transit to be traced back to the original source, as well as forward to identify all trade customers to which those plants have been supplied (Dossier Sections 1.1, 1.2 and 1.3).

### 3.3.3 | Pest monitoring during production

All producers are registered as professional operators with the UK Competent Authority via the Animal and Plant Health Agency (APHA) for England and Wales, or with Science and Advice for Scottish Agriculture (SASA) for Scotland, and are authorised to issue UK plant passports, verifying they meet the required national sanitary standards. The Competent Authority inspects crops at least once a year to check they meet the standards set out in the guides. The UK 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 Sections 1.1, 1.2 and 1.3).

The sanitary status of production areas is controlled by the producers as part of these schemes, as well as via official inspections by APHA Plant Health and Seeds Inspectors (PHSI; England and Wales) or with SASA (Scotland) (Dossier Sections 1.1, 1.2 and 1.3).

Plant material is regularly monitored for plant health issues. Pest monitoring is carried out visually by trained nursery staff via regular crop walking and records are kept of this monitoring. Qualified agronomists also undertake crop walks to verify the producer's assessments. Curative or preventative actions as described below 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. All plants are also carefully inspected by nurseries on arrival and dispatch for any plant health issues (Dossier Sections 1.1, 1.2 and 1.3).

The nurseries follow the Plant Health Management Standard issued by the Plant Healthy Certification Scheme which DEFRA, the Royal Horticultural Society (Dossier Sections 1.1, 1.2 and 1.3).

During production, in addition to the general health monitoring of the plants by the nurseries, official growing season inspections are undertaken by the UK Plant Health Service at an appropriate time, taking into consideration factors such as the likelihood of pest presence and growth stage of the crop. Where appropriate this could include sampling and laboratory analysis. Official sampling and analysis could also be undertaken nearer to the point of export depending on the type of analysis and the import requirements of the country being exported to. Samples are generally taken on a representative sample of plants, in some cases however where the consignment size is quite small all plants are sampled. Magnification equipment is provided to all inspectors as part of their standard equipment and is used during inspections when appropriate (Dossier Sections 1.1, 1.2 and 1.3).

In the Dossier it is reported that in the last 3 years there has been a substantial level of inspection of registered *P. alba, P. nigra* and *P. tremula* producers, both in support of the Plant Passporting scheme (checks are consistent with EU legislation, with a minimum of 1 a year for authorised operators) and as part of the Quarantine Surveillance programme (Great Britain uses the same framework for its surveillance programme as the EU) The number of inspected nurseries were 4 in 2020 and 5 in 2021 and 2022. Inspections targeted *P. ramorum* but plants were also inspected for symptoms and signs of other pests including quarantine pests. (Dossier Sections 1.1, 1.2 and 1.3).

All residues or waste materials are reported to be assessed for the potential to host, harbour and transmit pests (Dossier Sections 1.1, 1.2 and 1.3).

Incoming plant material and other goods such as packaging material and growing media, that have the potential to be infected or harbour pests, are checked on arrival. Growers have procedures in place to quarantine any suspect plant material and to report findings to the authorities (Dossier Sections 1.1, 1.2 and 1.3).

### 3.3.4 | Pest management during production

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 Sections 1.1, 1.2 and 1.3).

Pest and disease pressure varies from season to season. Product application takes place only when required and depends on situation (disease pressure, growth stage etc. and environmental factors) at that time. Subject to this variation in pest pressure, in some seasons few, if any, pesticides are applied; in others it is sometimes necessary to apply preventative and/or control applications of pesticides. In many circumstances also, biological control rather than chemical control is reported to be used to manage pest outbreaks (Dossier Sections 1.1, 1.2 and 1.3).

Examples of typical treatments used against rust, leaf spot, canker, spider mites, aphids and weeds are listed in the Dossier Sections 1.1, 1.2, 1.3 and 5.1. These would be applied at the manufacturers recommended rate and intervals (Dossier Sections 1.1, 1.2 and 1.3).

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. 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 Sections 1.1, 1.2 and 1.3).

Post-harvest and through the autumn and winter, nursery management is centred on pest and disease prevention and maintaining good levels of nursery hygiene. Leaves, pruning residues and weeds are all removed from the nursery to reduce the number of over wintering sites for pests and diseases (Dossier Sections 1.1, 1.2 and 1.3).

### 3.3.5 | Inspections 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 (Dossier Sections 1.1, 1.2 and 1.3).

Separate to any official inspection, plant material is checked by growers for plant health issues prior to dispatch (Dossier Sections 1.1, 1.2 and 1.3).

A final pre-export inspection is undertaken as part of the process of issuing a phytosanitary certificate. These inspections are generally undertaken as near to the time of export as possible, usually within 1–2 days and not more than 2 weeks before export. Phytosanitary certificates are only issued if the commodity meets the required plant health standards after inspection and/or testing according to appropriate official procedures (Dossier Sections 1.1, 1.2 and 1.3).

The protocol for plants infested by pests during inspections before export is to treat the plants, if they are on site for a sufficient period of time or to destroy any plants infested by pests otherwise. All other host plants in the nursery would be treated. The phytosanitary certificate for export will not be issued until the UK Plant Health inspectors confirm that the plants are free from pests (Dossier Sections 1.1, 1.2 and 1.3).

### 3.3.6 | Export procedure

Bare root plants, harvested from November to March, 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 store for up to 5 months after harvesting prior to export (Dossier Sections 1.1, 1.2 and 1.3).

Rooted plants in pots can be moved at any point in the year to fulfil customer demand. These will likely be destined for garden centre trade rather than nurseries (Dossier Sections 1.1, 1.2 and 1.3).

Graftwood/budwood is wrapped in plastic and packed in cardboard boxes or Dutch crates on ISPM certified wooden pallets, or metal pallets, dependant on quantity. Graftwood/budwood may be exported in bundles of 10–20 items (Dossier Sections 1.1, 1.2 and 1.3).

Cell grown plants may be traded as individual plants or as bundles. Typically, bundles will include 5–10 plants depending on the size of plant (Dossier Section 5.1).

Prior to export bare root plants can be placed in bundles 5–50 plants, depending on their size 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 Sections 1.1, 1.2 and 1.3).

Rooted plants in pots are transported on Danish trolleys for smaller containers, or ISPM 15 certified pallets, or individually in pots for larger containers (Dossier Sections 1.1, 1.2 and 1.3).

The preparation of the commodities for export is carried out inside the nurseries in a closed environment, e.g. packing shed (Dossier Sections 1.1, 1.2 and 1.3).

Plants are transported by lorry (size dependant on load quantity). Cold sensitive plants are occasionally transported by temperature-controlled lorry if weather conditions during transit are likely to be very cold (Dossier Sections 1.1, 1.2 and 1.3).

## 4 | IDENTIFICATION OF PESTS POTENTIALLY ASSOCIATED WITH THE COMMODITY

The search for potential pests associated with the commodity rendered 1657 species (see Microsoft Excel® file in Appendix F).

### 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.

Fifty-five EU-quarantine species that are reported to use commodity as a host plant were evaluated (Table 5) 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 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 were selected for further evaluation.

Table 5 presents an overview of the evaluation of the 55 EU-quarantine pest species that are reported as associated with the commodity.

Of these 55 EU-quarantine pest species evaluated, 2 (*Bemisia tabaci* (European populations) and *Entoleuca mammata*) are present in the UK and can be associated with the commodity and hence were selected for further evaluation.

There were two EU quarantine pests, despite being reported to be associated with Populus were not further evaluated (*Agrilus anxius* and *Phytophthora ramorum*).

An association with *Populus* was reported in CABI for *A. anxius* without providing the original source (CABI, 2020). The consultation of other literature revealed that *Populus* is not reported as a host of *A. anxius* and that *A. anxius* is a specialist on *Betula*. Moreover, the pest is not known to be present in the UK. *Populus deltoides* was reported to be a putative host of *P. ramorum*. However, the host status was not confirmed by the fulfilment of the Koch's postulates (Vettraino et al., 2010). Therefore, there is no indication that poplars are hosts of the pathogen.

**TABLE 5** Overview of the evaluation of the 55 EU-quarantine pest species for which information was found in the Dossier, databases and literature searches that use *Populus* as a host plant for their relevance for this Opinion.

| No. | Pest name according to EU legislation[a] | EPPO code | Group | Pest present in the UK | *Populus* confirmed as a host (reference) | Pest can be associated with the commodity | Pest relevant for the Opinion |
|---|---|---|---|---|---|---|---|
| 1 | *Acleris issikii* | ACLRIS | Insects | No | *Populus nigra* (Byun & Yan, 2004) | Not assessed | No |
| 2 | *Aleurocanthus woglumi* | ALECWO | Insects | No | *Populus* spp. (Shaw, 1950) | Not assessed | No |
| 3 | *Anoplophora chinensis* | ANOLCN | Insects | No | *Populus alba*, *P. nigra* (Sjöman et al., 2014) | Not assessed | No |
| 4 | *Anoplophora glabripennis* | ANOLGL | Insects | No | *Populus alba*, *P. nigra*, *P. tremula* (Sjöman et al., 2014) | Not assessed | No |
| 5 | *Apriona cinerea* | APRICI | Insects | No | *Populus alba* (EPPO, 2024), *P. nigra* (Singh et al., 2004) | Not assessed | No |
| 6 | *Apriona germari* | APRIGE | Insects | No | *Populus alba* (Lim et al., 2014) | Not assessed | No |
| 7 | *Apriona rugicollis* | APRIJA | Insects | No | *Populus* (EPPO, 2024) | Not assessed | No |
| 8 | *Arrhenodes minutus* | ARRHMI | Insects | No | *Populus* (Kissinger, 1993) | Not assessed | No |
| 9 | *Begomovirus caricae* as Begomoviruses | PALCUV | Viruses | No | *Populus alba* (Mustafa et al., 2022) | Not assessed | No |
| 10 | *Begomovirus solanumkeralaense* as Begomoviruses | TOLCKA | Viruses | No | *Populus alba* (Mustafa et al., 2022) | Not assessed | No |
| 11 | *Bemisia tabaci* (non-European populations) | BEMITA | Insects | No | *Populus nigra* (Samin et al., 2015) | Not assessed | No |
| 12 | *Bemisia tabaci* (European populations)[b] | BEMITA | Insects | Yes | *Populus nigra* (Samin et al., 2015) | Yes | Yes |
| 13 | *Candidatus* Phytoplasma fraxini | PHYPFR | Phytoplasmas | No | *Populus nigra* (Franco-Lara et al., 2020) | Not assessed | No |
| 14 | *Choristoneura conflictana* | ARCHCO | Insects | No | *Populus alba* (EPPO, 2024) | Not assessed | No |
| 15 | *Choristoneura rosaceana* | CHONRO | Insects | No | *Populus* sp. (Ferguson, 1975) | Not assessed | No |
| 16 | *Entoleuca mammata* | HYPOMA | Fungi | Yes | *Populus alba*, *P. tremula* (Kasanen et al., 2004) | Yes | Yes |
| 17 | *Eotetranychus lewisi* | EOTELE | Mites | No | *Populus deltoides* (Estebanes-Gonzalez & Baker, 1968) | Not assessed | No |
| 18 | *Euwallacea fornicatus sensu lato* | XYLBFO | Insects | No | *Populus alba* (van Rooyen et al., 2021), *Populus nigra* (DAFNAE, 2024) | Not assessed | No |
| 19 | *Homalodisca vitripennis* | HOMLTR | Insects | No | *Populus* sp. (Hoddle et al., 2003) | Not assessed | No |
| 20 | *Lopholeucaspis japonica* | LOPLJA | Insects | No | *Populus alba* (Batsankalashvili et al., 2017) | Not assessed | No |
| 21 | *Lycorma delicatula* | LYCMDE | Insects | No | *Populus alba* (Dara et al., 2015) | Not assessed | No |
| 22 | *Oemona hirta* | OEMOHI | Insects | No | *Populus alba*, *P. nigra* (EPPO, 2024) | Not assessed | No |
| 23 | *Phymatotrichopsis omnivora* | PHMPOM | Fungi | No | *Populus alba*, *P. nigra* (Anonymous, 1960) | Not assessed | No |
| 24 | *Phytophthora ramorum* (non-EU isolates) | PHYTRA | Oomycetes | Yes | *Populus deltoides* (Vettraino et al., 2010) | No[c] | No |
| 25 | *Popillia japonica* | POPIJA | Insects | No | *Populus nigra* (Clausen et al., 1927) | Not assessed | No |
| 26 | *Sphaerulina musiva* | MYCOPP | Fungi | No | *Populus nigra* (Anonymous, 1960) | Not assessed | No |
| 27 | *Trirachys sartus* | AELSSA | Insects | No | *Populus alba*, *P. nigra* (Ahmad et al., 1977) | Not assessed | No |

(Continues)

**TABLE 5** (Continued)

| No. | Pest name according to EU legislation[a] | EPPO code | Group | Pest present in the UK | *Populus* confirmed as a host (reference) | Pest can be associated with the commodity | Pest relevant for the Opinion |
|---|---|---|---|---|---|---|---|
| 28 | *Xiphinema rivesi* (non-European populations) | XIPHRI | Nematodes | No | *Populus* sp. (Xu & Zhao, 2019) | Not assessed | No |
| 29 | *Xylella fastidiosa* | XYLEFA | Bacteria | No | *Populus tremula* (Casarin et al., 2023) | Not assessed | No |
| **Scolytinae spp. (non-European)** | | | | | | | |
| 30 | *Ambrosiodmus apicalis* as Scolytinae spp. (non-European) | – | Insects | No | *Populus* (Wood & Bright, 1992) | Not assessed | No |
| 31 | *Ambrosiodmus lewisi* as Scolytinae spp. (non-European) | AMBDLE | Insects | No | *Populus* (Wood & Bright, 1992) | Not assessed | No |
| 32 | *Ambrosiodmus rubricollis* as Scolytinae spp. (non-European) | AMBDRU | Insects | No | *Populus* (Wood & Bright, 1992) | Not assessed | No |
| 33 | *Anisandrus maiche* as Scolytinae spp. (non-European) | ANIDMA | Insects | No | *Populus tremula* (Terekhova & Skrylnik, 2012) | Not assessed | No |
| 34 | *Anisandrus obesus* as Scolytinae spp. (non-European) | ANIDOB | Insects | No | *Populus tremuloides* (Wood & Bright, 1992) | Not assessed | No |
| 35 | *Debus emarginatus* as Scolytinae spp. (non-European) | DEBUEM | Insects | No | *Populus* (Wood & Bright, 1992) | Not assessed | No |
| 36 | *Dryoxylon onoharaense* as Scolytinae spp. (non-European) | DRYXON | Insects | No | *Populus deltoides* (Atkinson, 2024) | Not assessed | No |
| 37 | *Euwallacea interjectus* as Scolytinae spp. (non-European) | XYLBIN | Insects | No | *Populus* spp. (Wood & Bright, 1992) | Not assessed | No |
| 38 | *Euwallacea validus* as Scolytinae spp. (non-European) | XYLBVA | Insects | No | *Populus deltoides* (Wood & Bright, 1992) | Not assessed | No |
| 39 | *Gnathotrichus retusus* as Scolytinae spp. (non-European) | GNAHRE | Insects | No | *Populus tristis* (Atkinson, 2024) | Not assessed | No |
| 40 | *Hylocurus hirtellus* as Scolytinae spp. (non-European) | – | Insects | No | *Populus* sp. (Atkinson, 2024) | Not assessed | No |
| 41 | *Hypothenemus seriatus* as Scolytinae spp. (non-European) | STEHSE | Insects | No | *Populus deltoides* (Wood & Bright, 1992) | Not assessed | No |
| 42 | *Micracis swainei* as Scolytinae spp. (non-European) | – | Insects | No | *Populus* (Wood & Bright, 1992) | Not assessed | No |
| 43 | *Procryphalus mucronatus* as Scolytinae spp. (non-European) | – | Insects | No | *Populus* spp., *Populus tremuloides* (Atkinson, 2024) | Not assessed | No |
| 44 | *Pycnarthrum hispidum* as Scolytinae spp. (non-European) | – | Insects | No | *Populus* sp. (Gomez et al., 2020) | Not assessed | No |
| 45 | *Scolytoplatypus tycoon* as Scolytinae spp. (non-European) | – | Insects | No | *Populus* (Wood & Bright, 1992) | Not assessed | No |

**TABLE 5** (Continued)

| No. | Pest name according to EU legislation[a] | EPPO code | Group | Pest present in the UK | *Populus* confirmed as a host (reference) | Pest can be associated with the commodity | Pest relevant for the Opinion |
|---|---|---|---|---|---|---|---|
| 46 | *Trypodendron retusum* as Scolytinae spp. (non-European) | – | Insects | No | *Populus deltoides*, *P. grandidentata*, *P. tremuloides* (Wood & Bright, 1992) | Not assessed | No |
| 47 | *Trypophloeus klimeschi* as Scolytinae spp. (non-European) | TRYOKL | Insects | No | *Populus diversifolia* (Wood & Bright, 1992) | Not assessed | No |
| 48 | *Trypophloeus kurenzovi* as Scolytinae spp. (non-European) | – | Insects | No | *Populus tremula* (Wood & Bright, 1992) | Not assessed | No |
| 49 | *Trypophloeus populi* as Scolytinae spp. (non-European) | CRYHPO | Insects | No | *Populus angustifolia, P. tremuloides, P. tristis* (Wood & Bright, 1992) | Not assessed | No |
| 50 | *Trypophloeus thatcheri* as Scolytinae spp. (non-European) | – | Insects | No | *Populus tremuloides, P. tristis* (Wood & Bright, 1992) | Not assessed | No |
| 51 | *Trypophloeus tremulae* as Scolytinae spp. (non-European) | – | Insects | No | *Populus alba*, *P. nigra*, *P. tremula* (DAFNAE, 2024) | Not assessed | No |
| 52 | *Xyleborus affinis* as Scolytinae spp. (non-European) | XYLBAF | Insects | No | *Populus deltoides* (Atkinson, 2024) | Not assessed | No |
| 53 | *Xyleborus perforans* as Scolytinae spp. (non-European) | XYLBPE | Insects | No | *Populus deltoides* (DAFNAE, 2024) | Not assessed | No |
| 54 | *Xyleborus volvulus* as Scolytinae spp. (non-European) | XYLBTO | Insects | No | *Populus tremula* (DAFNAE, 2024) | Not assessed | No |
| 55 | *Xyloterinus politus* as Scolytinae spp. (non-European) | XYORPO | Insects | No | *Populus* sp. (Mayers et al., 2020) | Not assessed | No |

[a]Commission Implementing Regulation (EU) 2019/2072.

[b]*B. tabaci* (European population) is regulated as a protected zone quarantine pest. Therefore *B. tabaci* is listed twice, as European and non-European population. The association with *P. nigra* was assessed at the species level and not at the population level.

[c]*Populus deltoides* was reported to be a putative host of the pathogen: However, host status was not confirmed by the fulfilment of the Koch's postulates (Vettraino et al., 2010). Therefore, there is no indication that poplars are hosts of the pathogen.

## 4.2 | Selection of other relevant pests (non-regulated 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 country of export. 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. commodity is a host of the pest;
d. one or more life stages of the pest can be associated with the specified commodity;
e. the pest may have an impact in the EU.

For non-regulated species with a limited distribution (i.e. present in one or a few EU MSs) and fulfilling the other criteria (i.e. c, d and e), either one of the following conditions should be additionally fulfilled for the pest to be further evaluated:

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

Pests that fulfilled the above listed criteria were selected for further evaluation.

Based on the information collected, 1602 potential pests known to be associated with the species commodity were evaluated for their relevance to this Opinion. Pests were excluded from further evaluation when at least one of the conditions listed above (1–5) was not met. Details can be found in Appendix F (Microsoft Excel® file). None of the pests not regulated in the EU was selected for further evaluation because none of them met all selection criteria.

There were two pests, i.e. *Colletotrichum populi* and *Pemphigus populitransversus* that were initially considered potentially relevant, but they were discarded at later stage because of the following reasons.

*Colletotrichum populi*

*Colletotrichum populi* was reported on *P. nigra* var. *italica* in China (Li et al., 2012). There was also one report from the UK on *Fragaria × ananassa* as *Colletotrichum aenigma* (Baroncelli et al., 2015), which according to USDA Fungal Database is the current fungus name (Farr & Rossman, 2024). However, according to the Index Fungorum (2024) and MyCoBank (2024) *C. aenigma* and *C. populi* are two separate species. The Panel, decided to follow the Index Fungorum and MyCoBank and therefore, the pest is not considered to be present in the UK.

*Pemphigus populitransversus*

The pest meets the criteria of being considered for further evaluation because *P. populitransversus* is reported to be associated with *P. nigra* in South Africa and *Populus* sp. in the Azores (Aphids on World's Plants, 2024), besides being impactful on *Brassica* in North America (Wene & White, 1953; Sokal et al., 1991; Coyle et al., 2005). However, there is no report on the pest producing galls on poplars in the UK (Dossier Section 2.0) suggesting a lack of association with the commodities. Available information suggests that the population in the UK is anholocyclic and only infests the secondary host (Brassicaceae) (Aphids on World's plants, 2024; Blackman & Eastop, 2006). Because of the high uncertainties and the lack of information a quantitative assessment is not conducted. A pest categorisation is also likely to be unconclusive based on the currently available information. The Panel proposes to include the pest in the horizon scanning programme.

## 4.3 | Overview of interceptions

Data on the interception of harmful organisms on plants of *Populus* can provide information on some of the organisms that can be present on *Populus* despite the current measures taken. According to EUROPHYT (2024) (accessed on 10 December 2024) and TRACES-NT (2024) (accessed on 10 December 2024), there were no interceptions of plants for planting of *Populus* from the UK destined to the EU Member States due to the presence of harmful organisms between the years 1995 and 30 November 2024. It should be noted that since Brexit the movement of *Populus* from UK to the EU has been banned according to the current plant health legislation and therefore it is not expected to have interceptions after Brexit.

## 4.4 | List of potential pests not further assessed

From the list of pests not selected for further evaluation, the Panel highlighted two species (see Appendix E) for which currently available evidence provides no reason to select these species for further evaluation in this Opinion. A specific justification of the inclusion in this list is provided for each species in Appendix E.

## 4.5 | Summary of pests selected for further evaluation

The two pests satisfying all the relevant criteria listed above in the Sections 4.1 and 4.2 are included in Table 6. The effectiveness of the risk mitigation measures applied to the commodity was evaluated for these selected pests.

**TABLE 6** List of relevant pests selected for further evaluation.

| Number | Current scientific name | EPPO code | Name used in the EU legislation | Taxonomic information | Group | Regulatory status |
|---|---|---|---|---|---|---|
| 1 | *Bemisia tabaci* | BEMITA | *Bemisia tabaci* Genn. (European populations) | Hemiptera Aleyrodidae | Insects | Protected Zone Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072 |
| 2 | *Entoleuca mammata* | HYPOMA | *Entoleuca mammata* (Wahlenb.) Rogers and Ju | Xylariales Xylariaceae | Fungi | Protected Zone Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072 |

# 5 | RISK MITIGATION MEASURES

For the selected pests (Table 7), the Panel evaluated the likelihood that it could be present in the *P alba, P. nigra* and *P. tremula* 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 1.1, 1.2, 1.3, 2.0, 3.1, 3.2, 3.3, 4.1, 4.2, 4.3, 5.1, 5.2 and 5.3), the Panel summarised the risk mitigation measures (see Table 7) that are implemented in the production nursery.

**TABLE 7** Overview of implemented risk mitigation measures for *Populus alba, Populus nigra* and *Populus tremula* plants designated for export to the EU from the UK.

| Number | Risk mitigation measure | Implementation in the UK |
|---|---|---|
| 1 | Registration of production sites | All producers are registered as professional operators with the UK Competent Authority via APHA for England and Wales, or SASA for Scotland, and are authorised to issue the UK plant passports, verifying they meet the required national sanitary standards (Dossier Sections 1.1 1.2 and 1.3). |
| 2 | Physical separation | Most of the nurseries also produce plants for the local market, and there is no distancing between production areas for the export and the local market. All plants within UK nurseries are grown under the same phytosanitary measures, meeting the requirements of the UK Plant Passporting regime (Dossier Sections 1.1, 1.2 and 1.3). |
| 3 | Certified plant material | Populus 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 seed and young plants may be obtained from EU (Netherlands, Belgium and France); seeds and planting material from the EU countries are certified with phytosanitary certificates (Dossier Sections 1.1, 1.2 and 1.3). |

(Continues)

**TABLE 7** (Continued)

| Number | Risk mitigation measure | Implementation in the UK |
|---|---|---|
| 4 | Growing media | The growing media is virgin peat or peat-free compost. 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 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 Sections 1.1, 1.2 and 1.3). |
| 5 | Surveillance, monitoring and sampling | For additional information see Section 3.3.3 Pest monitoring during production. |
| 6 | Hygiene measures | All nurseries have plant hygiene and housekeeping rules and practices in place, which are communicated to all relevant employees.<br>General hygiene measures are undertaken as part of routine nursery production, including disinfection of tools and equipment between batches/lots and different plant species. The tools are dipped in a disinfectant solution and wiped with a clean cloth between trees to reduce the risk of transfer of pests between subjects. There are various disinfectants available, with Virkon S (active substance: potassium peroxymonosulfate and sodium chloride) being a common example.<br>Growers must have an appropriate programme of weed management in place on the nursery (Dossier Sections 1.1, 1.2 and 1.3). |
| 7 | Removal of infested plant material | Post-harvest and through the autumn and winter, nursery management is centred on pest and disease prevention and maintaining good levels of nursery hygiene. Leaves, pruning residues and weeds are all removed from the nursery to reduce the number of over wintering sites for pests and diseases.<br>All residues or waste materials shall be assessed for the potential to host, harbour or transmit pests (Dossier Sections 1.1, 1.2 and 1.3). |
| 8 | Irrigation water | Water for irrigation is routinely sampled and sent for analysis (Dossier Sections 1.1, 1.2 and 1.3). |
| 9 | 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.<br>Pest and disease pressure varies from season to season. Plant protection products are applied application takes place only when required and depends on situation (disease pressure, growth stage etc. and environmental factors) at that time. Subject to this variation in pest pressure, in some seasons few, if any, pesticides are applied; in others it is sometimes necessary to apply preventative and/or control applications of pesticides. In many circumstances also, biological control is reported to be used to control outbreaks, rather than using chemical treatments.<br>Examples of typical products used against rusts, leafspots and canker fungi, spider mites, aphids and weeds are provided in the Dossier Sections 1.1, 1.2, 1.3 and 5.1. These would be applied at the manufacturers recommended rate and intervals (Dossier Sections 1.1, 1.2 and 1.3). |
| 10 | Measures against soil pests | 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. 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 Sections 1.1, 1.2 and 1.3). |
| 11 | 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 (Dossier Sections 1.1, 1.2 and 1.3).<br>Separate to any official inspection, plant material is checked by growers for plant health issues prior to dispatch (Dossier Sections 1.1, 1.2 and 1.3).<br>A final pre-export inspection is undertaken as part of the process of issuing a phytosanitary certificate. These inspections are generally undertaken usually within 1–2 days, and not more than 2 weeks before export. Phytosanitary certificates are only issued if the commodity meets the required plant health standards after inspection and/or testing according to appropriate official procedures (Dossier Sections 1.1, 1.2 and 1.3).<br>The protocol for plants infested by pests during inspections before export is to treat the plants, if they are on site for a sufficient period of time or to destroy any plants infested by pests otherwise. All other host plants in the nursery would be treated. The phytosanitary certificate for export will not be issued until the UK Plant Health inspectors confirm that the plants are free from pests (Dossier Sections 1.1, 1.2 and 1.3). |

**TABLE 7** (Continued)

| Number | Risk mitigation measure | Implementation in the UK |
|---|---|---|
| 12 | Separation during transport to the destination | The commodities are dispatched as single plants in pots, single cell grown plants, single bare root plants or in bundles as follows:<br>– 10–20 for cuttings/graftwood;<br>– 5, 10, 15, 25, 50 for bare root plants;<br>– 5–10 for cell grown plants.<br>Cuttings/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 (Dossier Sections 1.1, 1.2 and 1.3).<br>Bare root plants 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 (Dossier Sections 1.1, 1.2 and 1.3).<br>Rooted plants in pots are transported on Danish trolleys for smaller containers, or ISPM 15 certified pallets, or individually in pots for larger containers (Dossier Sections 1.1, 1.2 and 1.3).<br>The preparation of the commodities for export is carried out inside the nurseries in a closed environment, e.g. packing shed, except for the specimen trees, which are prepared outside in an open field due to their dimensions (Dossier Sections 1.1, 1.2 and 1.3).<br>Plants are transported by lorry (size dependant on load quantity). Sensitive plants are occasionally transported by temperature-controlled lorry if weather conditions during transit are likely to be very cold (Dossier Sections 1.1, 1.2 and 1.3). |

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

For each evaluated pest, the relevant risk mitigation measures acting on the pest were identified. Any limiting factors on the effectiveness 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 a pest data sheet provided in Appendix A. Based on this information, for each selected relevant pest, an expert judgement is given for the likelihood of pest freedom taking into consideration the risk mitigation measures and their combination acting on the pest.

An overview of the evaluation of each relevant pest is given in the sections below (Sections 5.2.1–5.2.2). The outcome of the EKE regarding pest freedom after the evaluation of the currently proposed risk mitigation measures is summarised in Section 5.2.3.

### 5.2.1 | Overview of the evaluation of *Bemisia tabaci* (European populations) (Hemiptera; Aleyrodidae)

| **Overview of the evaluation of *B. tabaci* for bare root plants of 1–7 years** | | | | | |
|---|---|---|---|---|---|
| **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/bundles** | **9959** out of 10,000 **plants/bundles** | **9976** out of 10,000 **plants/bundles** | **9987** out of 10,000 **plants/bundles** | **9994** out of 10,000 **plants/bundles** | **9999** out of 10,000 **plants/bundles** |
| **Percentile of the distribution** | 5% | 25% | Median | 75% | 95% |
| **Proportion of infected plants/bundles** | **1** out of 10,000 **plants/bundles** | **6** out of 10,000 **plants/bundles** | **13** out of 10,000 **plants/bundles** | **25** out of 10,000 **plants/bundles** | **41** out of 10,000 **plants/bundles** |
| **Summary of the information used for the evaluation** | **Possibility that the pest could become associated with the commodity**<br>The pest is present in the UK, with few occurrences but continuously intercepted. The UK outbreaks of *B. tabaci* have been restricted to greenhouses. The pest is extremely polyphagous with a very wide host range. Other traded plants present in the surroundings of the nursery could be a source of the pest. Polytunnels and glasshouses in the nurseries could act as a reservoir of the pest. The pest could go undetected during inspections.<br>**Measures taken against the pest and their efficacy**<br>General measures taken by the nurseries are effective against the pest. These measures include (a) inspections, surveillance, monitoring, sampling and laboratory testing; (b) hygiene measures; (c) application of pest control products and (d) removal of infested plant material. | | | | |

(Continues)

(Continued)

| | |
|---|---|
| | **Interception records**<br>In the EUROPHYT/TRACES-NT database there are no records of notification of *Populus* plants for planting neither from the UK or from other countries due to the presence of *B. tabaci* between the years 1995 and September 2024 (EUROPHYT, 2024; TRACES-NT, 2024).<br>There were four interceptions of *B. tabaci* from the UK in 2007 and 2015 on non *Populus* plants, (EUROPHYT, 2024).<br>**Shortcomings of current measures/procedures**<br>None.<br>**Main uncertainties**<br>– Possibility of development of the pest outside greenhouses.<br>– Pest abundance in the nursery and the surroundings.<br>– The precision of surveillance and the application of measures targeting the pest.<br>– Host *status* of *Populus* spp. (other than *P. nigra)* to the pest. |

| **Overview of the evaluation of *B. tabaci* for cell grown plants of 1–2 years** | | | | | |
|---|---|---|---|---|---|
| **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/bundles** | **9943** out of 10,000 **bundles** | **9966** out of 10,000 **bundles** | **9981** out of 10,000 **bundles** | **9992** out of 10,000 **bundles** | **9998** out of 10,000 **bundles** |
| **Percentile of the distribution** | 5% | 25% | Median | 75% | 95% |
| **Proportion of infected plants/bundles** | **2** out of 10,000 **bundles** | **8** out of 10,000 **bundles** | **19** out of 10,000 **bundles** | **34** out of 10,000 **bundles** | **57** out of 10,000 **bundles** |
| **Summary of the information used for the evaluation** | **Possibility that the pest could become associated with the commodity**<br>The pest is present in the UK, with few occurrences but continuously intercepted. The UK outbreaks of *B. tabaci* have been restricted to greenhouses. The pest is extremely polyphagous with a very wide host range. Other traded plants present in the surroundings of the nursery could be a source of the pest. Polytunnels and glasshouses in the nurseries could act as a reservoir of the pest. The pest could go undetected during inspections.<br>**Measures taken against the pest and their efficacy**<br>General measures taken by the nurseries are effective against the pest. These measures include (a) inspections, surveillance, monitoring, sampling and laboratory testing; (b) hygiene measures; (c) application of pest control products and (d) removal of infested plant material.<br>**Interception records**<br>In the EUROPHYT/TRACES-NT database there are no records of notification of *Populus* plants for planting neither from the UK or from other countries due to the presence of *B. tabaci* between the years 1995 and September 2024 (EUROPHYT, 2024; TRACES-NT, 2024).<br>There were four interceptions of *B. tabaci* from the UK in 2007 and 2015 on non *Populus* plants, (EUROPHYT, 2024).<br>**Shortcomings of current measures/procedures**<br>None.<br>**Main uncertainties**<br>– Possibility of development of the pest outside greenhouses.<br>– Pest abundance in the nursery and the surroundings.<br>– The precision of surveillance and the application of measures targeting the pest.<br>– Host *status* of *Populus* spp. (other than *P. nigra)* to the pest. | | | | |

| **Overview of the evaluation of *B. tabaci* for plants in pots of 3–15 years** | | | | | |
|---|---|---|---|---|---|
| **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/bundles** | **9937** out of 10,000 **plants** | **9961** out of 10,000 **plants** | **9978** out of 10,000 **plants** | **9991** out of 10,000 **plants** | **9999** out of 10,000 **plants** |
| **Percentile of the distribution** | 5% | 25% | Median | 75% | 95% |
| **Proportion of infected plants/bundles** | **1** out of 10,000 **plants** | **9** out of 10,000 **plants** | **22** out of 10,000 **plants** | **39** out of 10,000 **plants** | **63** out of 10,000 **plants** |
| **Summary of the information used for the evaluation** | **Possibility that the pest could become associated with the commodity**<br>The pest is present in the UK, with few occurrences but continuously intercepted. The UK outbreaks of *B. tabaci* have been restricted to greenhouses. The pest is extremely polyphagous with a very wide host range. Other traded plants present in the surroundings of the nursery could be a source of the pest. Polytunnels and glasshouses in the nurseries could act as a reservoir of the pest. The pest could go undetected during inspections. | | | | |

(Continued)

| | |
|---|---|
| | **Measures taken against the pest and their efficacy**<br>General measures taken by the nurseries are effective against the pest. These measures include (a) inspections, surveillance, monitoring, sampling and laboratory testing; (b) hygiene measures; (c) application of pest control products and (d) removal of infested plant material.<br>**Interception records**<br>In the EUROPHYT/TRACES-NT database there are no records of notification of *Populus* plants for planting neither from the UK or from other countries due to the presence of *B. tabaci* between the years 1995 and September 2024 (EUROPHYT, 2024; TRACES-NT, 2024).<br>There were four interceptions of *B. tabaci* from the UK in 2007 and 2015 on non *Populus* plants, (EUROPHYT, 2024).<br>**Shortcomings of current measures/procedures**<br>None.<br>**Main uncertainties**<br>– Possibility of development of the pest outside greenhouses.<br>– Pest abundance in the nursery and the surroundings.<br>– The precision of surveillance and the application of measures targeting the pest.<br>– Host *status* of *Populus* spp. to the pest Host *status* of *Populus* spp. (other than *P. nigra)* to the pest. |

For more details, see relevant pest data sheet on *Bemisia tabaci* (European populations) (Section A.1 in Appendix A).

## 5.2.2 | Overview of the evaluation of *Entoleuca mammata* (Xylariales; Xylariaceae)

| **Overview of the evaluation of *E. mammata* for cuttings/graftwood *P. nigra* of 1–2 years** | | | | | |
|---|---|---|---|---|---|
| **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/bundles** | **9947** out of 10,000 **plants/bundles** | **9971** out of 10,000 **plants/bundles** | **9983** out of 10,000 **plants/bundles** | **9992** out of 10,000 **plants/bundles** | **9998** out of 10,000 **plants/bundles** |
| **Percentile of the distribution** | 5% | 25% | Median | 75% | 95% |
| **Proportion of infected plants/bundles** | **2** out of 10,000 **plants/bundles** | **8** out of 10,000 **plants/bundles** | **17** out of 10,000 **plants/bundles** | **29** out of 10,000 **plants/bundles** | **63** out of 10,000 **plants/bundles** |
| **Overview of the evaluation of *E. mammata* for cuttings/graftwood *P. tremula*** | | | | | |
| **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/bundles** | **9894** out of 10,000 **plants/bundles** | **9941** out of 10,000 **plants/bundles** | **9967** out of 10,000 **plants/bundles** | **9985** out of 10,000 **plants/bundles** | **9997** out of 10,000 **plants/bundles** |
| **Percentile of the distribution** | 5% | 25% | Median | 75% | 95% |
| **Proportion of infected plants/bundles** | **3** out of 10,000 **plants/bundles** | **15** out of 10,000 **plants/bundles** | **33** out of 10,000 **plants/bundles** | **59** out of 10,000 **plants/bundles** | **106** out of 10,000 **plants/bundles** |
| **Summary of the information used for the evaluation** | **Possibility that the pest could become associated with the commodity**<br>*Entoleuca mammata* is present in the UK, although not widely distributed. All poplars (*Populus* spp.) are suitable hosts, although *P. tremula* is a major one and *P. nigra* and *P. alba* may be minor hosts. Mechanical wounds including pruning wounds are expected to be present and may represent infection courts. The hosts can be present either inside or in the surroundings of the nurseries. Altogether, this suggests that an association with the commodity is possible.<br>**Measures taken against the pest and their efficacy**<br>General measures taken by the nurseries have an effect against the pathogen. These measures include (a) the use of certified plant material; (b) inspections, surveillance, monitoring, sampling and laboratory testing; (c) the removal of infected plant material and (d) application of pest control products.<br>**Interception records**<br>In the EUROPHYT/TRACES-NT database there are no records of notification of *Populus* plants for planting neither from the UK nor from other countries due to the presence of *E. mammata* between the years 1995 and September 2024 (EUROPHYT, 2024; TRACES-NT, 2024).<br>**Shortcomings of current measures/procedures**<br>None observed.<br>**Main uncertainties**<br>– The presence/abundance of the pathogen in the area where the nurseries are located.<br>– Effect of fungicide treatments against the pathogen. | | | | |

| **Overview of the evaluation of *E. mammata* for bare root plants *P. alba, P. nigra* of 1–7 years** | | | | | |
|---|---|---|---|---|---|
| **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/bundles** | **9911** out of 10,000 **plants/bundles** | **9950** out of 10,000 **plants/bundles** | **9971** out of 10,000 **plants/bundles** | **9985** out of 10,000 **plants/bundles** | **9996** out of 10,000 **plants/bundles** |
| **Percentile of the distribution** | 5% | 25% | Median | 75% | 95% |
| **Proportion of infected plants/bundles** | **4** out of 10,000 **plants/bundles** | **15** out of 10,000 **plants/bundles** | **29** out of 10,000 **plants/bundles** | **50** out of 10,000 **plants/bundles** | **89** out of 10,000 **plants/bundles** |

| **Overview of the evaluation of *Entoleuca mammata* for bare root plants *P. tremula*** | | | | | |
|---|---|---|---|---|---|
| **Rating of the likelihood of pest freedom** | Extremely frequently pest free (based on the Median). | | | | |
| **Percentile of the distribution** | 5% | 25% | Median | 75% | 95% |
| **Proportion of pest-free plants/bundles** | **9822** out of 10,000 **plants/bundles** | **9900** out of 10,000 **plants/bundles** | **9942** out of 10,000 **plants/bundles** | **9970** out of 10,000 **plants/bundles** | **9992** out of 10,000 **plants/bundles** |
| **Percentile of the distribution** | 5% | 25% | Median | 75% | 95% |
| **Proportion of infected plants/bundles** | **8** out of 10,000 **plants/bundles** | **30** out of 10,000 **plants/bundles** | **58** out of 10,000 **plants/bundles** | **100** out of 10,000 **plants/bundles** | **178** out of 10,000 **plants/bundles** |
| **Summary of the information used for the evaluation** | **Possibility that the pest could become associated with the commodity**<br>*Entoleuca mammata* is present in the UK, although not widely distributed. All poplars (*Populus* spp.) are suitable hosts, although *Populus tremula* is a major one and *P. nigra* and *P. alba* may be minor hosts. The hosts can be present either inside or in the surroundings of the nurseries. Infection may occur through mechanically-induced wounds such as pruning wounds. Altogether, this suggests that an association with the commodity is possible.<br>**Measures taken against the pest and their efficacy**<br>General measures taken by the nurseries are effective against the pathogen. These measures include (a) the use of certified plant material; (b) inspections, surveillance, monitoring, sampling and laboratory testing; (c) the removal of infected plant material and (d) application of pest control products.<br>**Interception records**<br>In the EUROPHYT/TRACES-NT database there are no records of notification of *Populus* plants for planting neither from the UK nor from other countries due to the presence of *E. mammata* between the years 1995 and September 2024 (EUROPHYT, 2024; TRACES-NT, 2024).<br>**Shortcomings of current measures/procedures**<br>None observed.<br>**Main uncertainties**<br>– The presence/abundance of the pathogen in the area where the nurseries are located.<br>– Whether the pest can reliably be detected via visual inspection.<br>– Effect of fungicide treatments against the pathogen. | | | | |

| **Overview of the evaluation of *E. mammata* for cell grown plants *P. alba, P. nigra* of 1–2 years** | | | | | |
|---|---|---|---|---|---|
| **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/bundles** | **9930** out of 10,000 **bundles** | **9961** out of 10,000 **bundles** | **9979** out of 10,000 **bundles** | **9991** out of 10,000 **bundles** | **9998** out of 10,000 **bundles** |
| **Percentile of the distribution** | 5% | 25% | Median | 75% | 95% |
| **Proportion of infected plants/bundles** | **2** out of 10,000 **bundles** | **9** out of 10,000 **bundles** | **21** out of 10,000 **bundles** | **39** out of 10,000 **bundles** | **70** out of 10,000 **bundles** |

| **Overview of the evaluation of *E. mammata* for cell grown plants *P. tremula*** | | | | | |
|---|---|---|---|---|---|
| **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/bundles** | **9861** out of 10,000 **bundles** | **9922** out of 10,000 **bundles** | **9958** out of 10,000 **bundles** | **9981** out of 10,000 **bundles** | **9997** out of 10,000 **bundles** |

(Continued)

| **Percentile of the distribution** | 5% | 25% | Median | 75% | 95% |
|---|---|---|---|---|---|
| **Proportion of infected plants/bundles** | **3** out of 10,000 **bundles** | **19** out of 10,000 **bundles** | **42** out of 10,000 **bundles** | **78** out of 10,000 **bundles** | **139** out of 10,000 **bundles** |
| **Summary of the information used for the evaluation** | **Possibility that the pest could become associated with the commodity**<br>*Entoleuca mammata* is present in the UK, although not widely distributed. All poplars (*Populus* spp.) are suitable hosts, although *Populus tremula* is a major one and *P. nigra* and *P. alba* may be minor hosts. Cell grown plants are in close proximity to each other which increases the humidity and hence provides good growth conditions for *E. mammata*. Mechanical wounds could be present and may represent infection courts. The hosts can be present either inside or in the surroundings of the nurseries. Altogether, this suggests that an association with the commodity may be possible.<br>**Measures taken against the pest and their efficacy**<br>General measures taken by the nurseries are effective against the pathogen. These measures include (a) the use of certified plant material; (b) inspections, surveillance, monitoring, sampling and laboratory testing; (c) the removal of infected plant material and (d) application of pest control products.<br>**Interception records**<br>In the EUROPHYT/TRACES-NT database there are no records of notification of *Populus* plants for planting neither from the UK nor from other countries due to the presence of *E. mammata* between the years 1995 and September 2024 (EUROPHYT, 2024; TRACES-NT, 2024).<br>**Shortcomings of current measures/procedures**<br>None observed.<br>**Main uncertainties**<br>– The presence/abundance of the pathogen in the area where the nurseries are located.<br>– Whether the pest can reliably be detected via visual inspection.<br>– Effect of fungicide treatments against the pathogen. | | | | |

| **Overview of the evaluation of *E. mammata* for plants in pots (*Populus alba, P. nigra*) of 3–15 years** | | | | | |
|---|---|---|---|---|---|
| **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/bundles** | **9865** out of 10,000 **plants** | **9923** out of 10,000 **plants** | **9958** out of 10,000 **plants** | **9982** out of 10,000 **plants** | **9997** out of 10,000 **plants** |
| **Percentile of the distribution** | 5% | 25% | Median | 75% | 95% |
| **Proportion of infected plants/bundles** | **3** out of 10,000 **plants** | **18** out of 10,000 **plants** | **42** out of 10,000 **plants** | **77** out of 10,000 **plants** | **135** out of 10,000 **plants** |
| **Overview of the evaluation of *E. mammata* for plants in pots (*P. tremula*)** | | | | | |
| **Rating of the likelihood of pest freedom** | Very frequently pest free (based on the Median). | | | | |
| **Percentile of the distribution** | 5% | 25% | Median | 75% | 95% |
| **Proportion of pest-free plants/bundles** | **9730** out of 10,000 **plants** | **9845** out of 10,000 **plants** | **9916** out of 10,000 **plants** | **9964** out of 10,000 **plants** | **9994** out of 10,000 **plants** |
| **Percentile of the distribution** | 5% | 25% | Median | 75% | 95% |
| **Proportion of infected plants/bundles** | **6** out of 10,000 **plants** | **36** out of 10,000 **plants** | **84** out of 10,000 **plants** | **155** out of 10,000 **plants** | **270** out of 10,000 **plants** |
| **Summary of the information used for the evaluation** | **Possibility that the pest could become associated with the commodity**<br>*Entoleuca mammata* is present in the UK, although not widely distributed. All poplars (*Populus* spp.) are suitable hosts, although *P. tremula* is a major one and *P. nigra* and *P. alba* may be minor hosts. Mechanical wounds including pruning wounds are expected to be present and may represent infection courts. The hosts can be present either inside or in the surroundings of the nurseries. Altogether, this suggests that an association with the commodity may be possible.<br>**Measures taken against the pest and their efficacy**<br>General measures taken by the nurseries are effective against the pathogen. These measures include (a) the use of certified plant material; (b) inspections, surveillance, monitoring, sampling and laboratory testing; (c) the removal of infected plant material and (d) application of pest control products.<br>**Interception records**<br>In the EUROPHYT/TRACES-NT database there are no records of notification of *Populus* plants for planting neither from the UK nor from other countries due to the presence of *E. mammata* between the years 1995 and September 2024 (EUROPHYT, 2024; TRACES-NT, 2024).<br>**Shortcomings of current measures/procedures**<br>None observed.<br>**Main uncertainties**<br>– The presence/abundance of the pathogen in the area where the nurseries are located.<br>– Whether the pest can reliably be detected via visual inspection.<br>– Effect of fungicide treatments against the pathogen. | | | | |

For more details, see relevant pest data sheet on *Entoleuca mammata* (Section A.2 in Appendix A).

### 5.2.3 | Outcome of Expert Knowledge Elicitation

Table 8 and Figure 2 show the outcome of the EKE regarding pest freedom after the evaluation of the implemented risk mitigation measures for all the evaluated pests.

Figure 3 provides an explanation of the descending distribution function describing the likelihood of pest freedom after the evaluation of the implemented risk mitigation measures for *P. tremula* plants in pots up to 15 years old designated for export to the EU for *E. mammata*.

**TABLE 8** Assessment of the likelihood of pest freedom following evaluation of current risk mitigation measures against pests on *Populus alba, P. nigra* and *P. tremula* 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.

| Number | Group | 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 | Insects | *Bemisia tabaci*, *P. alba*, *P.nigra*, *P. tremula*, bare root plants | | | | | | LM | | U |
| 2 | Insects | *Bemisia tabaci*, *P. alba*, *P.nigra*, *P. tremula*, cell grown plants | | | | | L | M | | U |
| 3 | Insects | *Bemisia tabaci*, *P. alba*, *P.nigra*, *P. tremula*, plants in pots | | | | | L | M | | U |
| 4 | Fungi | *Entoleuca mammata*, *P. nigra*, cuttings/graftwood | | | | | L | M | | U |
| 5 | Fungi | *Entoleuca mammata*, *P. alba*, *P. nigra*, bare root plants | | | | | L | M | | U |
| 6 | Fungi | *Entoleuca mammata*, *P. alba*, *P. nigra*, cell grown plants | | | | | L | M | | U |
| 7 | Fungi | *Entoleuca mammata*, *P alba*, *P. nigra*, plants in pots | | | | L | | M | | U |
| 8 | Fungi | *Entoleuca mammata*, *P. tremula*, cuttings/graftwood | | | | L | | M | | U |
| 9 | Fungi | *Entoleuca mammata*, *P tremula*, bare root plants | | | | L | M | | U | |
| 10 | Fungi | *Entoleuca mammata*, *P tremula*, cell grown plants | | | | L | | M | | U |
| 11 | Fungi | *Entoleuca mammata*, *P tremula*, plants in pots | | | | 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 |

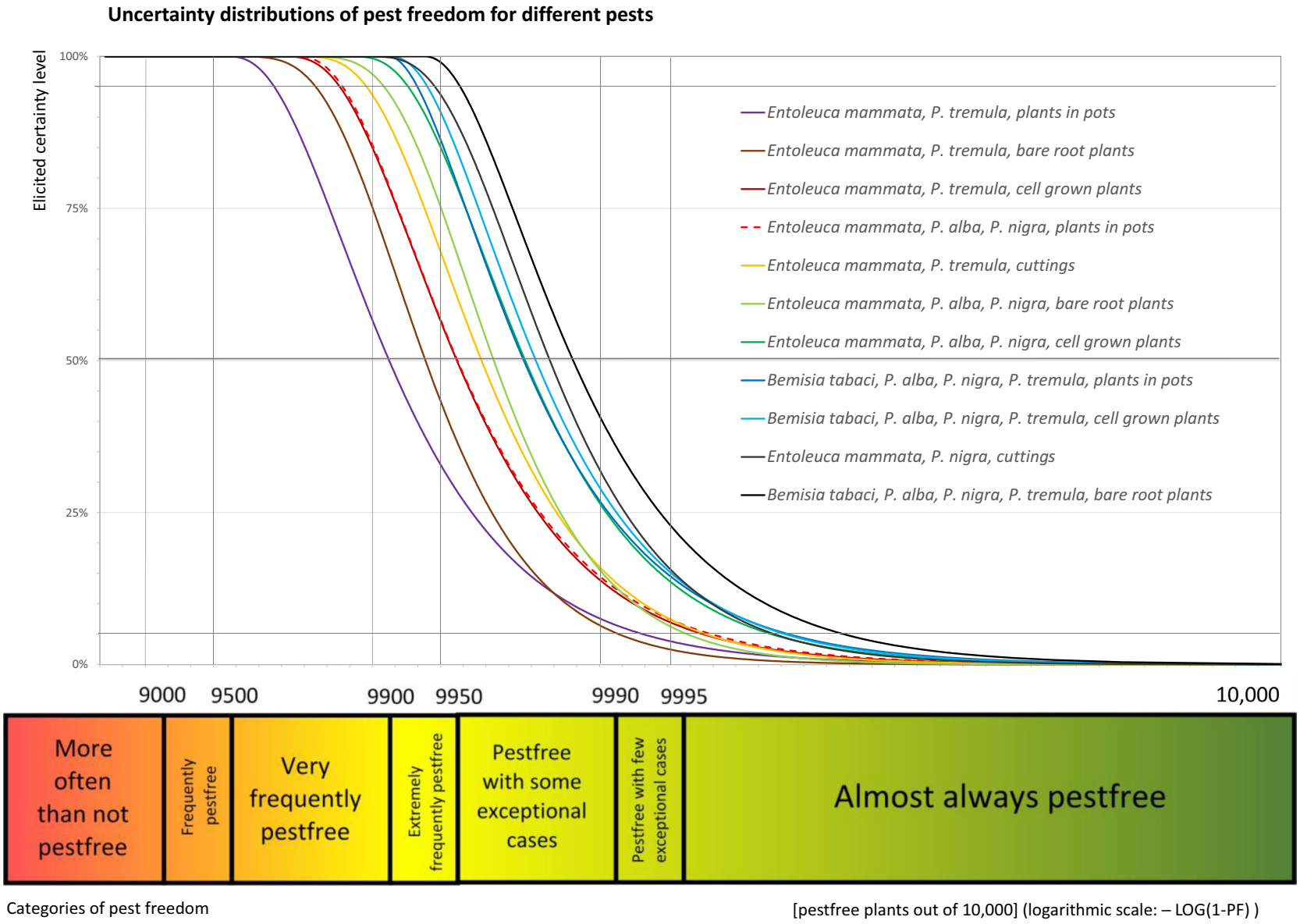


**FIGURE 2** Elicited certainty (*y*-axis) of the number of pest-free plants/bundles of *Populus alba, Populus nigra* and *Populus tremula* (*x*-axis; log-scaled) out of 10,000 plants/bundles designated for export to the EU from the UK for all evaluated pests visualised as descending distribution function. Horizontal lines indicate the reported certainty levels (starting from the bottom 5%, 25%, 50%, 75%, 95%). Please see reading instructions below.

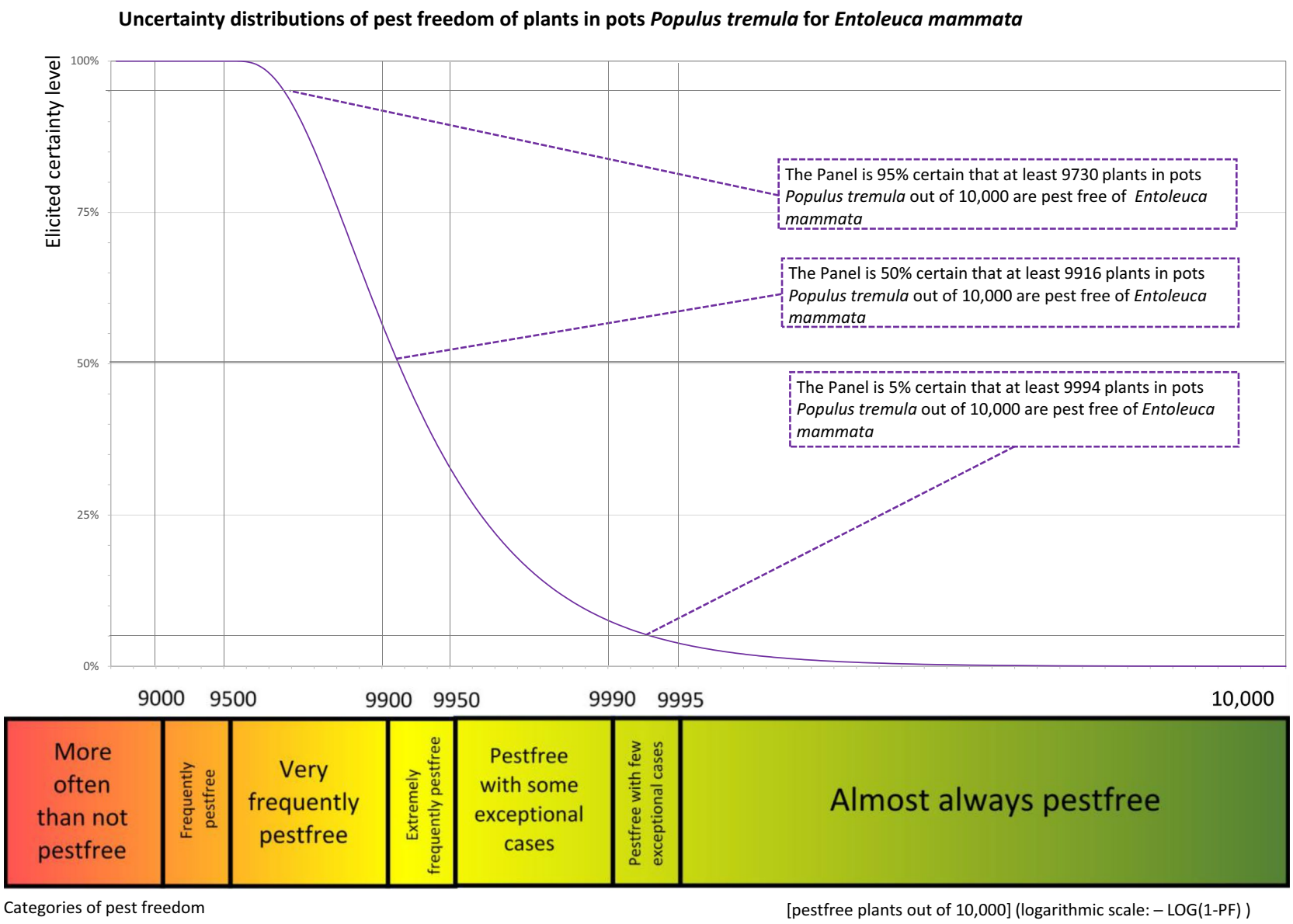


**FIGURE 3** Explanation of the descending distribution function describing the likelihood of pest freedom after the evaluation of the implemented risk mitigation measures for plants designated for export to the EU based on based on the example of *Entoleuca mammata* on *Populus tremula* plants in pots of 3–15 years old.

# 6 | CONCLUSIONS

There are two pests identified to be present in the UK and considered to be potentially associated with the commodities imported from the UK and relevant for the EU.

These pests are *Bemisia tabaci* (European populations) and *Entoleuca mammata*. The likelihood of the pest freedom after the evaluation of the implemented risk mitigation measures for the commodities designated for export to the EU was estimated. In the assessment of risk, the age of the plants was considered, reasoning that older trees are more likely to be infested mainly due to longer exposure time and larger size.

For *B. tabaci* the likelihood of pest freedom for bare root plants/trees up to 7 years old of *P. alba, P. nigra* and *P. tremula* 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 9959 and 10,000 bare root plants/trees up to 7 years old per 10,000 will be free from *B. tabaci*. The likelihood of pest freedom for cell grown plants of *P. alba, P. nigra* and *P. tremula* up to 2 years old was estimated as 'pest free with some exceptional cases' with the 90% uncertainty range reaching from 'extremely frequently pest free' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9943 and 10,000 cell grown plants in pots up to 2 years old per 10,000 will be free from *B. tabaci*. The likelihood of pest freedom for rooted plants in pots of *P. alba, P. nigra* and *P. tremula* from three to 15 years old was estimated as 'pest free with some exceptional cases' with the 90% uncertainty range reaching from 'extremely frequently pest free' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9937 and 10,000 rooted plants in pots from three to 15 years old per 10,000 will be free from *B. tabaci*.

For *E. mammata* the likelihood of pest freedom for cuttings/graftwood of *of P. nigra*, following evaluation of current risk mitigation measures, was estimated as 'pest free with some exceptional cases' with the 90% uncertainty range reaching from 'extremely frequently pest free' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9947 and 10,000 cuttings/graftwood per 10,000 will be free from *E. mammata*. The likelihood of pest freedom for bare root plants/trees up to 7 years old of *P. alba* and *P. nigra* was estimated as 'pest free with some exceptional cases' with the 90% uncertainty range reaching from 'extremely frequently pest free' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9911 and 10,000 bare root plants/trees up to 7 years old per 10,000 will be free from *E. mammata*. The likelihood of pest freedom for cell grown plants of *P. alba* and *P. nigra* up to 2 years old was estimated as 'pest free with some exceptional cases' with the 90% uncertainty range reaching from 'extremely frequently pest free' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9930 and 10,000 cell grown plants in pots up to 2 years old per 10,000 will be free from *E. mammata*. The likelihood of pest freedom for rooted plants in pots of *P. alba* and *P. nigra* from three to 15 years old was estimated as 'pest free with some exceptional cases' with the 90% uncertainty range spanning from 'very frequently pest free' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9865 and 10,000 rooted plants in pots from three to 15 years old per 10,000 will be free from *E. mammata*.

For *E. mammata* the likelihood of pest freedom for cuttings/graftwood of *P. tremula*, following evaluation of current risk mitigation measures, was estimated as 'pest free with some exceptional cases' with the 90% uncertainty range spanning from 'very frequently pest free' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9894 and 10,000 cuttings/graftwood per 10,000 will be free from *E. mammata*. The likelihood of pest freedom for bare root plants/trees up to 7 years old of *P. tremula* was estimated as 'extremely frequently pest free' with the 90% uncertainty range reaching from 'very frequently pest free' to 'pest free with few exceptional cases'. The EKE indicated, with 95% certainty, that between 9822 and 10,000 bare root plants/trees up to 7 years old per 10,000 will be free from *E. mammata*. The likelihood of pest freedom for cell grown plants of *P. tremula* up to 2 years old was estimated as 'pest free with some exceptional cases' with the 90% uncertainty range spanning from 'very frequently pest free' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9861 and 10,000 cell grown plants in pots up to 2 years old per 10,000 will be free from *E. mammata*. The likelihood of pest freedom for rooted plants in pots of *P. tremula* from three to 15 years old was estimated as 'extremely frequently pest free' with the 90% uncertainty range reaching from 'very frequently pest free' to 'pest free with few exceptional cases'. The EKE indicated, with 95% certainty, that between 9730 and 10,000 rooted plants in pots from three to 15 years old per 10,000 will be free from *E. mammata*.

## 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). |

## 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 |
| PHSI | Plant Health and Seeds Inspectorate |
| PLH | Plant Health |
| PRA | Pest Risk Assessment |
| RNQPs | Regulated Non-Quarantine Pests |
| SASA | Science and Advice for Scottish Agriculture |

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## REQUESTOR

European Commission

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## SUPPORTING INFORMATION

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

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# APPENDIX A

## Data sheets of pests selected for further evaluation

## A.1 | *BEMISIA TABACI* (EUROPEAN POPULATIONS)

### A.1.1 | Organism information

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| **Taxonomic information** | Current valid scientific name: *Bemisia tabaci*<br>Synonyms: *Aleurodes inconspicua*, *Aleurodes tabaci*, *Bemisia achyranthes*, *Bemisia bahiana*, *Bemisia costa-limai*, *Bemisia emiliae*, *Bemisia goldingi*, *Bemisia gossypiperda*, *Bemisia gossypiperda mosaicivectura*, *Bemisia hibisci*, *Bemisia inconspicua*, *Bemisia longispina*, *Bemisia lonicerae*, *Bemisia manihotis*, *Bemisia minima*, *Bemisia minuscula*, *Bemisia nigeriensis*, *Bemisia rhodesiaensis*, *Bemisia signata*, *Bemisia vayssieri*<br>Name used in the EU legislation: *Bemisia tabaci* Genn. (European populations)<br>Order: Hemiptera<br>Family: Aleyrodidae<br>Common name: Cassava whitefly, cotton whitefly, silver-leaf whitefly, sweet-potato whitefly, tobacco whitefly<br>Name used in the dossier: – |
| **Group** | Insects |
| **EPPO code** | BEMITA |
| **Regulated status** | *Bemisia tabaci* Genn. (European populations) is listed in Annex III of Commission Implementing Regulation (EU) 2019/2072 as protected zone quarantine pest for Ireland and Sweden. The non-European populations of *Bemisia tabaci* are listed in Annex II.<br>*Bemisia tabaci* is included in the EPPO A2 list (EPPO, 2024a).<br>The species is a quarantine pest in Belarus, Moldova, Norway and New Zealand. It is on A1 list of Azerbaijan, Chile, Georgia, Kazakhstan, Switzerland, Ukraine and the UK. It is on A2 list of Bahrain, Russia, Türkiye, EAEU (= Eurasian Economic Union – Armenia, Belarus, Kazakhstan, Kyrgyzstan and Russia) and OIRSA (= Organismo Internacional Regional de Sanidad Agropecuaria – Belize, Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama) (EPPO, 2024b). |
| **Pest status in the UK** | *Bemisia tabaci* (European populations) is present in the UK, with few occurrences (CABI, 2015; EPPO, 2024c) and it is continuously intercepted in commodities imported to the UK. The intercepted populations were identified as B biotype Middle East-Asia Minor 1 (=MEAM1) and Q biotype Mediterranean (=MED) (Cuthbertson, 2013).<br>From 1998 to 2015 there were between 7 and 35 outbreaks per year of *B. tabaci* in the UK and all the findings were subject to eradication. The UK outbreaks of *B. tabaci* have been restricted to greenhouses and there are no records of the whitefly establishing outdoors during summer (Bradshaw et al., 2019; Cuthbertson & Vänninen, 2015).<br>According to the additional information received by the applicant: the pest is absent, pest eradicated. Sporadic and regular outbreaks of *B. tabaci* that occur under glass in Great Britain and which are subject to control measures and eradication are all derived from European populations introduced with plants from Europe (Dossier Section 5.1). |
| **Pest status in the EU** | *Bemisia tabaci* is an alien species widespread in the EU – Austria, Belgium, Bulgaria, Croatia, the Republic of Cyprus, Czechia, Finland, France, Germany, Greece, Hungary, Italy, Malta, the Netherlands, Poland, Portugal, Romania, Slovenia and Spain (CABI, 2015; EPPO, 2024c).<br>It is absent from Denmark, Estonia, Ireland, Latvia, Lithuania, Luxembourg, Slovakia and Sweden (CABI, 2015; EPPO, 2024c).<br>In the EU, *B. tabaci* is mainly present in the greenhouses, with exception of Mediterranean coastal region (Cyprus, Greece, Malta, Italy, south of France, certain parts of Spain and Portugal), where the whitefly occurs also outdoors (EFSA PLH Panel, 2013). |
| **Host status on *Populus alba, P. nigra, P. tremula*** | *Bemisia tabaci* was found on *Populus nigra* in Iran in 2009 (Samin et al., 2015).<br>There is no information on whether *B. tabaci* can also attack *Populus alba, P. tremula* or other *Populus* species. |
| **PRA information** | Available Pest Risk Assessments:<br>– Scientific Opinion on the risks to plant health posed by *Bemisia tabaci* species complex and viruses it transmits for the EU territory (EFSA PLH Panel, 2013);<br>– UK Risk Register Details for *Bemisia tabaci* European populations (DEFRA, 2022);<br>– UK Risk Register Details for *Bemisia tabaci* non-European populations (DEFRA, 2023). |
| **Other relevant information for the assessment** | |
| **Biology** | *Bemisia tabaci* is a cosmopolitan whitefly present on almost all continents except for Antarctica (CABI, 2015; EPPO, 2024c). In the literature it is reported as either native to Africa, Asia, India, North America or South America (De Barro et al., 2011). However, based on mtCO1 (mitochondrial cytochrome oxidase 1) sequence its origin is most likely to be sub-Saharan Africa (De Barro, 2012).<br>*Bemisia tabaci* is a complex of at least 40 cryptic species that are morphologically identical but distinguishable at molecular level (Khatun et al., 2018). The species differ from each other in host association, spread capacity, transmission of viruses and resistance to insecticides (De Barro et al., 2011, Brown et al., 2023). |

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| | | *Bemisia tabaci* develops through three life stages: egg, nymph (four instars) and adult (Walker et al., 2010). Nymphs of *B. tabaci* mainly feed on phloem in minor veins of the underside leaf surface (Cohen et al., 1996). Adults feed on both phloem and xylem of leaves (Janssen et al., 1989; Lei et al., 1997, 2001; Jiang et al., 1999 cited in Walker et al., 2010). Honeydew is produced by both nymphs and adults (Davidson et al., 1994). *Bemisia tabaci* is multivoltine with up to 15 generations per year (Ren et al., 2001). The life cycle from egg to adult requires from 2.5 weeks up to 2 months depending on the temperature (Norman et al., 1995) and the host plant (Coudriet et al., 1985).<br>In the southern California desert on field-grown lettuce (from 27 October 1983 to 4 January 1984), *B. tabaci* completed at least one generation (Coudriet et al., 1985). In Israel the reproduction of *B. tabaci* was much reduced in winter months, but adults emerging in December survived and started ovipositing at the end of the cold season (Avidov, 1956). The most cold-tolerant stage are eggs (–2°, –6°, –10°C) and the least tolerant are large nymphs. Short periods of exposure in 0° to –6°C have little effect on mortality. As the temperature lowers to –10°C, the duration of time required to cause significant mortality shortens dramatically (Simmons & Elsey, 1995).<br>Females can lay more than 300 eggs (Gerling et al., 1986), which can be found mainly on the underside of the leaves (CABI, 2015). Females develop from fertilised and males from unfertilised eggs (Gerling et al., 1986). Eggs are yellowish white and with age turn golden brown. Their size is about 0.19–0.20 mm long and 0.10–0.12 mm wide. First instar nymph (=crawler) is scale-like, elliptical, darker yellow in colour and about 0.26 mm long and 0.15 mm wide. Crawlers have legs and crawl actively on leaves before they settle down and moult through second (0.38 mm long and 0.24 mm wide), third (0.55 mm long and 0.35 mm wide) and fourth instar nymph (0.86 mm long and 0.63 mm wide) (Hill, 1969). Fourth instar nymph (=pupa) stops feeding and moults into an adult (Walker et al., 2009, citing others). Adult emerges through a 'T'-shaped rupture in the pupal case (El-Helaly et al., 1971). Adults are pale yellow and have two pairs of white wings dusted with a white waxy powder (Hill, 1969). Female is approximately 1 mm long. Males are smaller about 0.8 mm long (EFSA PLH Panel, 2013).<br>Out of all life stages, only first instar nymph (=crawler) and adults are mobile. Movement of crawlers by walking is very limited, usually within the leaf where they hatched (Price & Taborsky, 1992) or to more suitable neighbouring leaves. The average distance was estimated within 10–70 mm (Summers et al., 1996). For these reasons they are not considered to be good colonisers. On the contrary, adults can fly reaching quite long distances in search of a permanent host. According to a study done by Cohen et al. (1988) some of the marked individuals were trapped 7 km away from the initial place after 6 days. Long-distance passive dispersal by wind is also possible (Byrne, 1999).<br>*Bemisia tabaci* is an important agricultural pest able to transmit viruses (belonging to genera *Begomovirus*, *Crinivirus*, *Ipomovirus*, *Carlavirus* and *Torradovirus*) causing significant damage to food crops such as tomatoes, cucurbits, beans and ornamental plants (EFSA PLH Panel, 2013; Fiallo-Olivé et al., 2020). Some of these viruses are reported to infect *Populus* species – papaya leaf curl virus (*Begomovirus caricae*) and tomato leaf curl Kerala virus (*Begomovirus solanumkeralaense*) (EFSA PLH Panel, 2013; Fiallo-Olivé et al., 2020).<br>Possible pathways of entry for *B. tabaci* are plants for planting including cuttings and rooted ornamental plants; cut flowers and branches with foliage; fruits and vegetables; human-assisted spread; natural spread such as wind (EFSA PLH Panel, 2013). |
| **Symptoms** | **Main type of symptoms** | Main symptoms of *B. tabaci* on plants are chlorotic spotting, decrease of plant growth, deformation of fruits, deformation of leaves, intervein yellowing, leaf yellowing, leaf curling, leaf crumpling, leaf vein thickening, leaf enations, leaf cupping, leaf loss, necrotic lesions on stems, plant stunting, reduced flowering, reduced fruit development, silvering of leaves, stem twisting, vein yellowing, wilting, yellow blotching of leaves, yellow mosaic of leaves, presence of honeydew and sooty mould. These symptoms are plant responses to the feeding of the whitefly and to the presence of transmitted viruses (EPPO, 2004; EFSA PLH Panel, 2013; CABI, 2015).<br>There is no information on the symptoms caused to *Populus* plants. |
| | **Presence of asymptomatic plants** | Symptoms of *B. tabaci* being present on the plants are usually visible. However, *B. tabaci* is a vector of several viruses and their infection could be asymptomatic. |
| | **Confusion with other pests** | *Bemisia tabaci* can be easily confused with other whitefly species such as *B. afer*, *Trialeurodes lauri*, *T. packardi*, *T. ricini*, *T. vaporariorum* and *T. variabilis*. A microscopic slide is needed for morphological identification (EPPO, 2004).<br>Different species of *B. tabaci* complex can be distinguished using molecular methods (Brown et al., 2023; De Barro et al., 2011). |
| **Host plant range** | | *Bemisia tabaci* has a wide host range, including more than 1000 different plant species (Abd-Rabou & Simmons, 2010).<br>Some of the many hosts of *B. tabaci* are *Abelmoschus esculentus, Amaranthus blitoides, A. retroflexus, Arachis hypogaea*, *Atriplex semibaccata*, *Bellis perennis, Borago officinalis*, *Brassica oleracea* var. *botrytis*, *B. oleracea* var. *gemmifera*, *B. oleracea* var. *italica*, *Bryonia dioica*, *Cajanus cajan*, *Capsella bursa-pastoris*, *Capsicum annuum*, *Citrus* spp., *Crataegus* spp., *Cucumis sativus*, *Cucurbita pepo*, *Erigeron canadensis*, *Euphorbia pulcherrima*, *Gerbera jamesonii*, *Glycine max*, *Gossypium* spp., *G. hirsutum*, *Hedera helix*, *Ipomoea batatas*, *Lactuca sativa*, *L. serriola*, *Lavandula coronopifolia*, *Ligustrum lucidum*, *L. quihoui*, *L. vicaryiis*, *Manihot esculenta*, *Melissa officinalis*, *Nicotiana tabacum*, *Ocimum basilicum*, *Origanum majorana*, *Oxalis pes-caprae*, *Phaseolus* spp., *P. vulgaris*, *Piper nigrum*, *Potentilla* spp., *Prunus* spp., *Rosa* spp., *Rubus fruticosus*, *Salvia officinalis*, *S. rosmarinus*, *Senecio vulgaris*, *Sinningia speciosa*, *Solanum lycopersicum*, *S. melongena*, *S. nigrum*, *S. tuberosum, Sonchus oleraceus, Stellaria media, Tagetes erecta, Taraxacum officinale, Thymus serpyllum, Urtica urens, Vitis vinifera* and many more (EFSA PLH Panel, 2013; CABI, 2015; EPPO, 2024c; Li et al., 2011).<br>For a full host list refer to CABI (2015), EFSA PLH Panel (2013) and EPPO (2024c) and Li et al. (2011) |

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| **Reported evidence of impact** | *Bemisia tabaci* (European populations) is EU protected zone quarantine pest. |
| **Evidence that the commodity is a pathway** | *Bemisia tabaci* is continuously intercepted in the EU on different commodities including plants for planting (EUROPHYT, 2024; TRACES-NT, 2024). Therefore, the commodity is a potential pathway for *B. tabac*. as *B. tabaci* was found to be associated with *Populus nigra* in Iran (Samin et al., 2015). Plants can carry leaves at the time of export which can host all life stages of the pest. |
| **Surveillance information** | *Bemisia tabaci* is regulated quarantine pest in the UK. As such, the policy for any outbreak is to eradicate the population. The UK makes many interceptions of *B. tabaci* and experiences a few outbreaks each year (356 interceptions and outbreaks in 2021), but all outbreaks are under protection and subject to eradication measures. This pest has never established outdoors in the UK (EFSA PLH Panel, 2024). |

### A.1.2 | Possibility of pest presence in the nursery

#### A.1.2.1 | Possibility of entry from the surrounding environment

*Bemisia tabaci* (European populations) is present in glasshouses in the UK with few occurrences (location not specified) (CABI, 2015; EPPO, 2024c) and is continuously intercepted on commodities to the UK. The UK outbreaks of *B. tabaci* have been restricted to glasshouses and there are no records of *B. tabaci* establishing outdoors during summer (Bradshaw et al., 2019; Cuthbertson & Vänninen, 2015). Bradshaw et al. (2019) indicate that theoretically *B. tabaci* (in summertime) could complete one generation across most of Scotland, and one to three generations over England and Wales. However, the temperatures experienced during the cold days and nights during summer may be low enough to cause chilling injury to *B. tabaci*, thereby inhibiting development and preventing establishment in the UK. It is unlikely, therefore, that this pest will establish outdoors in the UK under current climate conditions.

The possible entry of *B. tabaci* from surrounding environment to the nurseries may occur through adult dispersal and passively on wind currents (Byrne, 1999; Cohen et al., 1988; EFSA PLH Panel, 2013).

*Bemisia tabaci* is a polyphagous species that can infest a number of different plants. Suitable hosts of *B. tabaci* like *Brassica rapa, Fraxinus* spp., *Ilex* spp., *Quercus* spp., *Solanum* spp. and *Triticum* spp. are present within 2 km from the nurseries (Dossier Sections 1.1, 1.2 and 1.3).

Uncertainties

- Exact locations where the whitefly is present.
- Possibility of spread beyond the infested greenhouses.
- Possibility of the whitefly to survive the UK summer in outdoor conditions.

Taking into consideration the above evidence and uncertainties, the Panel considers that it is possible for the pest to enter the nurseries from surrounding environment, even though it is only reported to be present in greenhouses. In the surrounding area suitable hosts are present and the pest can spread by wind and adult flight.

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

The starting materials of *P. alba, P. nigra and P. tremula* are either seeds, seedlings or cuttings. Seeds and seedlings are either from the UK (certified with UK Plant Passports) or the EU (mostly the Netherlands, Belgium and France) (certified with phytosanitary certificates) (Dossier Sections 1.1, 1.2 and 1.3). Seeds are not a pathway for the whitefly.

In the nurseries many other plants are cultivated (Dossier Sections 3.1, 3.2 and 3.3). Out of them *Acer* spp., *Acacia* spp., *Crataegus* spp., *Hedera* spp., *Prunus* spp., *Pyrus* spp., *Rosa* spp., *Salvia* spp., *Viburnum* spp. and many more plants are potential suitable hosts of the whitefly. However, there is no information on how and where the plants are produced. Therefore, if the plants are first produced in another nursery, the whitefly could possibly travel with them.

The nurseries are using virgin peat or peat-free compost as a growing media, which is a mixture of coir, tree bark, wood fibre, etc., heat-treated by commercial suppliers during production to eliminate pests and diseases (Dossier Sections 1.1, 1.2 and 1.3). Growing media is not a pathway for the whitefly.

Uncertainties

- No information is available on the provenance of plants other than *Populus* used for plant production in the nurseries.

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

#### A.1.2.3 | Possibility of spread within the nursery

*Populus* plants are grown both in containers outdoors and in fields. There are no mother plants present in the nurseries and none of the nurseries expected to export to the EU produce plants from grafting (Dossier Sections 1.1, 1.2 and 1.3).

The whitefly can attack other suitable plants (such as *Acer* spp., *Acacia* spp., *Crataegus* spp., *Hedera* spp., etc.) and non-cultivated herbaceous plants (*Bellis perennis*, *Potentilla* spp., *Taraxacum officinale*) present within the nurseries and hedges surrounding the nurseries (*Crataegus* spp., *Hedera helix*, *Ilex* spp. and *Prunus* spp.).

There are greenhouses within the nurseries (Dossier Sections 1.1, 1.2 and 1.3).

The whitefly can spread within the nurseries by adult flight or wind. Spread within the nurseries through equipment and tools is not relevant.

Uncertainties

- Possibility of the whitefly to survive the UK summer in outdoor conditions.
- Possibility that greenhouses are heated which allows the pest to overwinter.

Taking into consideration the above evidence and uncertainties, the Panel considers that the spread of the pest within the nurseries is possible either by wind or by active flight.

### A.1.3 | Information from interceptions

In the EUROPHYT/TRACES-NT database there are no records of notification of *Populus, P. alba, P. nigra* and *P. tremula* plants for planting neither from the UK nor from other countries due to the presence of *B. tabaci* between the years 1995 and October 2024 (EUROPHYT, 2024; TRACES-NT, 2024).

There were two interceptions of *B. tabaci* from the UK in 2007 and 2015 on other plants already planted likely produced under protected conditions (EUROPHYT, 2024) and one interception on other live plants (including their roots) in October 2024 (TRACES-NT, 2024).

### 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 *B. tabaci* is provided. The description of the risk mitigation measures currently applied in the UK is provided in Table 7.

| N | Risk mitigation measure | Effect on the pest | Evaluation and uncertainties |
|---|---|---|---|
| 1 | Registration of production sites | Yes | As the plant passport is very similar to the EU one, plants shall be free from quarantine pests.<br>Uncertainties:<br>– None |
| 2 | Physical separation | No | Not relevant, there is no separation between production areas for the export and the local market. |
| 3 | Certified plant material | Yes | Seeds are not a pathway for *B. tabaci*.<br>As the plant passport is very similar to the EU one, seedlings shall be free from quarantine pests. Phytosanitary certificates should ensure that seedlings are free from quarantine pests.<br>Uncertainties:<br>– None |
| 4 | Growing media | No | Not relevant, growing media is not a pathway of *B. tabaci*. |
| 5 | Surveillance, monitoring and sampling | Yes | Plant material is regularly monitored for plant health issues. They must meet the required national sanitary standards. Monitoring should be affective in finding infestation of *B. tabaci*.<br>Uncertainties:<br>– Difficulty of detecting low levels of infestation.<br>– Difficulty in the identification by morphological traits. |
| 6 | Hygiene measures | Yes | Weeding can have some effect on the reduction of *B. tabaci* populations. The other measures are not relevant.<br>Uncertainties:<br>– None |
| 7 | Removal of infested plant material | Yes | Removing infested plant material can have some effect on the reduction of *B. tabaci* populations.<br>Uncertainties:<br>– None |
| 8 | Irrigation water | No | Not relevant, water is not a pathway of *B. tabaci*. |

(Continues)

(Continued)

| N | Risk mitigation measure | Effect on the pest | Evaluation and uncertainties |
|---|---|---|---|
| 9 | Application of pest control products | Yes | Plant protection products are only used when necessary and records of all plant protection treatments are kept. It may have an effect on the pest.<br>Uncertainties:<br>– No information about the specific treatments.<br>– No information on the effect of treatments against the pest. |
| 10 | Measures against soil pests | No | Not relevant to the pest. |
| 11 | Inspections and management of plants before export | Yes | Exporting plants should meet phytosanitary certificate requirements. Inspection before export should be affective in finding infestation of *B. tabaci*. However, a low level of infestation by *B. tabaci* could go undetected.<br>Inspection is performed between 1 day and 2 weeks before the export, but a reinfestation can occur during this period.<br>Uncertainties:<br>– Capacity of detection of low levels of infestation.<br>– Difficulty in the identification by morphological traits.<br>– Exact duration of the period between inspection and export. |
| 12 | Separation during transport to the destination | Yes | The pest could spread from infested plants to non-infested plants during transport to the destination.<br>Uncertainties:<br>– None |

### A.1.5 | Overall likelihood of pest freedom for bare root plants

A.1.5.1 | Reasoning for a scenario which would lead to a reasonably low number of infected bare root plants

This scenario assumes that the pest is not present in the nursery area.

A.1.5.2 | Reasoning for a scenario which would lead to a reasonably high number of infected bare root plants

This scenario assumes high pest pressure in and around nurseries especially when in proximity of greenhouses. Leaves may be present and there is a high uncertainty of probability of detection in the canopies. Seven years old plants have more leaves compared to younger plants and hence more possibilities for the pest to hide and being overlooked. Reasoning for a central scenario equally likely to over- or underestimate the number of infected bundles of whips and seedlings (Median).

The scenario assumes low values for the central scenario because *B. tabaci* is not expected to be present outdoors and because of the uncertainty about the host status of *B. tabaci* on *Populus* species other than *Populus nigra*. However, it has been considered also that pest outbreaks are reported in greenhouses in the UK, and that that visual inspections could overlook the pest.

A.1.5.3 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/ interquartile range)

The Panel expresses the maximum uncertainty with the first quartile, and a lower uncertainty with the third quartile, mainly because there is relatively high distance between the greenhouse and the commodity outside. It is very unlikely to be present outdoors and *Populus* is not a major host. It is a quarantine pest in the UK and therefore more likely to be detected in the greenhouse where measures must be taken.

### A.1.5.4 | Elicitation outcomes of the assessment of the pest freedom for *Bemisia tabaci* (European populations) on bare root plants

The following Tables show the elicited and fitted values for pest infection (Table A.1) and pest freedom (Table A.2).

**TABLE A.1** Elicited and fitted values of the uncertainty distribution of pest infestation by *Bemisia tabaci* per 10,000 plants/bundles.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elicited values | 0 | | | | | 6 | | 12 | | 25 | | | | | 50 |
| EKE | 0.137 | 0.384 | 0.839 | 1.85 | 3.35 | 5.42 | 7.70 | 13.1 | 19.9 | 24.1 | 29.4 | 35.0 | 41.0 | 45.6 | 49.9 |

*Note*: The EKE results is the BetaGeneral (0.89141, 2.423, 0, 59.5) 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 plants/bundles per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.2.

**TABLE A.2** The uncertainty distribution of plants free of *Bemisia tabaci* per 10,000 plants/bundles calculated by Table A.1.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Values | 9950 | | | | | 9975 | | 9988 | | 9994 | | | | | 10,000 |
| EKE results | 9950 | 9954 | 9959 | 9965 | 9971 | 9976 | 9980 | 9987 | 9992 | 9995 | 9997 | 9998 | 9999.2 | 9999.6 | 9999.9 |

*Note*: The EKE results are the fitted values.

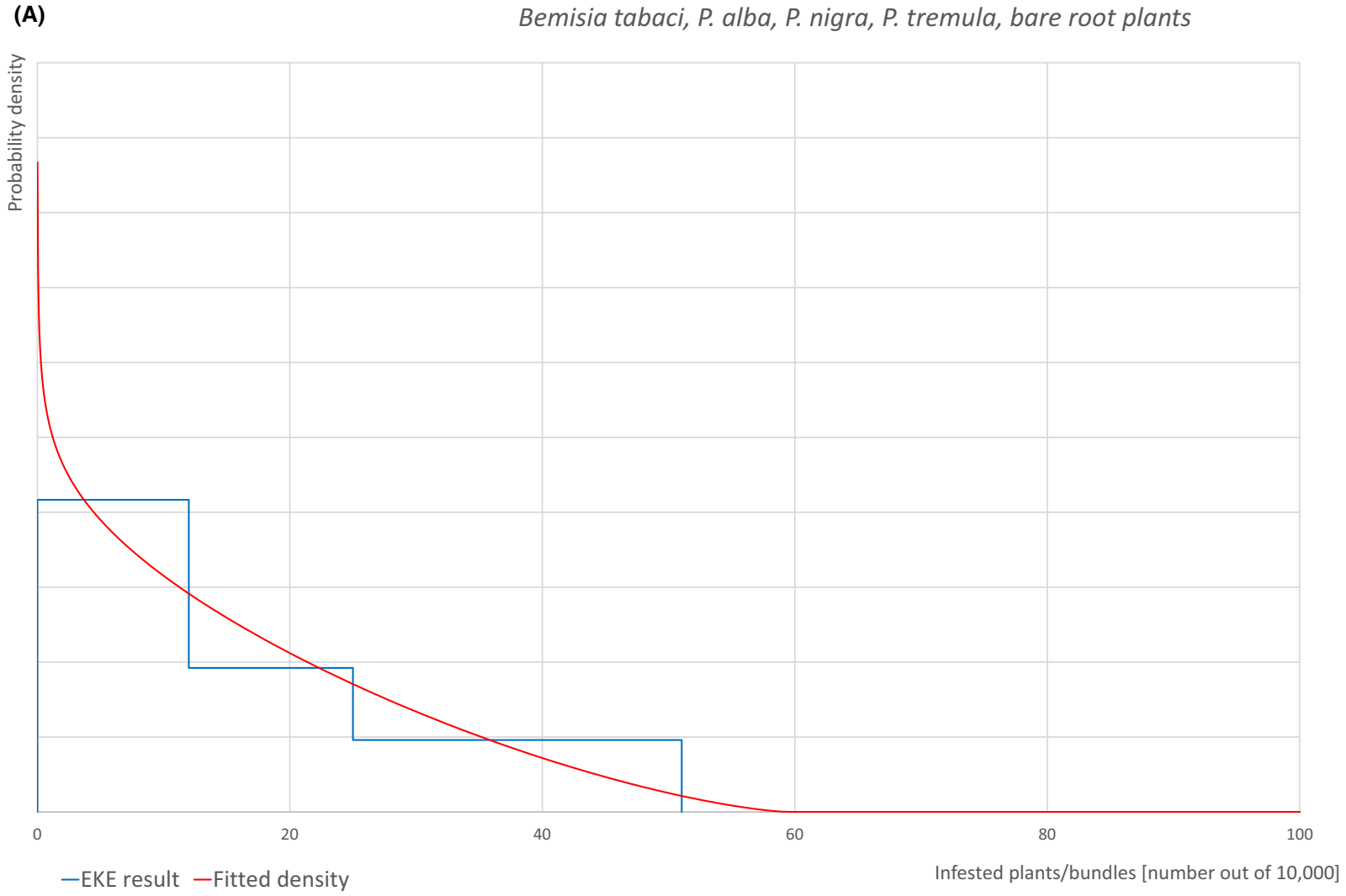


**FIGURE A.1** (Continued)

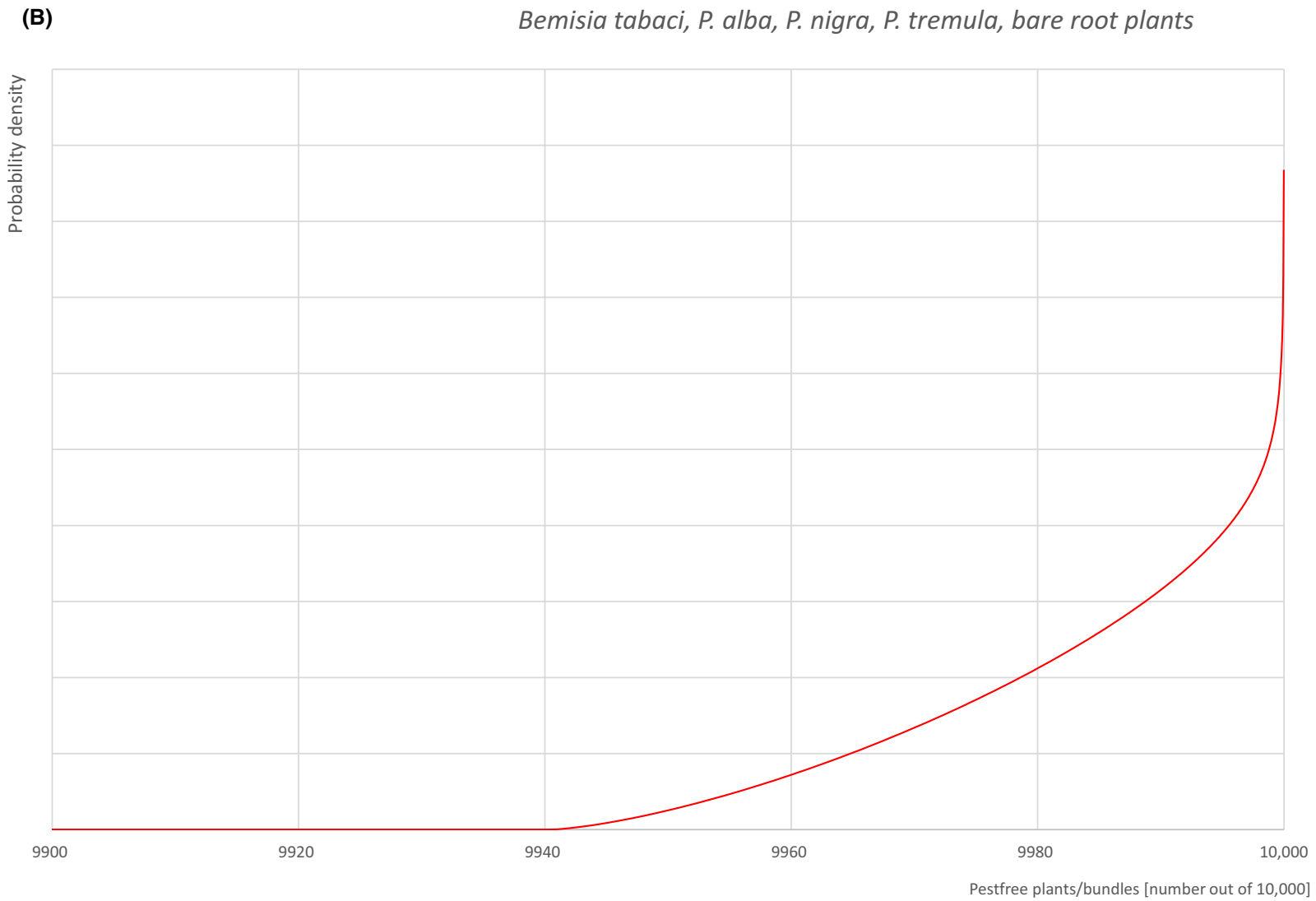


**FIGURE A.1** (Continued)

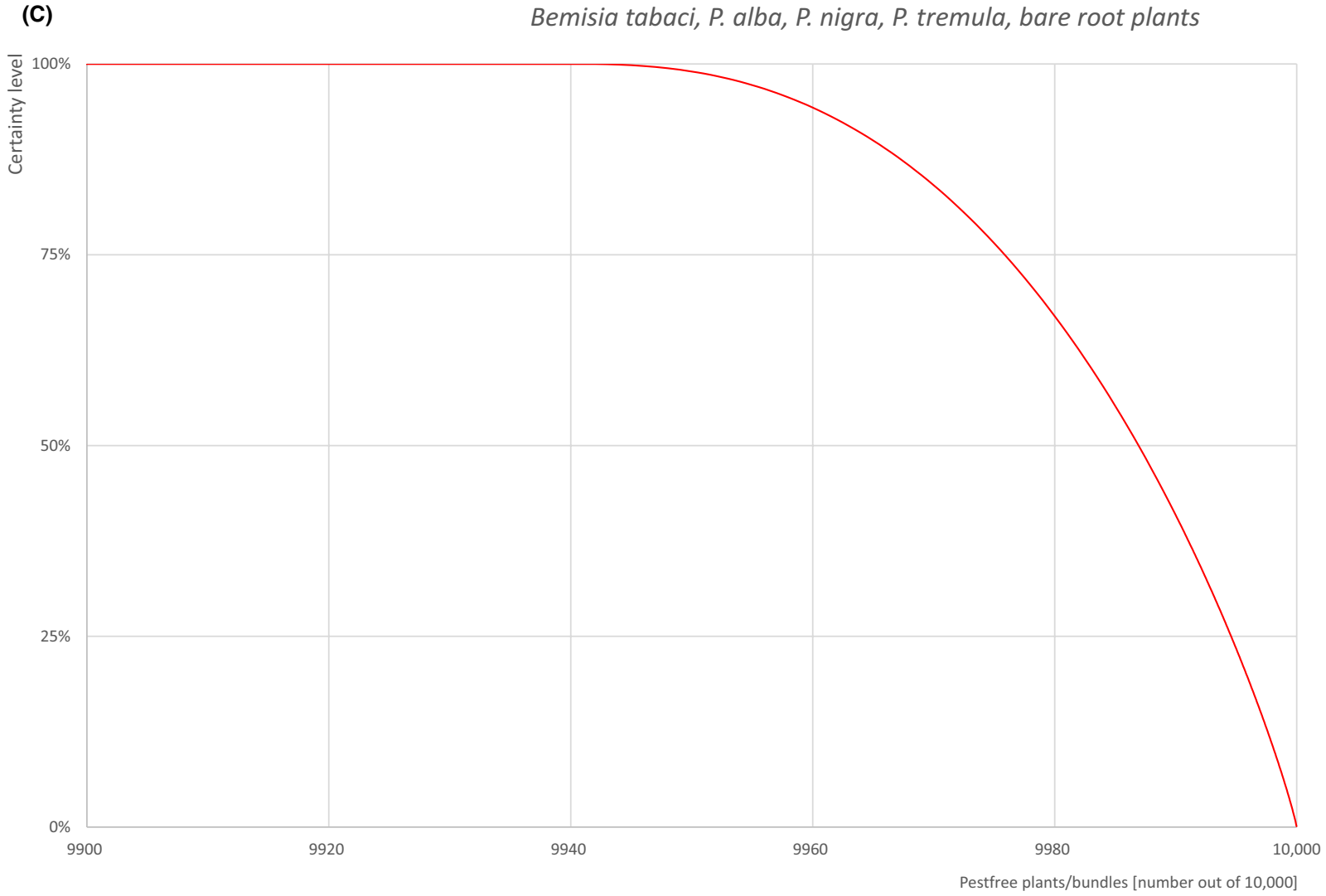


**FIGURE A.1** (A) Elicited uncertainty of pest infection per 10,000 plants/bundles (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free bare root plants/bundles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

### A.1.6 | Overall likelihood of pest freedom for cell grown plants

A.1.6.1 | Reasoning for a scenario which would lead to a reasonably low number of infected cell grown plants

This scenario assumes that the pest is not present in the nursery area.

A.1.6.2 | Reasoning for a scenario which would lead to a reasonably high number of infected cell grown plants

This scenario assumes high pest pressure in and around nurseries especially when in proximity with greenhouses. It also assumes, that cell grown plants may be stored nearby the greenhouses or be grown inside the greenhouses at the beginning of the cultivation, which makes it more likely that they could be infested with *B- tabaci*. Moreover, cell grown plants are exported with leaves.

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

The scenario assumes low values for the central scenario because *B. tabaci* is not expected to be present outdoors and because there is uncertainty about the host status of *B. tabaci* on *Populus*. In addition, cell grown plants are smaller compared to potted plants, so they are easier to inspect. However, it has also been taken into account that the pest is repeatedly intercepted in the UK in glasshouses, that visual inspections could miss the pest and that it is possible that there could be spread to plants grown outdoors from the glasshouse.

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

The Panel expresses the maximum uncertainty with the first quartile, and a lower uncertainty with the third quartile, mainly because plants are relatively small and easy to inspect. It is very unlikely to be present outdoors and *Populus* is not a major host. The pest is a quarantine pest in the UK and therefore more likely to be detected in the greenhouse where measures must be taken.

### A.1.6.5 | Elicitation outcomes of the assessment of the pest freedom for *Bemisia tabaci* (European populations) on cell grown plants

The following Tables show the elicited and fitted values for pest infection (Table A.3) and pest freedom (Table A.4).

**TABLE A.3** Elicited and fitted values of the uncertainty distribution of pest infestation by *Bemisia tabaci* per 10,000 bundles.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elicited values | 0 | | | | | 9 | | 18 | | 35 | | | | | 70 |
| EKE | 0.292 | 0.746 | 1.52 | 3.14 | 5.41 | 8.41 | 11.7 | 19.1 | 28.3 | 34.1 | 41.2 | 48.9 | 57.2 | 63.6 | 70.0 |

*Note*: The EKE results is the BetaGeneral (0.98178, 2.6842, 0, 85.5) 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.4.

**TABLE A.4** The uncertainty distribution of plants free of *Bemisia tabaci* per 10,000 bundles calculated by Table A.3.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Values | 9930 | | | | | 9965 | | 9982 | | 9991 | | | | | 10,000 |
| EKE results | 9930 | 9936 | 9943 | 9951 | 9959 | 9966 | 9972 | 9981 | 9988 | 9992 | 9995 | 9997 | 9998 | 9999.3 | 9999.7 |

Note: The EKE results are the fitted values.

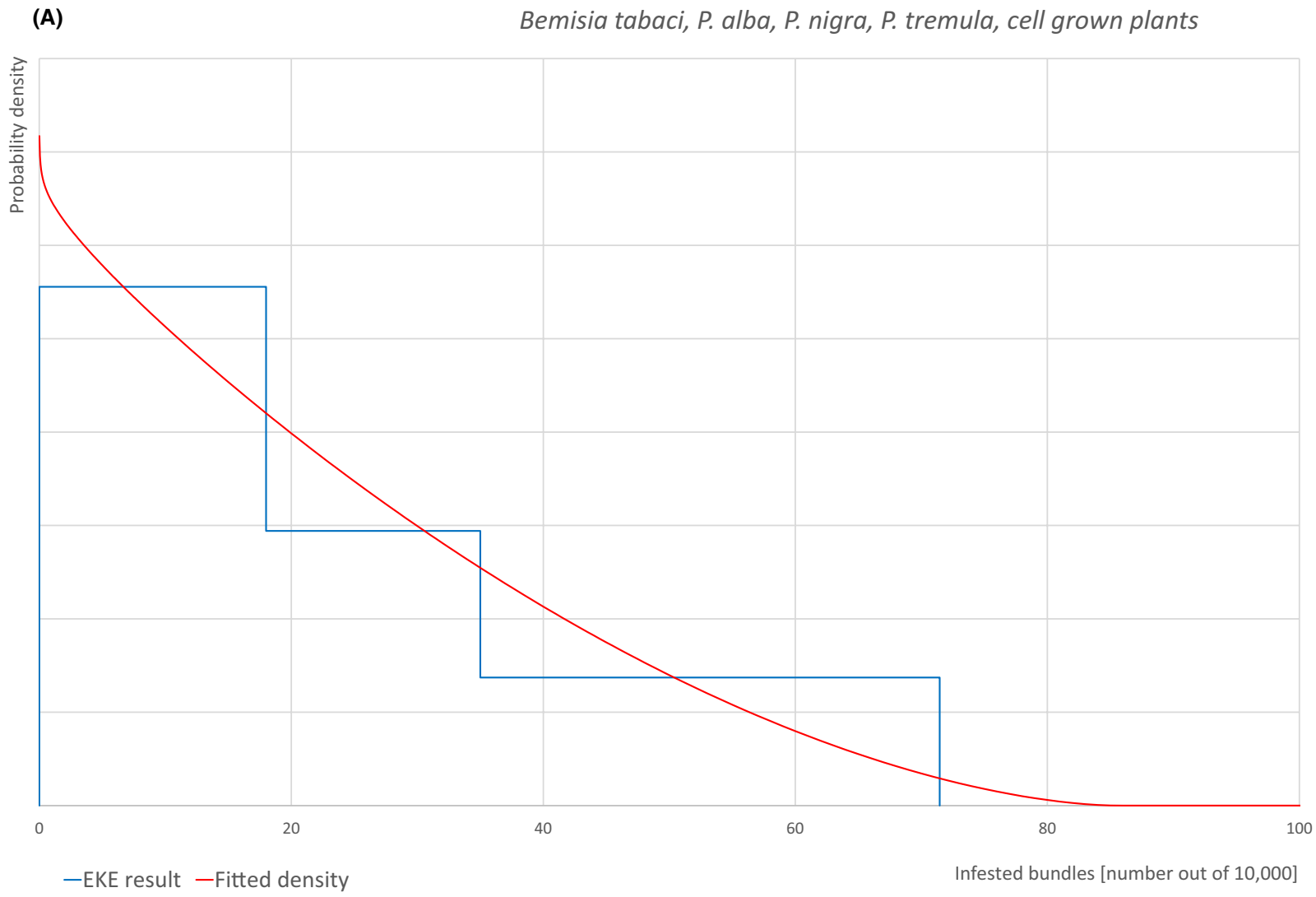


**FIGURE A.2** (Continued)

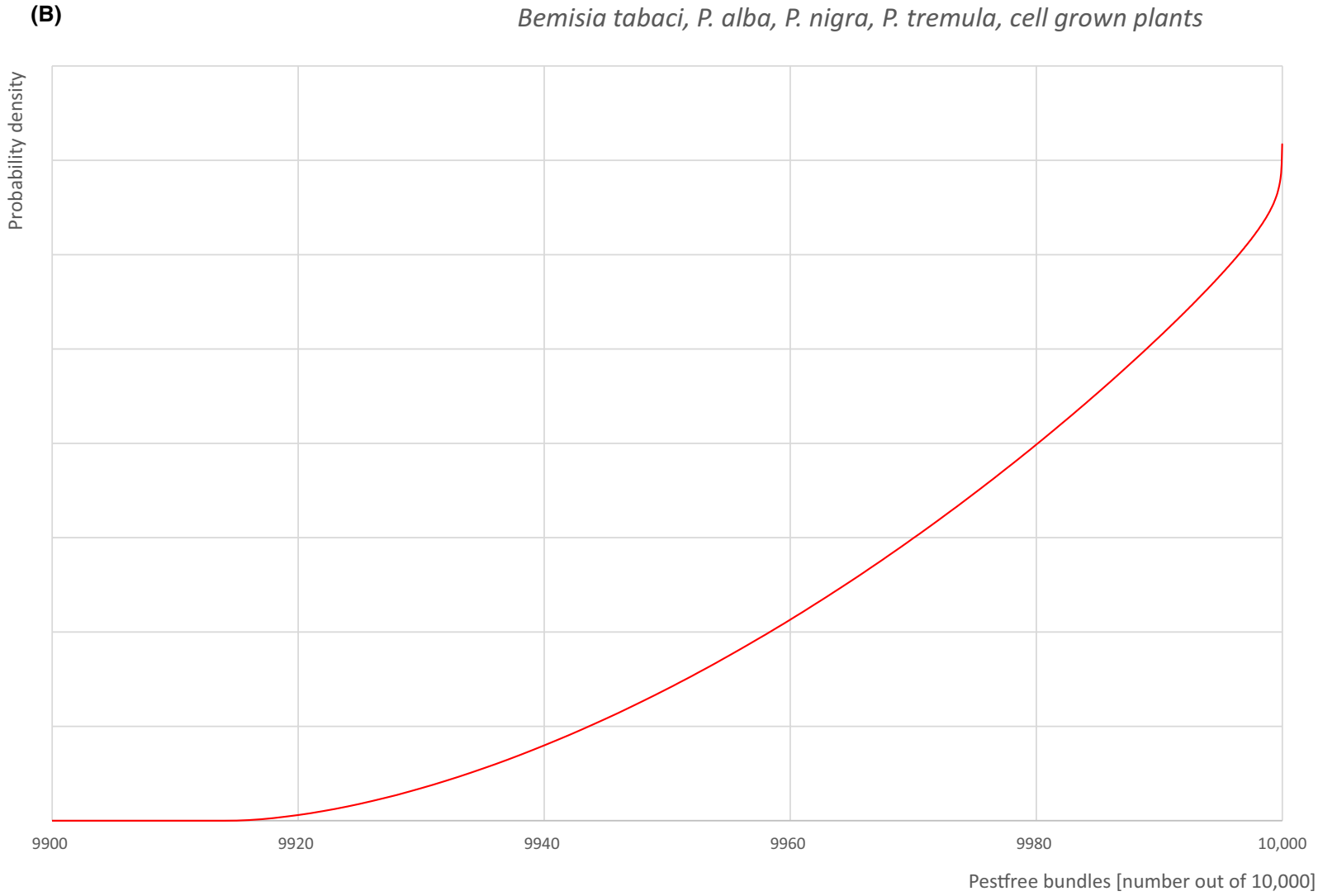


**FIGURE A.2** (Continued)

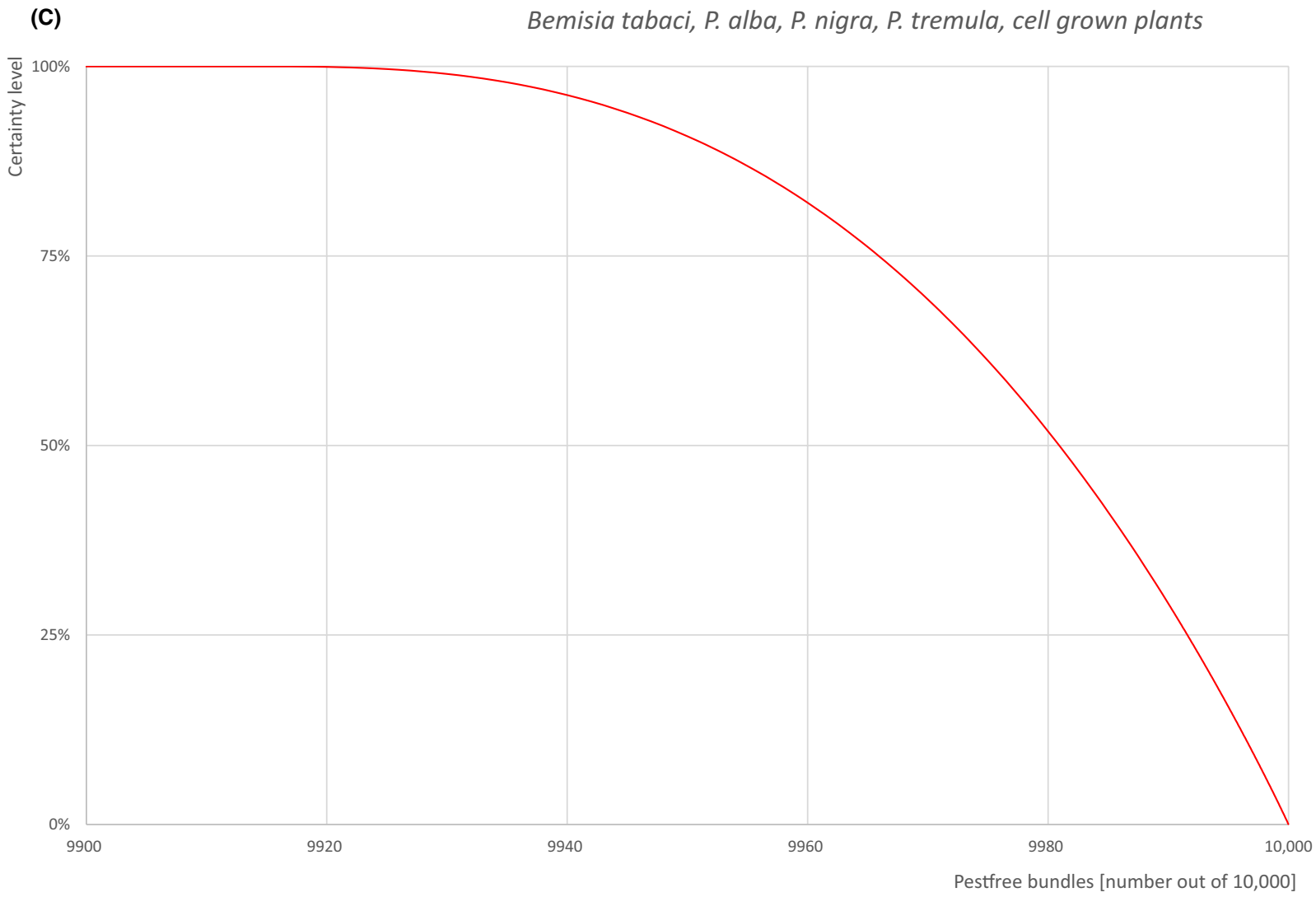


**FIGURE A.2** (A) Elicited uncertainty of pest infection per 10,000 bundles (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free bundles per 10,000 (i.e. = 1 – pest infection proportion expressed as percentage); (C) descending uncertainty distribution function of pest infection per 10,000 bundles.

### A.1.7 | Overall likelihood of pest freedom for plants in pots

A.1.7.1 | Reasoning for a scenario which would lead to a reasonably low number of infested plants in pots

This scenario assumes that the pest is not present in the nursery area.

A.1.7.2 | Reasoning for a scenario which would lead to a reasonably high number of infested plants in pots

This scenario assumes high pest pressure in and around nurseries especially when in proximity with greenhouses. It also assumes high inspection difficulty in the canopy of large trees, so there are more possibilities that the pest is unnoticed. However, *Populus* may not be a good host for *B. tabaci* as no reports of damage on *Populus* were found and there is only one record of *B. tabaci* on *Populus* without damage in Iran.

A.1.7.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infested plants in pots (Median)

The scenario assumes low values for the central scenario because *B. tabaci* is not expected to be present outdoors and because there is uncertainty about the host status of *B. tabaci* on *Populus*. However, it has also been taken into account that the pest is repeatedly intercepted in the UK in glasshouses, that visual inspections could miss the pest and that it is possible that there could be spread to plants grown outdoors from the glasshouse.

A.1.7.4 | Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/ interquartile range)

The Panel expresses the maximum uncertainty with the first quartile, and a slightly lower uncertainty with the third quartile, mainly because there is relatively high distance between the greenhouse and the commodity outside. Moreover, it is very unlikely that the pest is present outdoors and *Populus* is not a major host. The pest is a quarantine one in the UK and therefore it is more likely to be detected in the greenhouse where measures must be taken.

### A.1.7.5 | Elicitation outcomes of the assessment of the pest freedom for *Bemisia tabaci* (European populations) on plants in pots

The following Tables show the elicited and fitted values for pest infection (Table A.5) and pest freedom (Table A.6).

**TABLE A.5** Elicited and fitted values of the uncertainty distribution of pest infestation by *Bemisia tabaci* per 10,000 plants.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elicited values | 0 | | | | | 10 | | 20 | | 40 | | | | | 75 |
| EKE | 0.247 | 0.681 | 1.47 | 3.19 | 5.72 | 9.15 | 12.9 | 21.5 | 32.2 | 38.8 | 46.7 | 54.9 | 63.3 | 69.5 | 75.1 |

*Note*: The EKE results is the BetaGeneral (0.9073, 2.1215, 0, 85.5) 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 plants per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.6.

**TABLE A.6** The uncertainty distribution of plants free of *Bemisia tabaci* per 10,000 plants calculated by Table A.5.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Values | 9925 | | | | | 9960 | | 9980 | | 9990 | | | | | 10,000 |
| EKE results | 9925 | 9931 | 9937 | 9945 | 9953 | 9961 | 9968 | 9978 | 9987 | 9991 | 9994 | 9997 | 9998.5 | 9999.3 | 9999.8 |

*Note*: The EKE results are the fitted values.

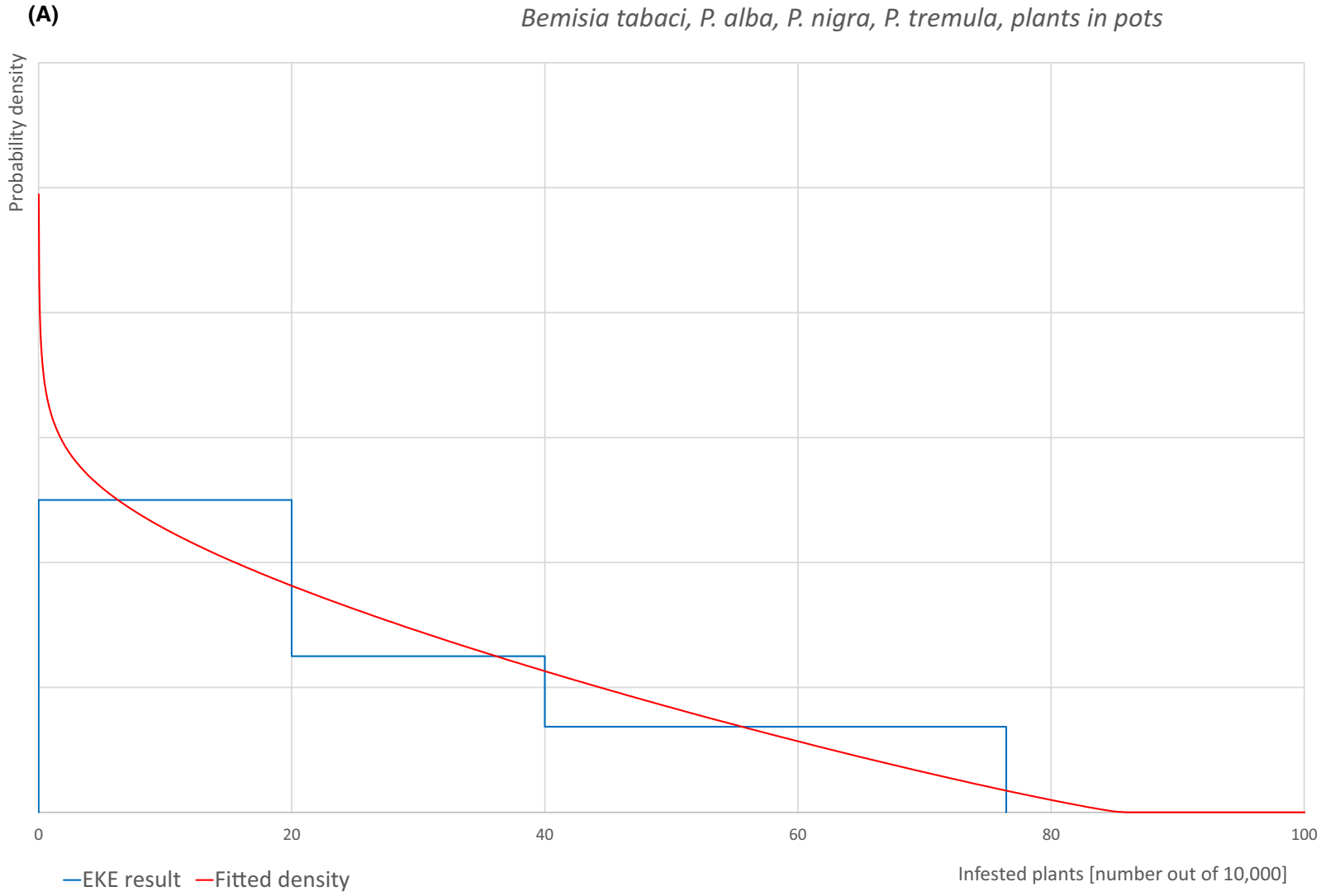


**FIGURE A.3** (Continued)

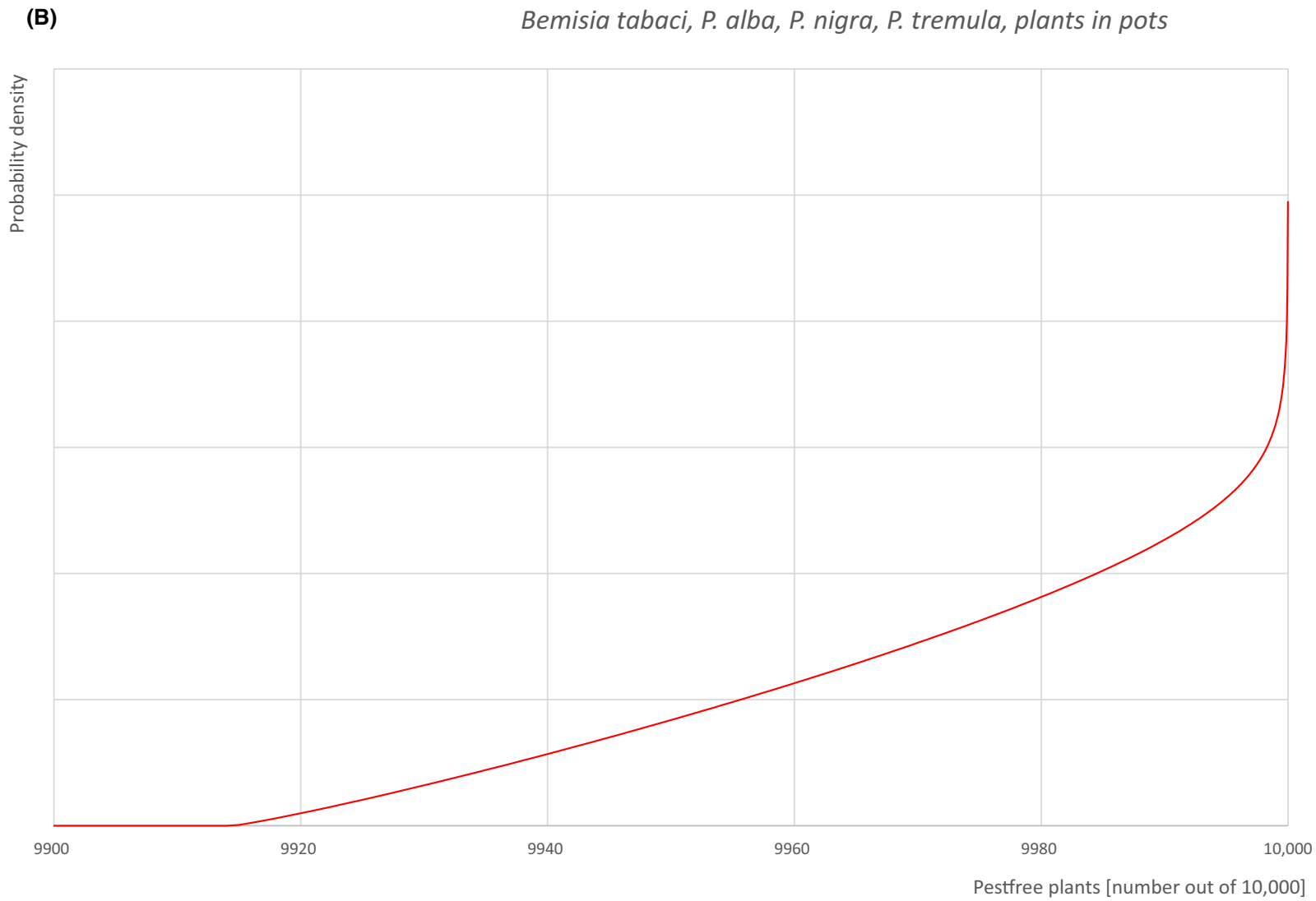


**FIGURE A.3** (Continued)

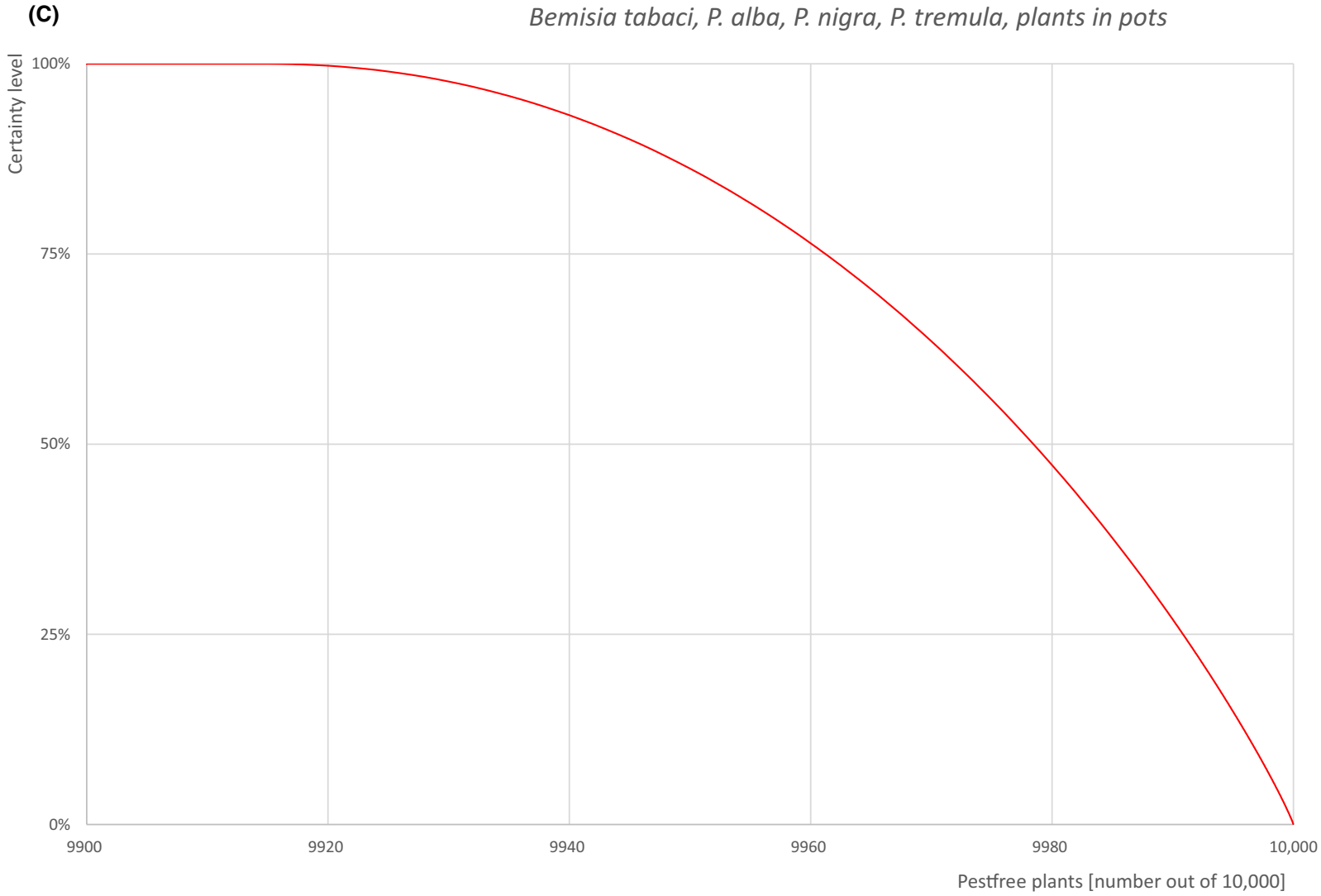


**FIGURE A.3** (A) Elicited uncertainty of pest infection per 10,000 plants (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free plants per 10,000 (i.e. = 1 – pest infection proportion expressed as percentage); (C) descending uncertainty distribution function of pest infection per 10,000 plants.

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## A.2 | *ENTOLEUCA MAMMATA*

### A.2.1 | Organism information

| | |
|---|---|
| **Taxonomic information** | Current valid scientific name: *Entoleuca mammata*<br>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)<br>Name used in the EU legislation: *Entoleuca mammata* (Wahlenb.) Rogers and JU<br>Order: Xylariales<br>Family: Xylariaceae<br>Common name: Hypoxylon canker of poplar, canker of poplar, canker of aspen<br>Name used in the dossier: *Entoleuca mammata* |
| **Group** | Fungi |
| **EPPO code** | HYPOMA |
| **Regulated status** | *Entoleuca mammata* is listed in Annex III of Commission Implementing Regulation (EU) 2019/2072 as protected zone quarantine pest for Ireland and the UK (Northern Ireland).<br>The pathogen is quarantine pest in China and Israel and is on the A1 list of Türkiye (EPPO, 2024a). |
| **Pest status in the UK** | *Entoleuca mammata* is present in the UK, with few occurrences in England, Wales, Channel Islands and Scotland (CABI, 2019; EPPO, 2024b; Granmo et al., 1999; Matthiassen, 1993).<br>According to the Dossier Section 2.0 the pathogen is present in the UK: not widely distributed and not under official control. |
| **Pest status in the EU** | *Entoleuca mammata* is present in the following EU MS: Austria, Belgium, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Italy, Latvia, Lithuania, the Netherlands, Poland, Slovakia, Slovenia, Spain and Sweden (EFSA PLH Panel, 2023; EPPO, 2024b). |
| **Host status on *Populus alba, P. nigra* and *P. tremula*** | *Populus alba, P. nigra* and *P. tremula* are hosts of *E. mammata* (EFSA PLH Panel, 2023). *P. tremula* is considered the main host in Europe, whereas *P. nigra* is listed only as minor host (EFSA PLH Panel, 2017). According to Ostry (2013), the pest was found in plantations of *P. nigra* var. *betulifolia* × *P. nigra* 'Volga', *P. nigra* var. *betulifolia* × *P. balsamifera* subsp. *trichocarpa* and *P. deltoides* × *P. nigra* 'Incrassata'.<br>*Entoleuca mammata* is also host for the hybrid *P. tremula* × *P. tremuloides* (Ostry, 2013). |
| **PRA information** | Pest Risk Assessments available:<br>– Pest categorisation of *Entoleuca mammata* (EFSA PLH Panel, 2017);<br>– Express Pest Risk Analysis: *Entoleuca mammata* (Klejdysz et al. 2018);<br>– UK Risk Register Details for *Entoleuca mammata* (DEFRA, 2023). |
| **Other relevant information for the assessment** | |
| **Biology** | *Entoleuca mammata* causes canker disease in *Populus tremuloides* and *P. tremula* as primary hosts, but other hardwood species can be also affected as minor hosts (EFSA PLH Panel, 2017). The fungus is also known as primary saprophyte on several *Salix* species (Matthiasen, 1993). *E. mammata* is thought to be native to North America and introduced into Europe several centuries ago (Kasanen et al., 2004). It is now largely spread in the temperate zones of the northern hemisphere in North America, Europe and Asia. *Entoleuca mammata* is present in Canada and in several states of the USA, mostly in the north. In Asia, it is only found in the Korea Republic on decayed wood (Lee et al., 2000). In Europe, in addition to the mentioned EU MS and the UK (see above), it is also reported from Andorra, Bosnia and Herzegovina, Montenegro, North Macedonia, Russia (Southern Russia and Western Siberia), Serbia, Switzerland, Ukraine (CABI, 2019; EPPO, 2024c) and Norway (Granmo et al., 1999; NBIC, 2021).<br>The ascospores of *E. mammata* can infect the living wood of the hosts penetrating in the periderm and invading tissues under bark through mechanical wounds and injuries, often caused by woodpeckers and insects (Anderson et al., 1979a; Ostry & Anderson, 1983); water stress can increase host susceptibility (EFSA PLH Panel, 2017; EFSA PLH Panel, 2023). The pathogen is mostly found on trees 15–40 years old, but all ages can be infected (EFSA PLH Panel, 2017; EPPO 2023). Infection usually starts from branches and twigs and then can spread to the main stem. *Entoleuca mammata* is most frequently found on stems about 1.5–2.5 m above the ground (Matthiasen, 1993). 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. *E. mammata* 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, 2023; Stermer et al., 1984). |

(Continued)

| | | |
|---|---|---|
| | | The pathogen 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, and ascospores are the main source of inoculum (EFSA PLH Panel, 2017; Ostry & Anderson, 2009; Ostry, 2013).<br>*Entoleuca mammata* can spread over long distances via windborne ascospores, which are produced 2–3 years after infection (Anderson et al., 1979b); cankers on felled trees on the ground continue to produce ascospores for 23 months (Ostry & Anderson, 2009). Ascospores are dispersed with a temperature above −4°C and 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, may be a pathway for passive spread of *E. mammata* in international trade; however, also young plants may carry ascospores or mycelium of the fungus, which can survive as a latent infection on living material inadvertently moved (EFSA PLH Panel, 2017; EPPO, 2024c).<br>*Entoleuca mammata* is considered an important pathogen of poplars in the USA and Canada, causing economic losses of millions of dollars a year (Anderson et al., 1979b; EFSA PLH Panel, 2017; Ostry, 2013). In Europe, damage on *Populus tremula* has been reported in natural stands in France and Italy and in poplar plantations in Sweden and Estonia (EFSA PLH Panel, 2017; Lutter et al., 2019); however, the pathogen is generally known as a pest of low importance (EFSA PLH Panel, 2023). |
| **Symptoms** | **Main type of symptoms** | Symptoms of *E. mammata* infection have been described especially for *Populus* species. 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 break 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, 2023).<br>Wilting of leaves may be observed when living trees are girdled by cankers, as well as sprouting of new shoots on stem and branches. Infected trees can be secondarily colonised by other fungi, accelerating the host decline (EPPO, 2023). |
| | **Presence of asymptomatic plants** | The disease caused by *E. mammata* has a latent period and symptoms can appear only 2 years after the ascospore infection, therefore asymptomatic plants can be found (Ostry & 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 of *E. mammata* but can be easily distinguished in laboratory by the ascospore characteristics (EFSA PLH Panel, 2017). |
| **Host plant range** | | The list of hosts of *E. mammata* includes: *Alnus sinuata, Betula* sp., *Fagus* sp., *Malus* sp., *Ostrya* sp., *Populus adenopoda, P. alba, P. balsamifera, P. grandidentata, P. nigra, P. tremula, P. tremuloides, P. trichocarpa, P.* × *wettsteini, Populus hybrids, Salix caprea, S. cinerea, S. daphnoides, S. myrisinifolia, S. pentandra, S. phylicifolia, S. triandra, Salix*, sp. and *Sorbus aucuparia* (EFSA PLH Panel, 2023; EPPO, 2024c, 2024e; Ostry, 2013).<br>In North America, *E. mammata* mainly infects the quacking aspen (*Populus tremuloides*); minor damage is recorded on *P. alleghaniensis*, *P. balsamifera, P. grandidentata* and various *Populus* hybrids. Other secondary hosts in North America are *Acer, Alnus, Betula, Carpinus, Fagus, Picea, Pyrus, Salix, Sorbus* and *Ulmus* (Manion & Griffin, 1986).<br>In Europe, the main hosts are poplars, mostly *Populus tremula;* other hosts are *Populus alba, P. nigra, P. trichocarpa* and the hybrid *P. tremula* × *P. tremuloides* (Ostry, 2013). In central and northern Scandinavia, willows seem to be the main hosts of *E. mammata*, mostly *Salix caprea, S. pentandra* and *S. myrsinifolia* (Matthiasen, 1993). |
| **Reported evidence of impact** | | *Entoleuca mammata* is an EU protected zone quarantine pest. |
| **Evidence that the commodity is a pathway** | | Plants for planting may carry ascospores and mycelium of *E. mammata* also as asymptomatic plants (EFSA PLH Panel, 2017; EPPO 2023) therefore the commodity is a pathway. *E. mammata* is believed to have been introduced in the last century into France with plant material (flowering branches of *Populus tremula*) used for hybridisation (EPPO, 1976). |
| **Surveillance information** | | *Entoleuca mammata* is not a regulated pest for the UK and it is not under official control – limited in parts of the UK (Dossier Section 2.0). |

### A.2.2 | Possibility of pest presence in the nursery

#### A.2.2.1 | Possibility of entry from the surrounding environment

*Entoleuca mammata* is present in the UK in England, Wales, Channel Islands and Scotland (CABI, 2019; EPPO, 2024b; Dossier Section 2.0). In Wales the pathogen was found on *Salix* sp. (Matthiassen, 1993).

*Entoleuca mammata* can easily spread with ascospores dispersed by air currents also over long distance and can infect *Acer campestre, A. pseudoplatanus* and *Populus* spp., which are present within 2 km from the nurseries in woodlands and hedgerows (Dossier Sections 1.1, 1.2 and 1.3). Other possible hosts, as *Betula* spp., *Fagus* spp., *Sorbus aucuparia* and *Salix* spp. might be present in the private gardens in the same area.

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 *Entoleuca mammata* to enter the nurseries from surrounding environment via ascospores transported by wind and air currents.

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

For all the *Populus* species of the Dossier the starting material is a mix of seeds, seedlings and cuttings, depending on the nursery. Seeds are certified and coming from the UK. Seedlings are either from the UK or the EU (including the Netherlands, Belgium and France) (Dossier Sections 1.1, 1.2 and 1.3).

None of the nurseries have mother plants of *Populus* or mother plants of other species, since no plants from grafting are produced (Dossier Sections 1.1, 1.2 and 1.3).

In addition to *Populus alba, P. nigra* and *P. tremula* plants, the nurseries also produce other plants (Dossier Sections 3.1, 3.2 and 3.3). Out of them, there are suitable hosts for the pathogen such as *Alnus* spp., *Fagus* spp., *Malus* spp., *Pyrus* spp., *Salix caprea, S. pentandra, Salix* spp., *Sorbus aucuparia* and *Ulmus* spp.. However, there is no information on how and where the plants are produced. Therefore, if the plants are first produced in another nursery, the pathogen could possibly travel with them.

The nurseries are using virgin peat or peat-free compost (a mixture of coir, tree bark, wood fibre, etc.) as a growing media (Dossier Sections 1.1, 1.2 and 1.3). The growing media is certified and heat-treated by commercial suppliers during production to eliminate pests and diseases. 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 other than *Populus* used for plant production in the nurseries.

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 *Populus* and plants of other species used for plant production in the area. The entry of the pathogen with seeds and the growing media the Panel considers as not possible.

A.2.2.3 | Possibility of spread within the nursery

*Populus alba, P. nigra* and *P. tremula* plants are either grown in containers (cells, pots, tubes, etc.) outdoors, in the open air or in field. Cell grown trees may be grown in greenhouses, however most plants will be field-grown, or field-grown in containers; there are no mother plants present in the nurseries (Dossier Sections 1.1, 1.2 and 1.3).

The pathogen can infect other suitable plants, such as *Alnus* spp., *Fagus* spp., *Malus* spp., *Salix* spp., *Sorbus* spp., etc. present within the nurseries (Dossier Sections 3.1, 3.2 and 3.3).

Once entered, ascospores of *E. mammata* could be produced on infected plants and naturally spread within the nurseries by air currents.

Uncertainties

– Whether ascospores are produced on infected nursery 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.2.3 | Information from interceptions

In the EUROPHYT/TRACES-NT database there are no records of notification of *Populus alba, P. nigra* and *P. tremula* plants for planting neither from the UK nor from other countries due to the presence of *E. mammata* between the years 1995 and September 2024 (EUROPHYT, 2024; TRACES-NT, 2024).

### 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 *E. mammata* is provided. The description of the risk mitigation measures currently applied in the UK is provided in the Table 7.

| N | Risk mitigation measure | Effect on the pest | Evaluation and uncertainties |
|---|---|---|---|
| 1 | Registration of production sites | Yes | The risk mitigation measure is expected to be effective in reducing the likelihood of presence of the pathogen on the commodity.<br>Uncertainties:<br>– None |
| 2 | Physical separation | No | Not applicable. |
| 3 | Certified plant material | Yes | The risk mitigation measure is expected to be effective in reducing the likelihood of presence of the pathogen on the commodity.<br>Uncertainties:<br>– None |
| 4 | Growing media | No | Not applicable. |
| 5 | Surveillance, monitoring and sampling | Yes | This measure could have some effect. *Entoleuca mammata* is not a regulated pest for Great Britain, and no specific measures on surveillance are taken. The pest has been a protected zone quarantine pest in Northern Ireland for many years and exports to North Ireland from other areas of the UK are checked in accordance with the requirements.<br>Uncertainties:<br>– Whether plants are subjected to annual surveys |
| 6 | Hygiene measures | No | Not applicable. |
| 7 | Removal of infested plant material | Yes | This measure could have some effect.<br>Uncertainties:<br>– None |
| 8 | Irrigation water | No | Not applicable. |
| 9 | Application of pest control products | Yes | Although little information exists on the efficacy of chemical treatments against *E. mammata* (Ostry, 2013), some of the fungicides used in the nursery targeting canker pathogens (Azoxystrobin, Pyrimethanil, Triazolinthione, Tebuconazole, Propamocarb Hydrochloride) could reduce the likelihood of the infection by the pathogen.<br>Uncertainties:<br>– The level of efficacy of fungicides in reducing infection of *E. mammata* |
| 10 | Measures against soil pests | No | Not applicable. |
| 11 | Inspections and management of plants before export | Yes | This measure could have some effect, although symptoms can appear only 2 years after the infection.<br>Uncertainties:<br>– None |
| 12 | Separation during transport to the destination | No | Not applicable. |

### A.2.5 | Overall likelihood of pest freedom for cuttings/graftwood

A.2.5.1 | Reasoning for a scenario which would lead to a reasonably low number of infected cuttings/graftwood

The scenario assumes the pathogen to be absent or with 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. The scenario also assumes that symptoms of the disease are visible and promptly detected during inspections.

A.2.5.2 | Reasoning for a scenario which would lead to a reasonably high number of infected cuttings/graftwood

The scenario assumes a high pressure of the pathogen in the nurseries and in the surroundings as suitable hosts are present. Older plants are exposed to the pathogen for longer period of time. The scenario also assumes that symptoms of the disease are not easily recognizable during inspections and that infections are asymptomatic.

A.2.5.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infected bundles of cuttings/graftwood (Median)

The scenario assumes a limited presence of the pathogen in the nurseries and the surroundings and that the plants are exposed to the pathogen for a sufficient period of time to cause infection through mechanical wounds. Poplars are suitable hosts.

A.2.5.4 | 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 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. The young age of plants would also leave less uncertainty for estimates above the median.

### A.2.5.5 | Elicitation outcomes of the assessment of the pest freedom for *Entoleuca mammata* on cuttings/graftwood of *Populus nigra*

The following Tables show the elicited and fitted values for pest infection (Table A.7) and pest freedom (Table A.8).

**TABLE A.7** Elicited and fitted values of the uncertainty distribution of pest infestation by *Entoleuca mammata* per 10,000 plants/bundles

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elicited values | 0 | | | | | 8 | | 16 | | 30 | | | | | 70 |
| EKE | 0.405 | 0.912 | 1.70 | 3.20 | 5.19 | 7.72 | 10.4 | 16.5 | 24.4 | 29.5 | 36.1 | 43.8 | 53.0 | 61.0 | 70.2 |

*Note:* The EKE results is the BetaGeneral (1.1421, 5.5388, 0, 120) 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 plants/bundles per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.8.

**TABLE A.8** The uncertainty distribution of plants free of *Entoleuca mammata* per 10,000 plants/bundles calculated by Table A.7

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Values | 9930 | | | | | 9970 | | 9984 | | 9992 | | | | | 10,000 |
| EKE results | 9930 | 9939 | 9947 | 9956 | 9964 | 9971 | 9976 | 9983 | 9990 | 9992 | 9995 | 9997 | 9998 | 9999.1 | 9999.6 |

*Note*: The EKE results are the fitted values.

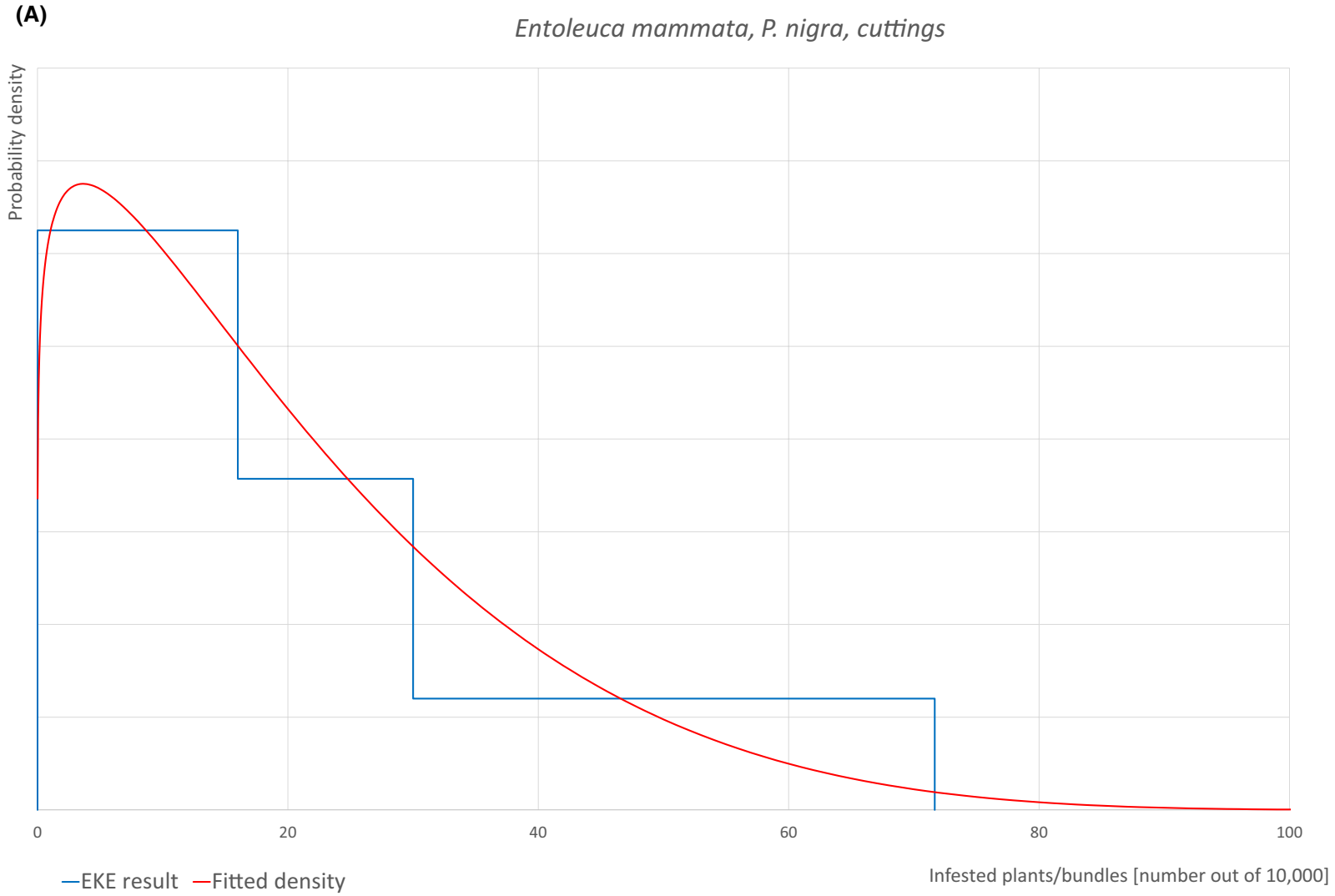


**FIGURE A.4** (Continued)

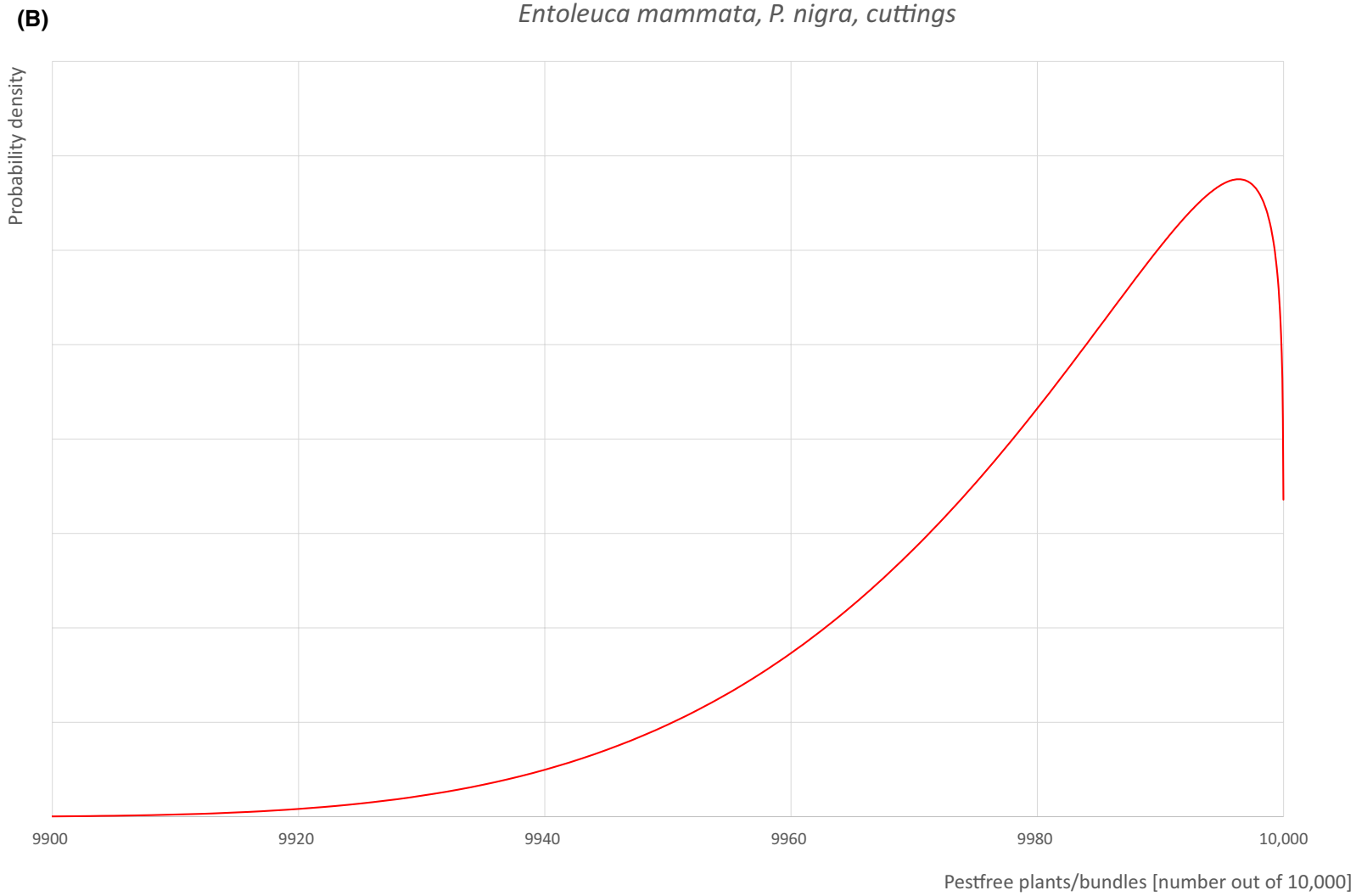


**FIGURE A.4** (Continued)

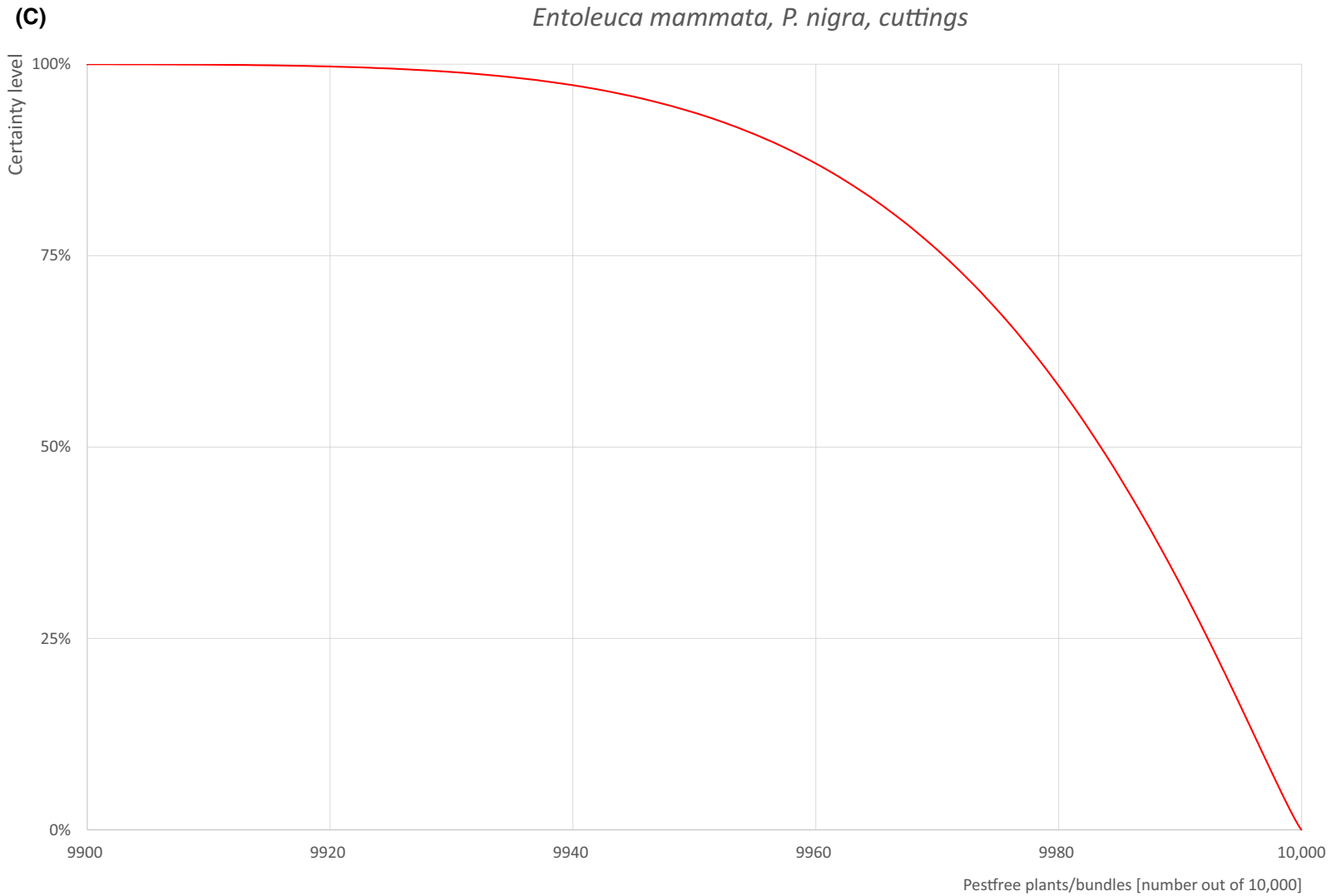


**FIGURE A.4** (A) Elicited uncertainty of pest infection per 10,000 plants/bundles (histogram in blue– vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest free plants/bundles per 10,000 (i.e. = 1 – pest infection proportion expressed as percentage); (C) descending uncertainty distribution function of pest infection per 10,000 plants/bundles.

### A.2.5.6 | Elicitation outcomes of the assessment of the pest freedom for *Entoleuca mammata* on cuttings/graftwood of *Populus tremula*

The following Tables show the elicited and fitted values for pest infection (Table A.9) and pest freedom (Table A.10).

**TABLE A.9** Elicited and fitted values of the uncertainty distribution of pest infestation by *Entoleuca mammata* per 10,000 plants/bundles

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elicited values | 0 | | | | | 16 | | 32 | | 60 | | | | | 140 |
| EKE | 0.810 | 1.82 | 3.39 | 6.39 | 10.4 | 15.4 | 20.8 | 33.1 | 48.8 | 59.0 | 72.2 | 87.6 | 106 | 122 | 140 |

*Note*: The EKE results is the BetaGeneral (1.1421, 5.5388, 0, 240) 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 plants/bundles per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.10.

**TABLE A.10** The uncertainty distribution of plants free of *Entoleuca mammata* per 10,000 plants/bundles calculated by Table A.9

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Values | 9860 | | | | | 9940 | | 9968 | | 9984 | | | | | 10000 |
| EKE results | 9860 | 9878 | 9894 | 9912 | 9928 | 9941 | 9951 | 9967 | 9979 | 9985 | 9990 | 9994 | 9997 | 9998 | 9999 |

*Note*: The EKE results are the fitted values.

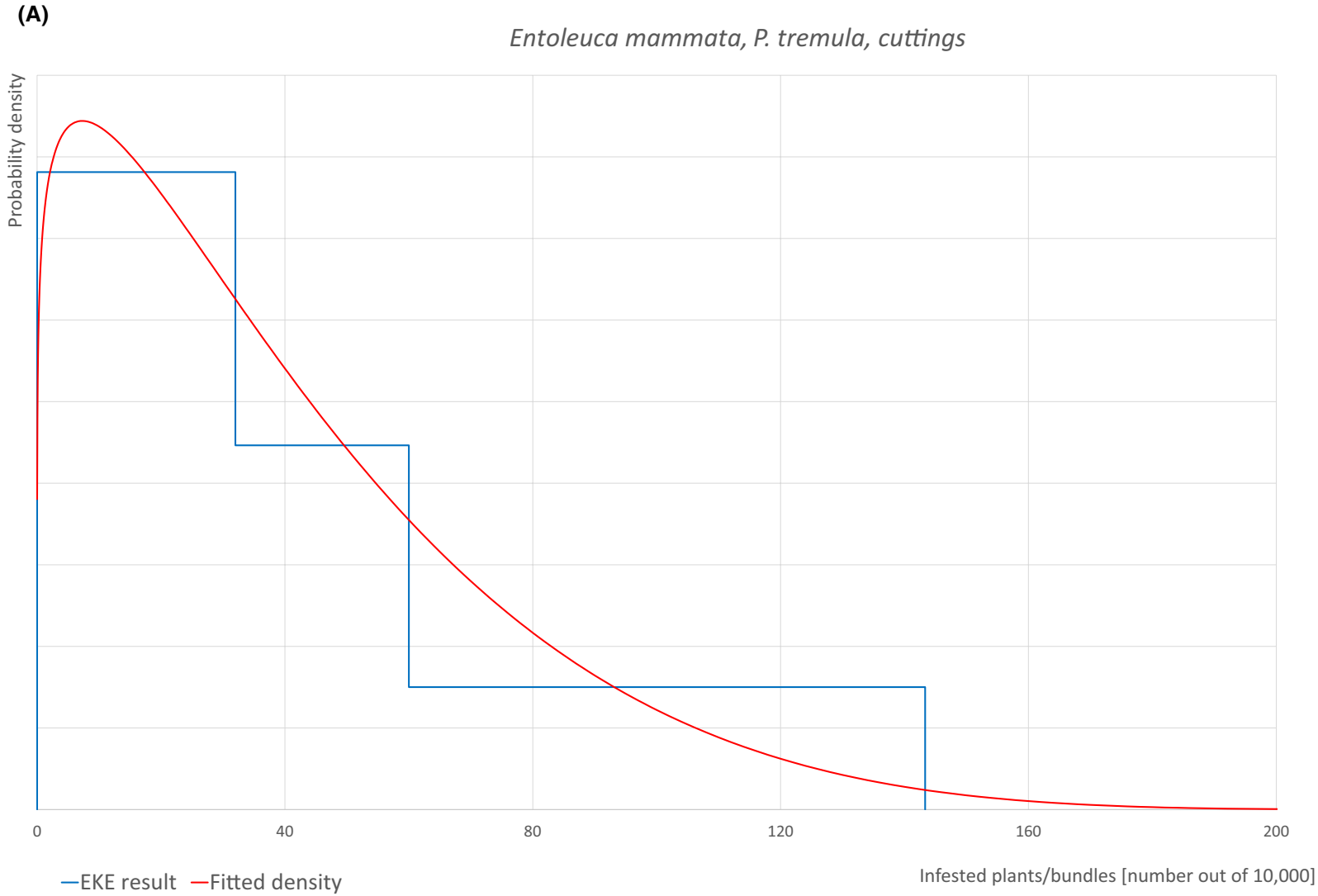


**FIGURE A.5** (Continued)

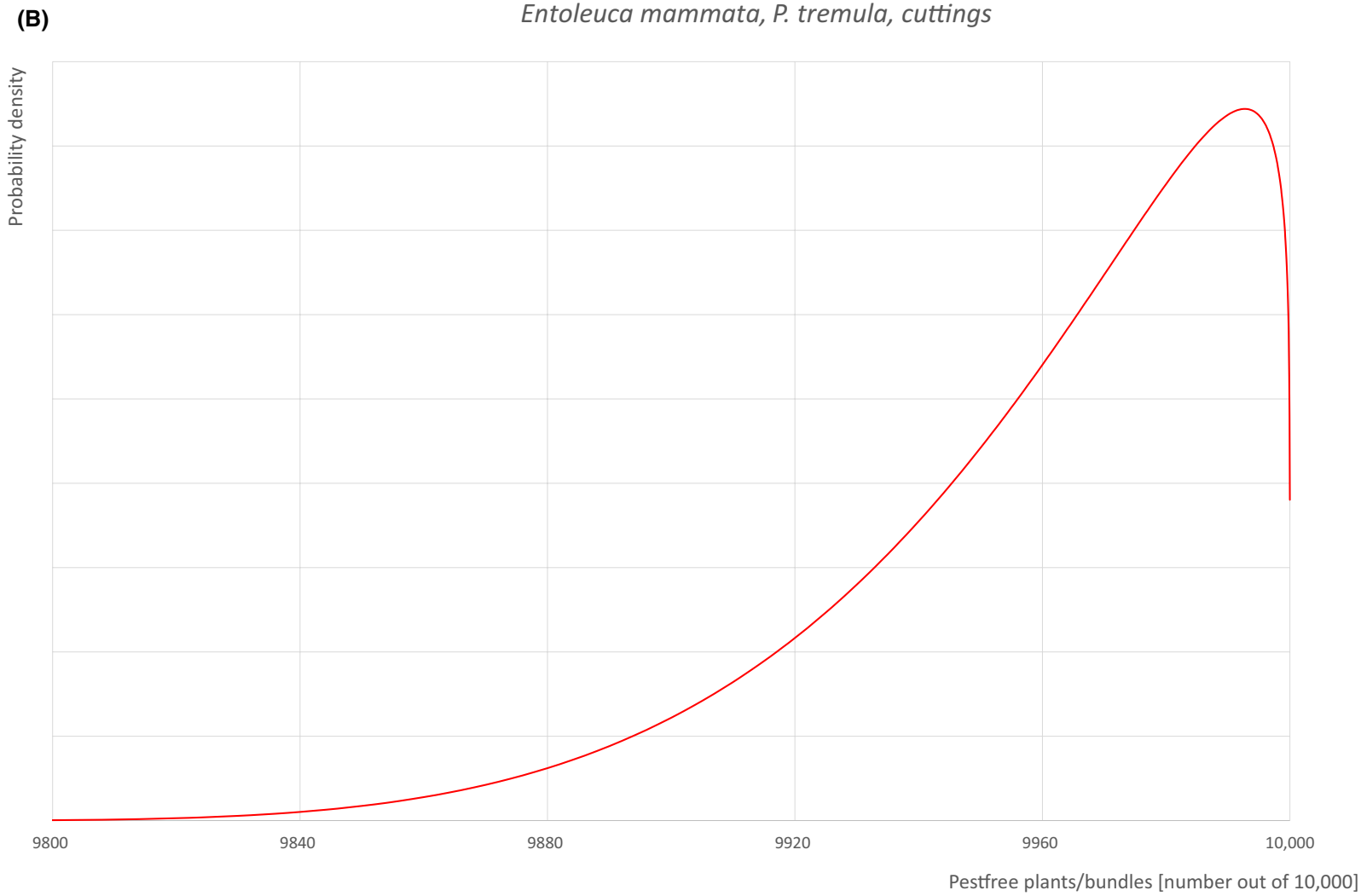


**FIGURE A.5** (Continued)

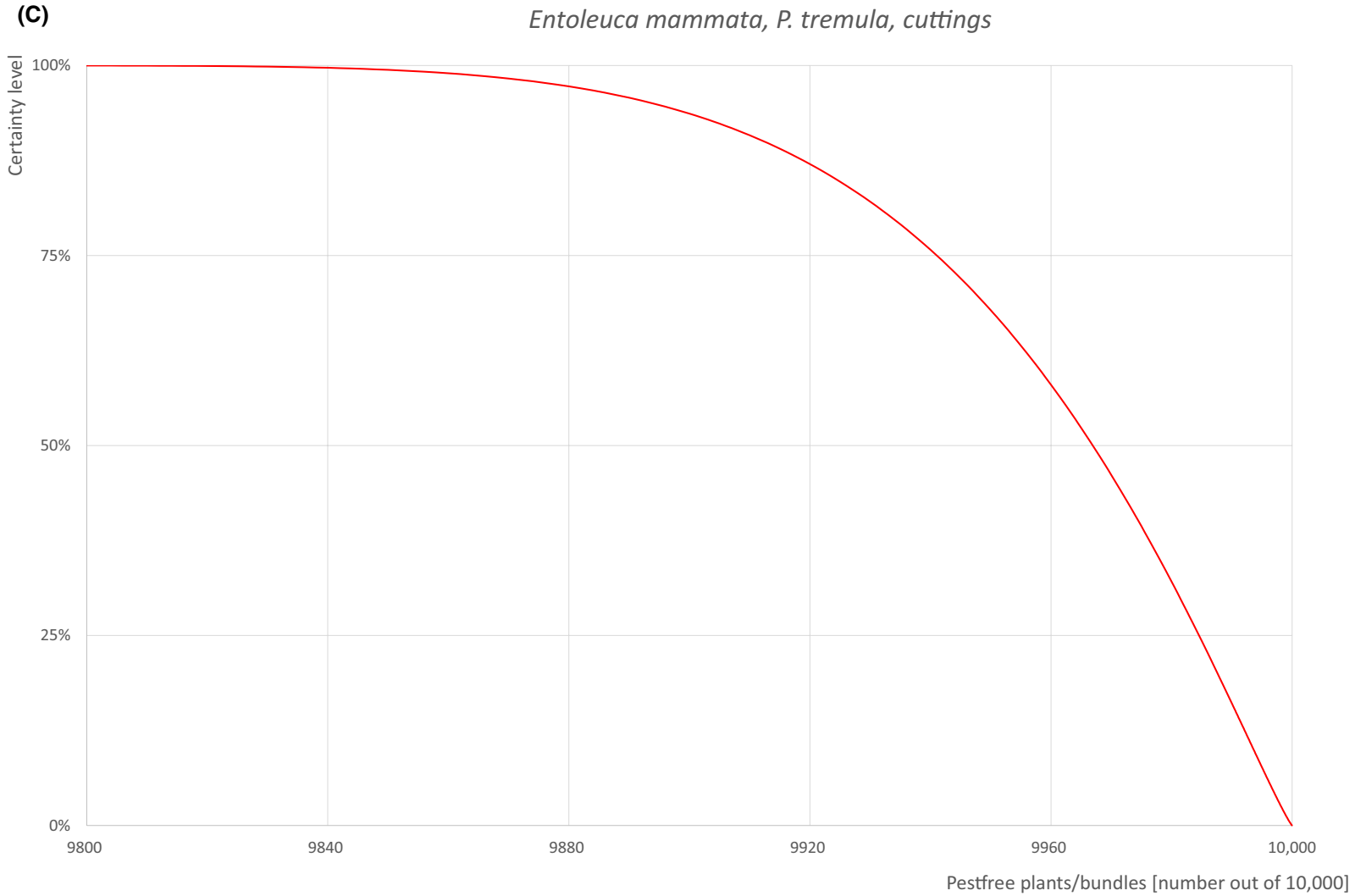


**FIGURE A.5** (A) Elicited uncertainty of pest infection per 10,000 plants/bundles (histogram in blue–vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest free plants/bundles per 10,000 (i.e. = 1 – pest infection proportion expressed as percentage); (C) descending uncertainty distribution function of pest infection per 10,000 plants/bundles.

### A.2.6 | Overall likelihood of pest freedom for bare root plants

A.2.6.1 | Reasoning for a scenario which would lead to a reasonably low number of infected bare root plants

The scenario assumes the pest to be absent or with a low pressure in the nurseries and in the surroundings. Younger plants are exposed to the pathogen for only a short period of time. The scenario also assumes that symptoms of the disease are visible and promptly detected during inspections.

A.2.6.2 | Reasoning for a scenario which would lead to a reasonably high number of infected bare root plants

The scenario assumes a high pressure of the pathogen in the nurseries and in the surroundings as suitable hosts are present. Older plants are exposed to the pathogen for a longer period of time. The scenario also assumes that symptoms of the disease are not easily recognisable during inspections and that infections are asymptomatic.

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

The scenario assumes a limited presence of the pathogen in the nurseries and the surroundings and that the plants are exposed to the pathogen for a sufficient period of time to cause infection through mechanical wounds. Poplars are suitable hosts.

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 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.2.6.5 | Elicitation outcomes of the assessment of the pest freedom for *Entoleuca mammata* on bare root plants of *Populus alba* and *Populus nigra*

The following Tables show the elicited and fitted values for pest infection (Table A.11) and pest freedom (Table A.12).

**TABLE A.11** Elicited and fitted values of the uncertainty distribution of pest infestation by *Entoleuca mammata* per 10,000 plants/bundles.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elicited values | 0 | | | | | 15 | | 29 | | 50 | | | | | 120 |
| EKE | 1.25 | 2.45 | 4.11 | 7.00 | 10.6 | 14.9 | 19.3 | 29.2 | 41.7 | 49.8 | 60.5 | 73.1 | 88.8 | 103 | 120 |

*Note*: The EKE results is the BetaGeneral (1.3991, 10.013, 0, 290) 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 plants/bundles per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.12.

**TABLE A.12** The uncertainty distribution of plants free of *Entoleuca mammata* per 10,000 plants/bundles calculated by Table A.11.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Values | 9880 | | | | | 9950 | | 9971 | | 9985 | | | | | 10,000 |
| EKE results | 9880 | 9897 | 9911 | 9927 | 9940 | 9950 | 9958 | 9971 | 9981 | 9985 | 9989 | 9993 | 9996 | 9998 | 9999 |

*Note*: The EKE results are the fitted values.

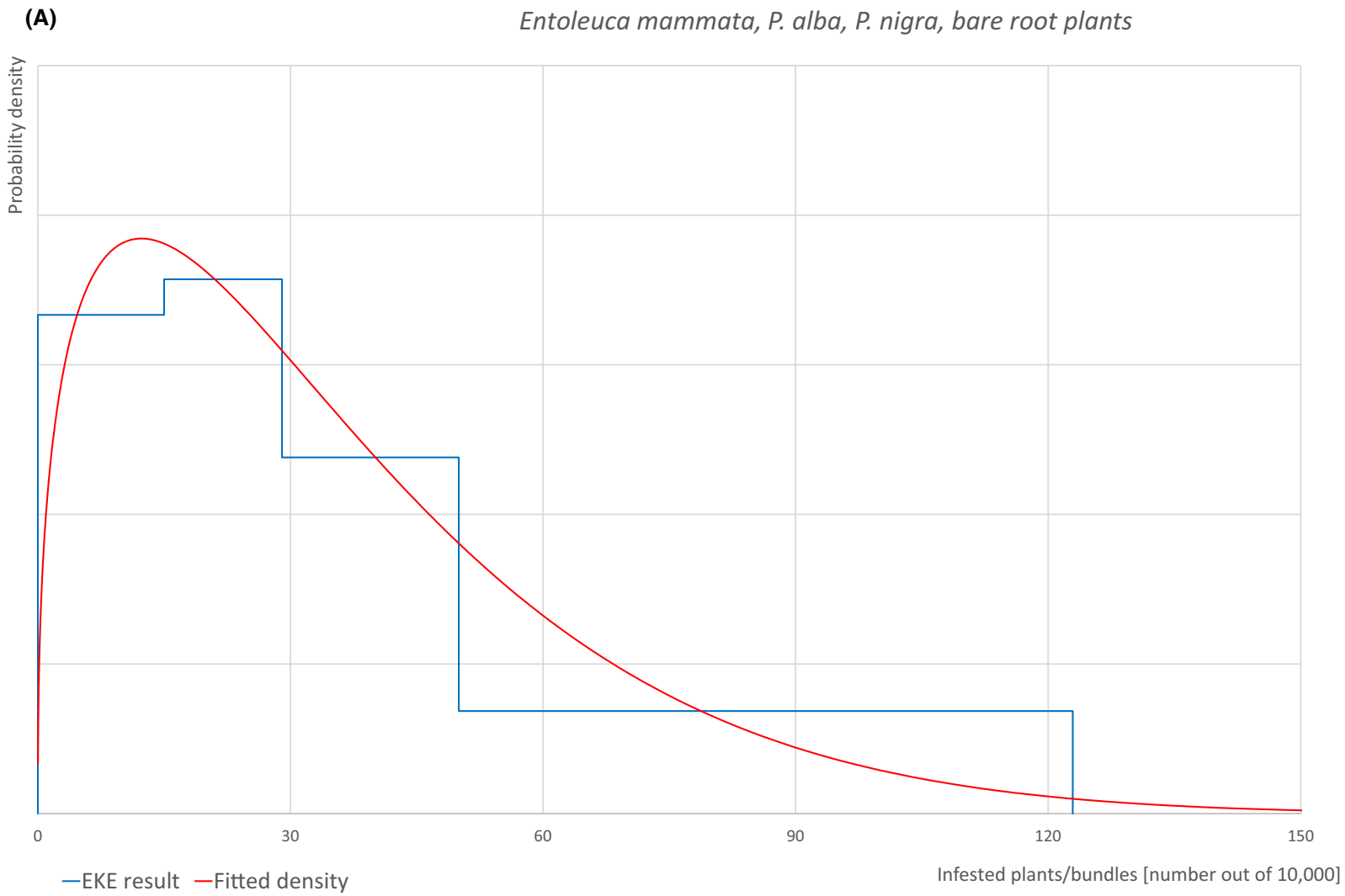


**FIGURE A.6** (Continued)

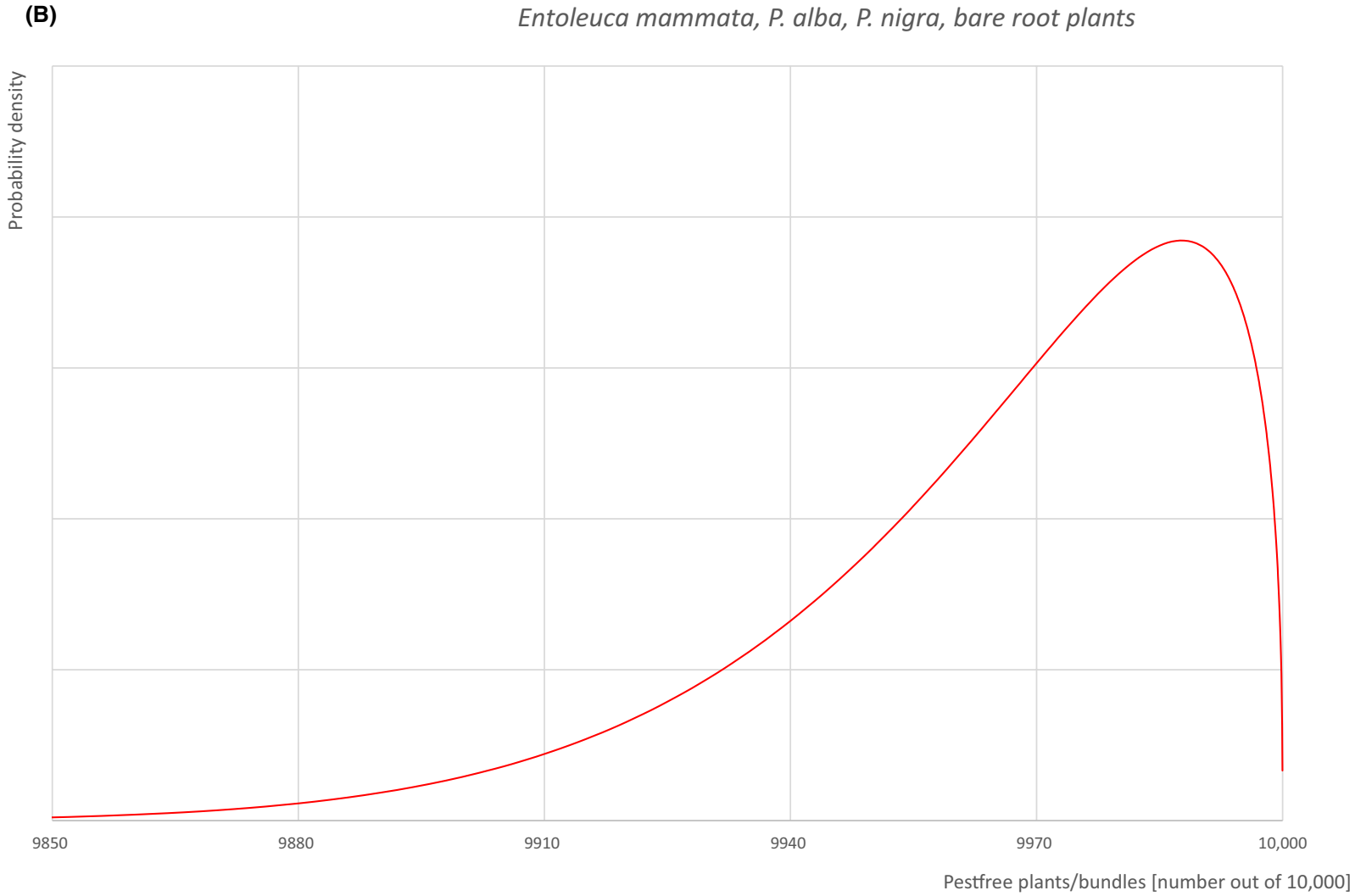


**FIGURE A.6** (Continued)

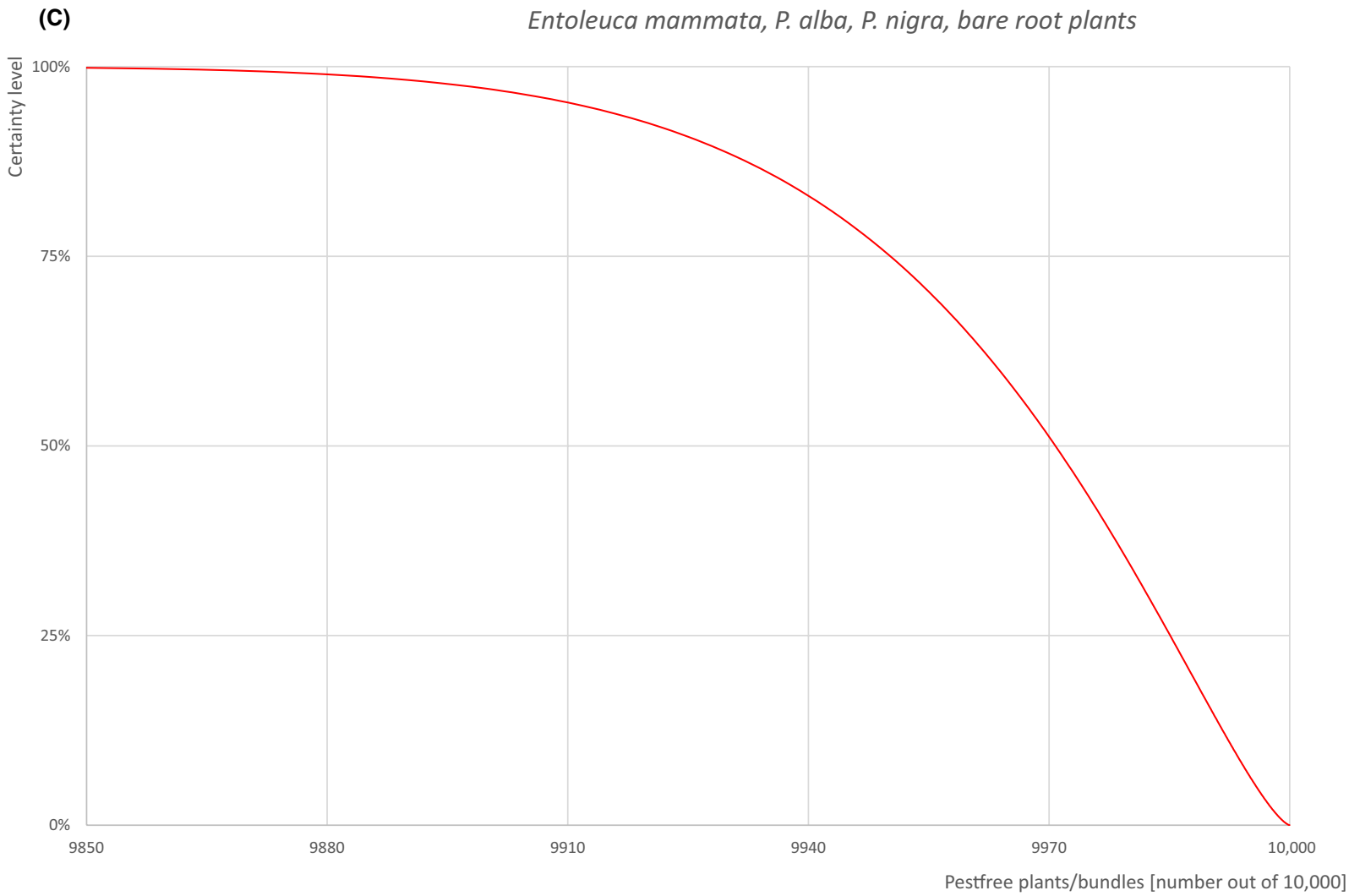


**FIGURE A.6** (A) Elicited uncertainty of pest infection per 10,000 plants/bundles (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free bare root plants/bundles per 10,000 (i.e. = 1 – pest infection proportion expressed as percentage); (C) descending uncertainty distribution function of pest infection per 10,000 plants/bundles.

### A.2.6.6 | Elicitation outcomes of the assessment of the pest freedom for *Entoleuca mammata* on bare root plants of *Populus tremula*

The following Tables show the elicited and fitted values for pest infection (Table A.13) and pest freedom (Table A.14).

**TABLE A.13** Elicited and fitted values of the uncertainty distribution of pest infestation by *Entoleuca mammata* per 10,000 plants/bundles.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elicited values | 0 | | | | | 30 | | 58 | | 100 | | | | | 240 |
| EKE | 2.51 | 4.90 | 8.22 | 14.0 | 21.1 | 29.8 | 38.7 | 58.4 | 83.3 | 99.6 | 121 | 146 | 178 | 206 | 241 |

*Note*: The EKE results is the BetaGeneral (1.3991, 10.013, 0, 580) 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 plants/bundles per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.14.

**TABLE A.14** The uncertainty distribution of plants free of *Entoleuca mammata* per 10,000 plants/bundles calculated by Table A.13.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Values | 9760 | | | | | 9900 | | 9942 | | 9970 | | | | | 10,000 |
| EKE results | 9759 | 9794 | 9822 | 9854 | 9879 | 9900 | 9917 | 9942 | 9961 | 9970 | 9979 | 9986 | 9992 | 9995 | 9997 |

*Note*: The EKE results are the fitted values.


**FIGURE A.7** (Continued)

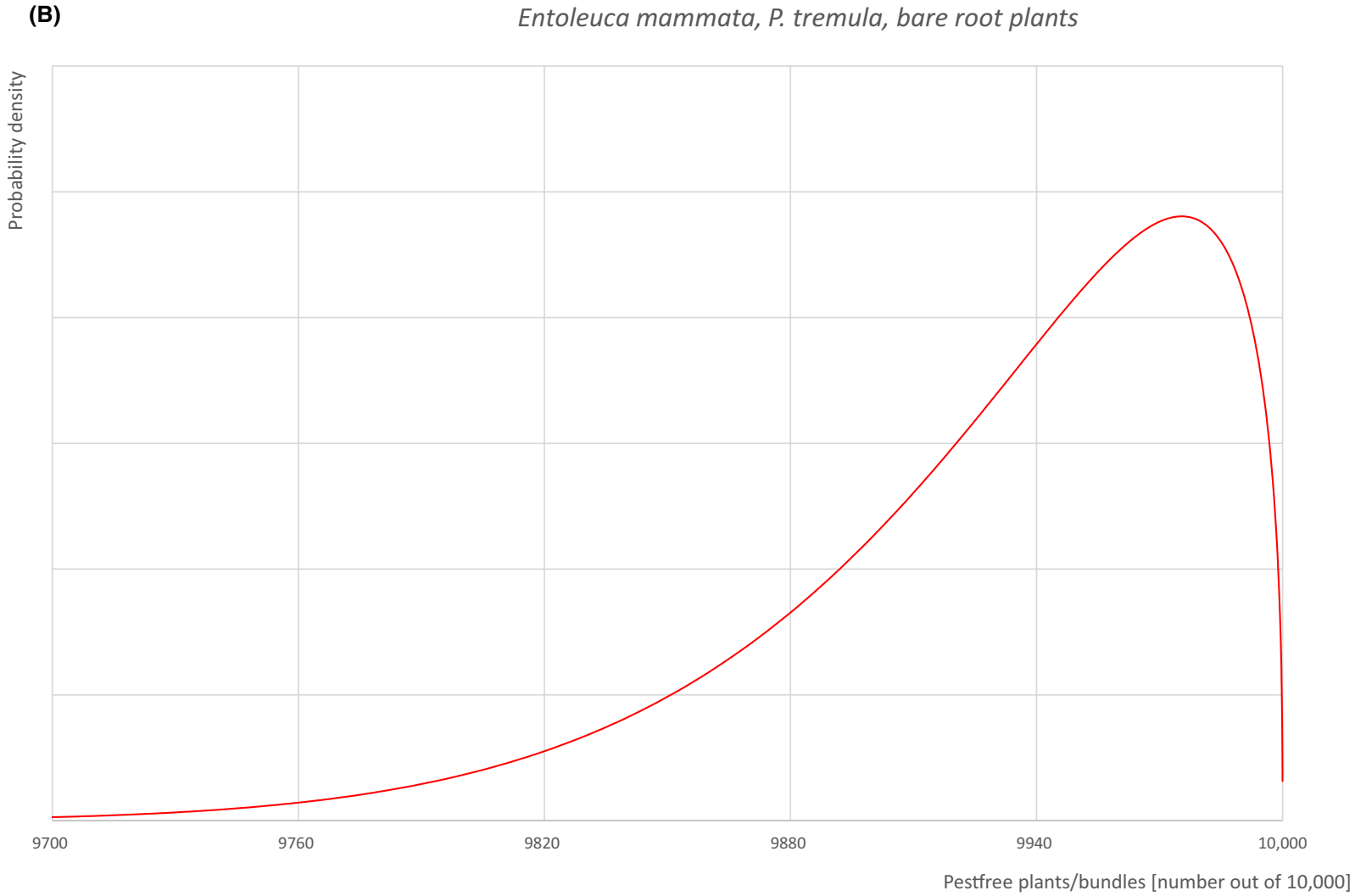


**FIGURE A.7** (Continued)

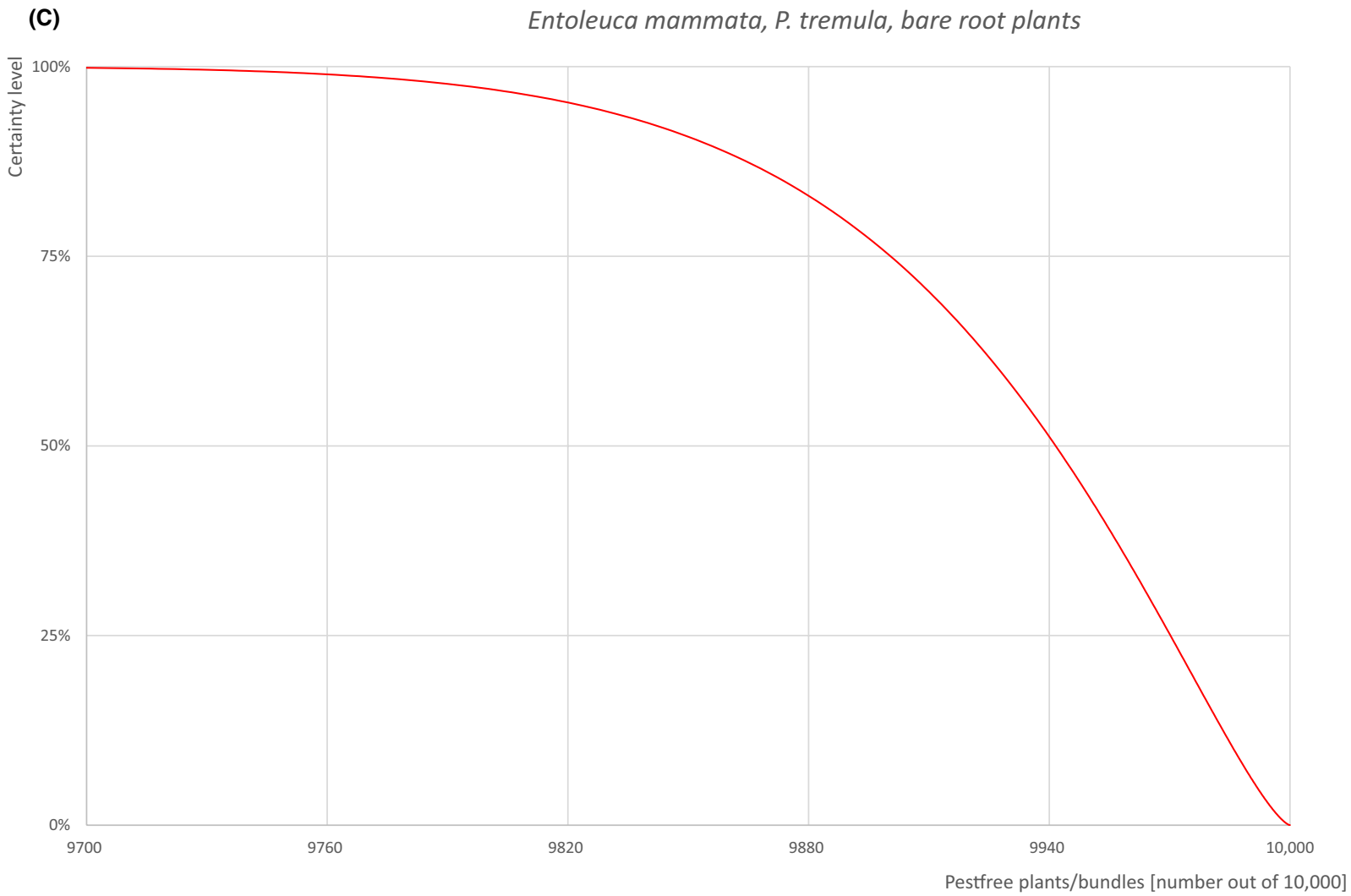


**FIGURE A.7** (A) Elicited uncertainty of pest infection per 10,000 plants/bundles (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free bare root plants/bundles per 10,000 (i.e. = 1 – pest infection proportion expressed as percentage); (C) descending uncertainty distribution function of pest infection per 10,000 plants/bundles.

### A.2.7 | Overall likelihood of pest freedom for cell grown plants

A.2.7.1 | Reasoning for a scenario which would lead to a reasonably low number of infected cell grown plants

The scenario assumes the pest to be absent or with a low pressure in the nurseries and in the surroundings. Younger plants are exposed to the pathogen for only a short period of time. The scenario also assumes that symptoms of the disease are visible and promptly detected during inspections.

A.2.7.2 | Reasoning for a scenario which would lead to a reasonably high number of infected cell grown plants

The scenario assumes a high pressure of the pathogen in the nurseries and in the surroundings as suitable hosts are present. Older plants are exposed to the pathogen for a longer period of time. Cell grown plants are in close proximity to each other, which increases the humidity and hence provides good growth conditions for *E. mammata*. The scenario also assumes that symptoms of the disease are not easily recognisable during inspections and that infections are asymptomatic.

A.2.7.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infected bundles of whips and seedlings (Median)

The scenario assumes a limited presence of the pathogen in the nurseries and the surroundings and that the plants are exposed to the pathogen for a sufficient period of time to cause infection through mechanical wounds. Plants are very young and therefore they display a limited susceptibility to the pathogen. Poplars are suitable hosts.

A.2.7.4 | 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. The young age of plants would also leave less uncertainty for estimates above the median.

### A.2.7.5 | Elicitation outcomes of the assessment of the pest freedom for *Entoleuca mammata* on cell grown plants of *Populus alba* and *Populus nigra*

The following Tables show the elicited and fitted values for pest infection (Table A.15) and pest freedom (Table A.16).

**TABLE A.15** Elicited and fitted values of the uncertainty distribution of pest infestation by *Entoleuca mammata* per 10,000 bundles.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elicited values | 0 | | | | | 10 | | 20 | | 40 | | | | | 90 |
| EKE | 0.351 | 0.873 | 1.75 | 3.54 | 6.04 | 9.34 | 12.9 | 21.2 | 32.0 | 38.9 | 47.8 | 57.9 | 69.6 | 79.4 | 90.0 |

*Note*: The EKE results is the BetaGeneral (1.0126, 3.9819, 0, 131) 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.16.

**TABLE A.16** The uncertainty distribution of plants free of *Entoleuca mammata* per 10,000 bundles calculated by Table A.15.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Values | 9910 | | | | | 9960 | | 9980 | | 9990 | | | | | 10,000 |
| EKE results | 9910 | 9921 | 9930 | 9942 | 9952 | 9961 | 9968 | 9979 | 9987 | 9991 | 9994 | 9996 | 9998 | 9999.1 | 9999.6 |

*Note*: The EKE results are the fitted values.

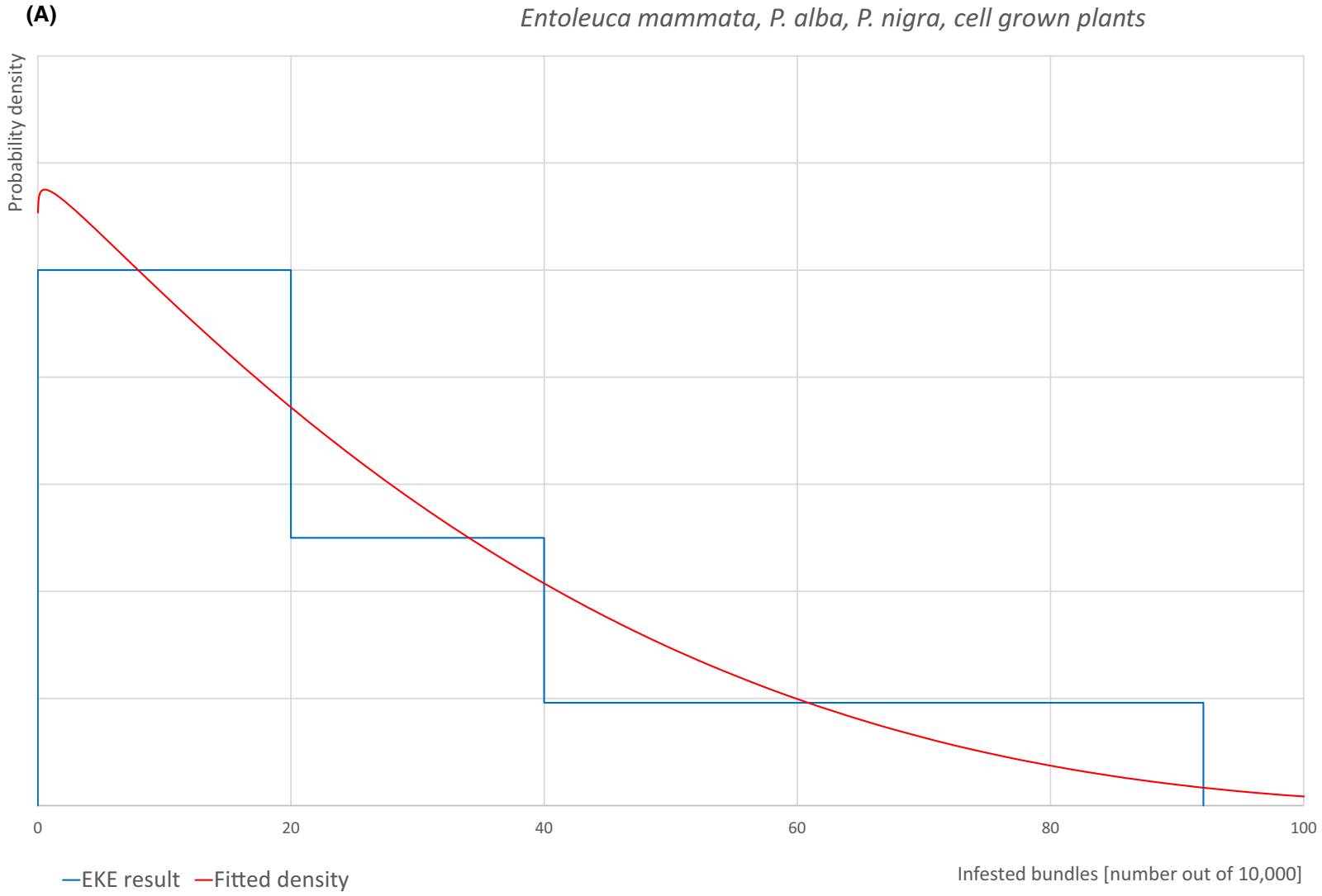


**FIGURE A.8** (Continued)

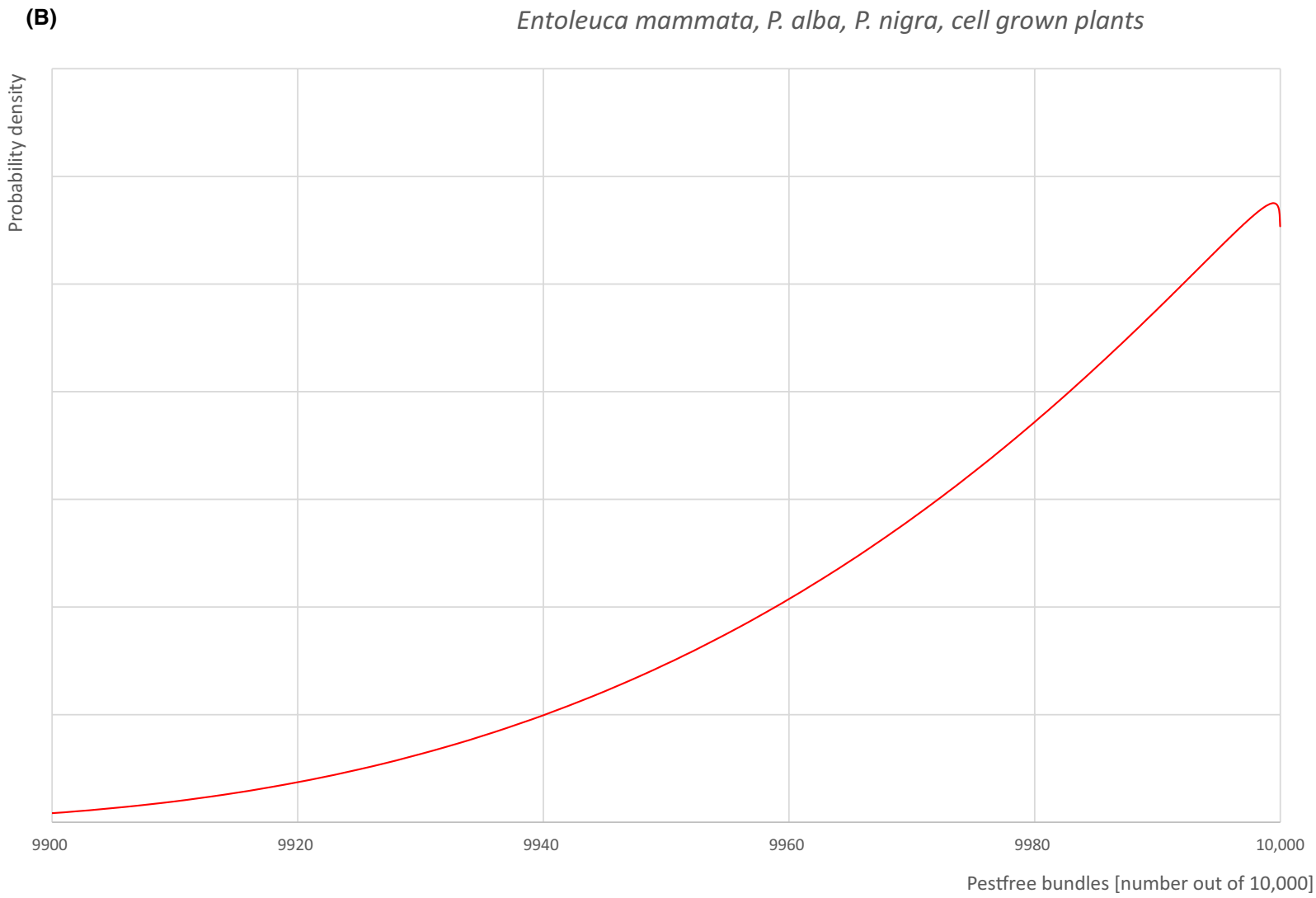


**FIGURE A.8** (Continued)

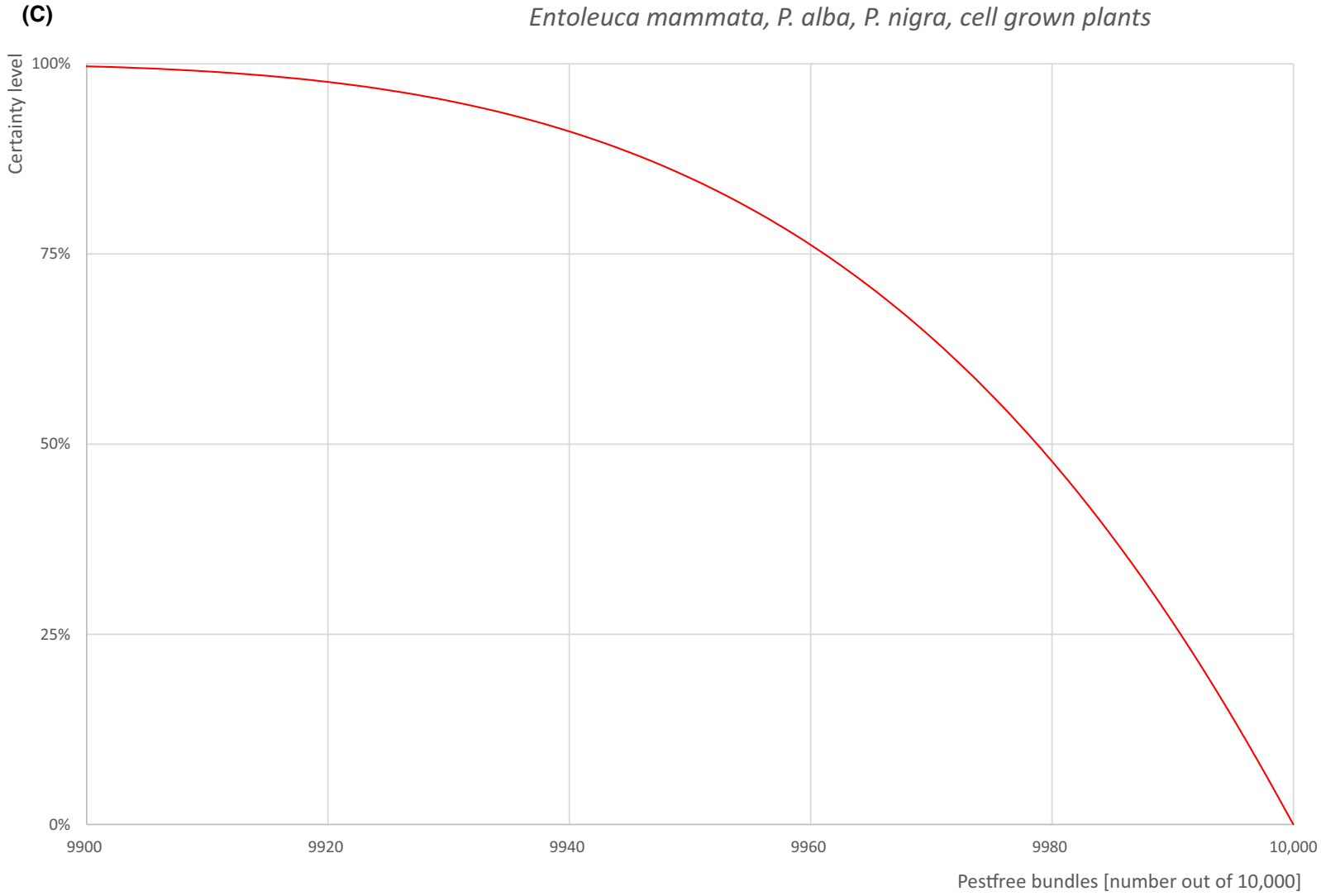


**FIGURE A.8** (A) Elicited uncertainty of pest infection per 10,000 bundles (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free bundles per 10,000 (i.e. = 1 – pest infection proportion expressed as percentage); (C) descending uncertainty distribution function of pest infection per 10,000 bundles.

### A.2.7.6 | Elicitation outcomes of the assessment of the pest freedom for *Entoleuca mammata* on cell grown plants of *Populus tremula*

The following Tables show the elicited and fitted values for pest infection (Table A.17) and pest freedom (Table A.18).

**TABLE A.17** Elicited and fitted values of the uncertainty distribution of pest infestation by *Entoleuca mammata* per 10,000 bundles.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elicited values | 0 | | | | | 20 | | 40 | | 80 | | | | | 180 |
| EKE | 0.702 | 1.75 | 3.50 | 7.07 | 12.1 | 18.7 | 25.8 | 42.5 | 63.9 | 77.7 | 95.6 | 116 | 139 | 159 | 180 |

*Note*: The EKE results is the BetaGeneral (1.0126, 3.9819, 0, 262) 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.18.

**TABLE A.18** The uncertainty distribution of plants free of *Entoleuca mammata* per 10,000 bundles calculated by Table A.17.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Values | 9820 | | | | | 9920 | | 9960 | | 9980 | | | | | 10,000 |
| EKE results | 9820 | 9841 | 9861 | 9884 | 9904 | 9922 | 9936 | 9958 | 9974 | 9981 | 9988 | 9993 | 9997 | 9998 | 9999 |

*Note*: The EKE results are the fitted values.

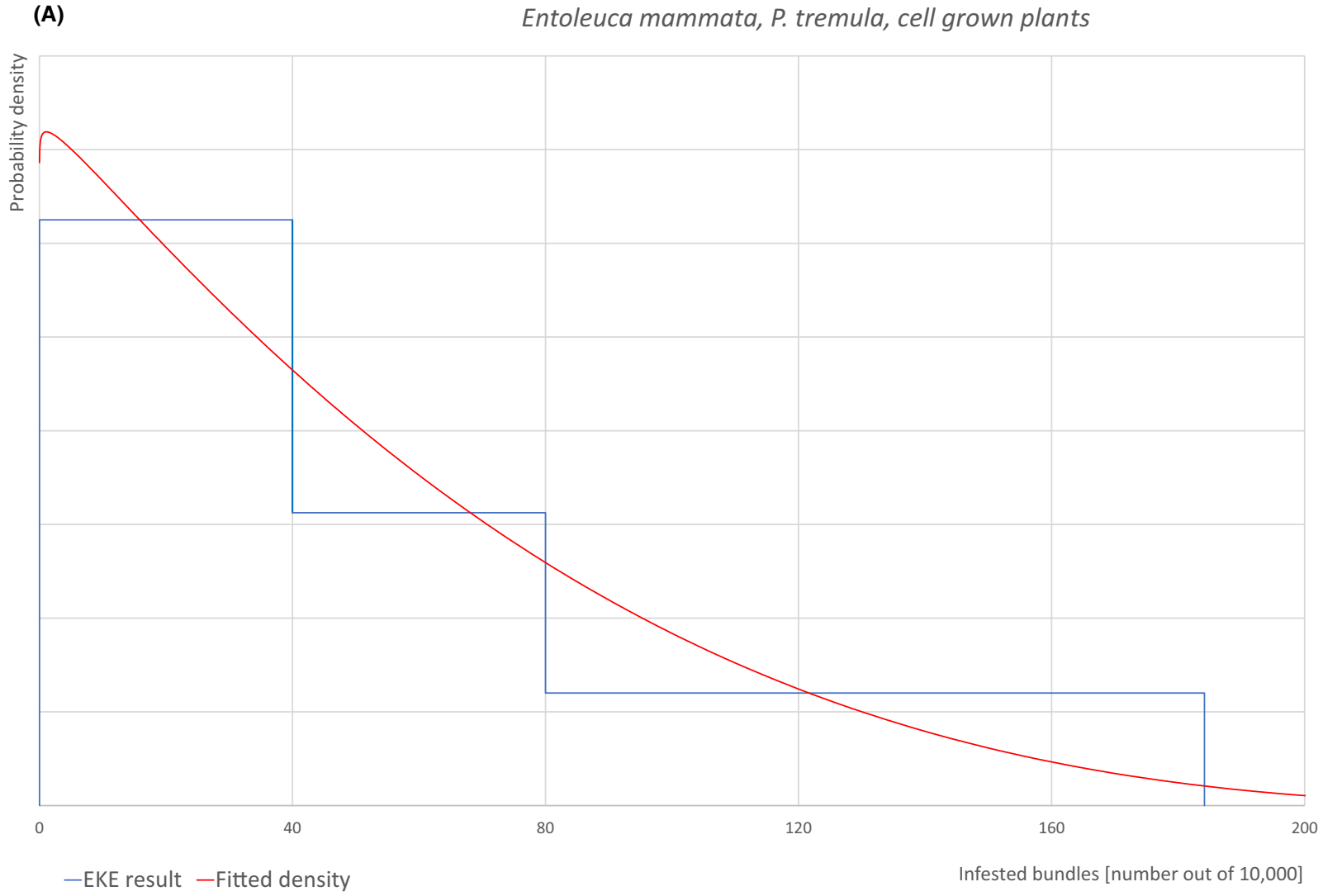


**FIGURE A.9** (Continued)

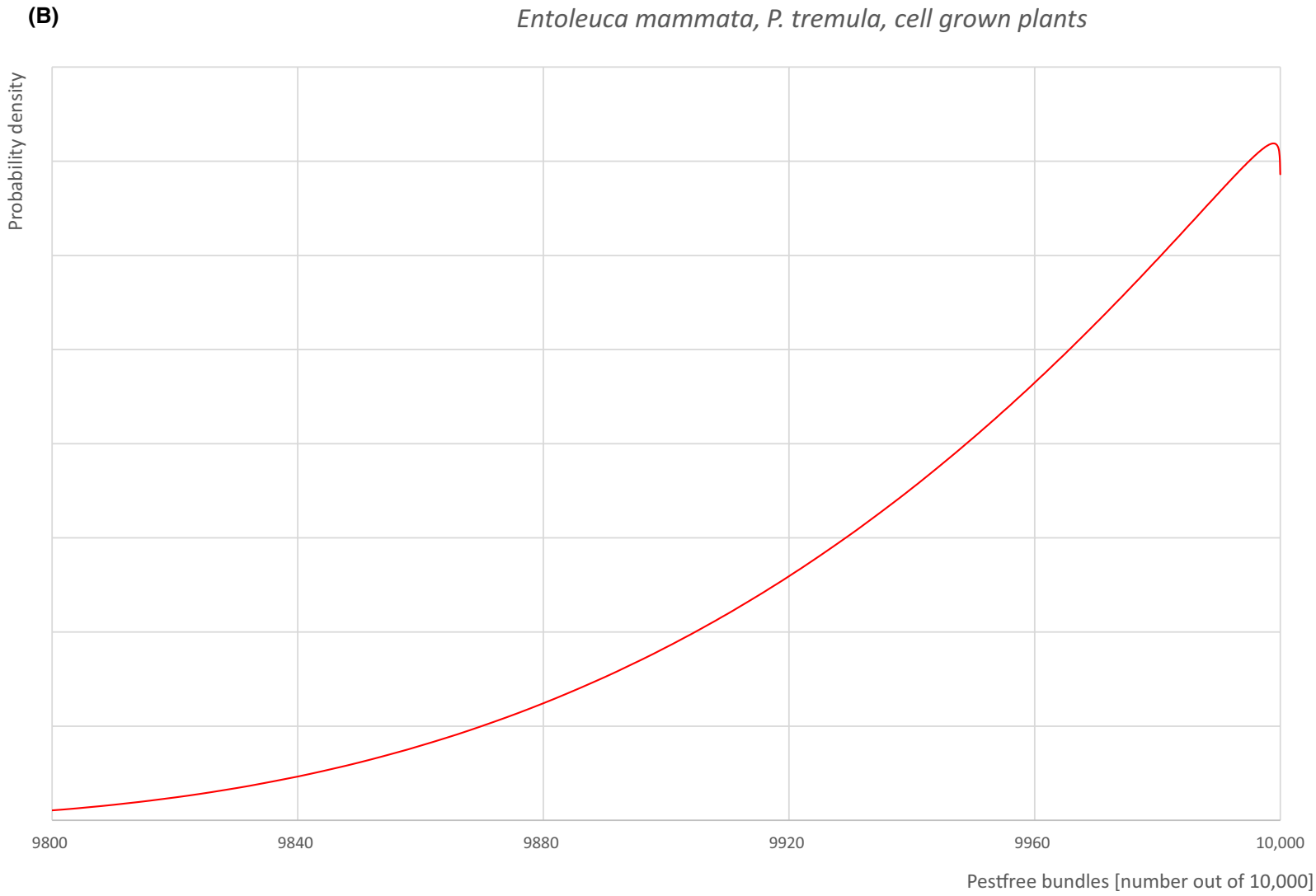


**FIGURE A.9** (Continued)

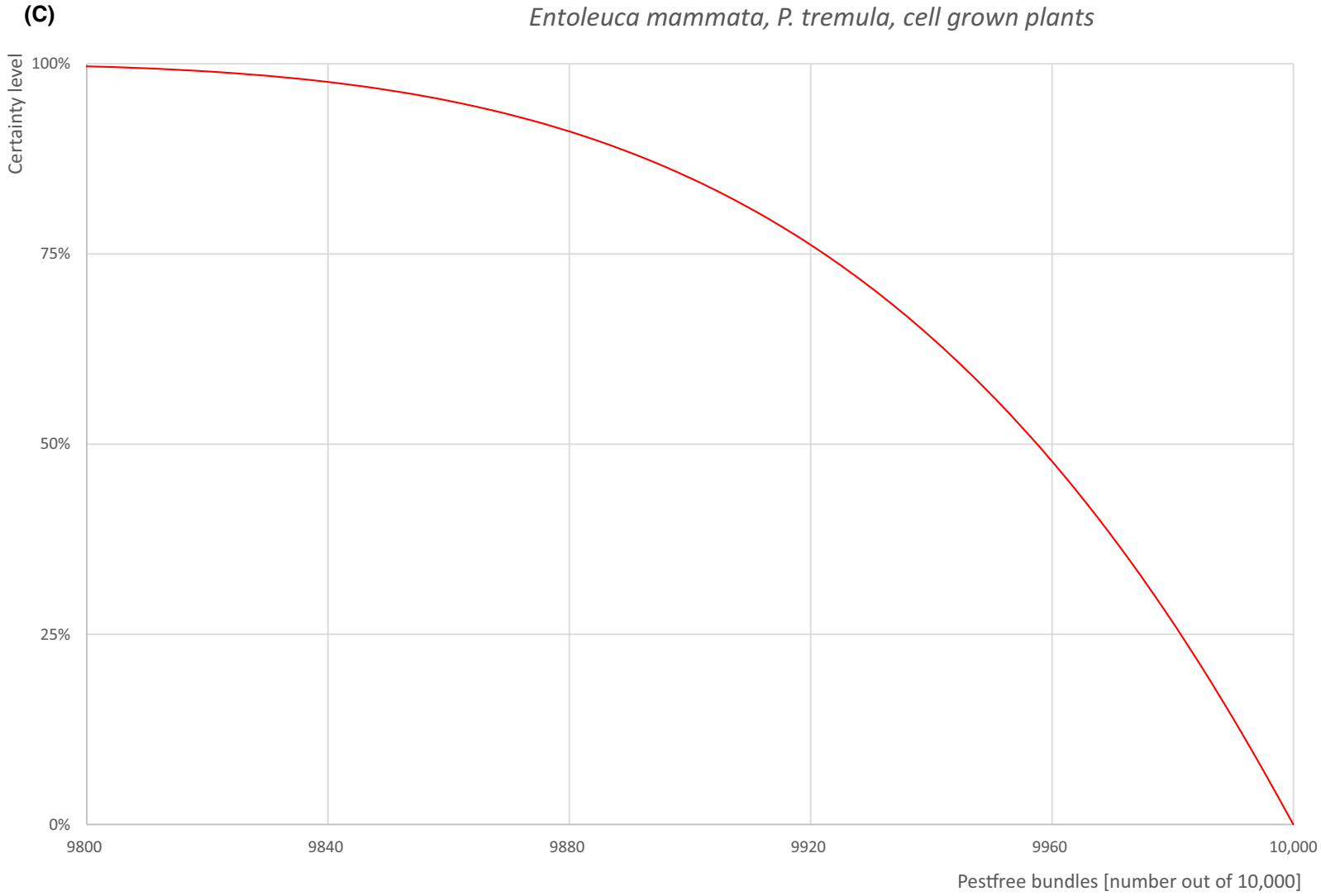


**FIGURE A.9** (A) Elicited uncertainty of pest infection per 10,000 bundles (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest free bundles per 10,000 (i.e. = 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 plants in pots

A.2.8.1 | Reasoning for a scenario which would lead to a reasonably low number of infected plants in pots

The scenario assumes the pest to be absent or with a low pressure in the nurseries and in the surroundings. Younger plants are exposed to the pathogen for only a short period of time. The scenario also assumes that symptoms of the disease are visible and promptly detected during inspections.

A.2.8.2 | Reasoning for a scenario which would lead to a reasonably high number of infected plants in pots

The scenario assumes a high pressure of the pathogen in the nurseries and in the surroundings as suitable hosts are present. Older plants are exposed to the pathogen for a longer period of time. The scenario also assumes that symptoms of the disease are not easily recognisable during inspections and that infections are asymptomatic.

A.2.8.3 | Reasoning for a central scenario equally likely to over- or underestimate the number of infected plants in pots (Median)

The scenario assumes a limited presence of the pathogen in the nurseries and the surroundings and that the plants are exposed to the pathogen for a sufficient period of time to cause infection through mechanical wounds. Poplars are suitable hosts.

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 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.2.8.5 | Elicitation outcomes of the assessment of the pest freedom for *Entoleuca mammata* on plants in pots of *Populus alba* and *Populus nigra*

The following Tables show the elicited and fitted values for pest infection (Table A.19) and pest freedom (Table A.20).

**TABLE A.19** Elicited and fitted values of the uncertainty distribution of pest infestation by *Entoleuca mammata* per 10,000 plants.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elicited values | 0 | | | | | 20 | | 39 | | 80 | | | | | 170 |
| EKE | 0.604 | 1.56 | 3.22 | 6.69 | 11.6 | 18.2 | 25.4 | 42.2 | 63.6 | 77.3 | 94.6 | 114 | 135 | 153 | 171 |

*Note*: The EKE results is the BetaGeneral (0.96971, 3.2104, 0, 225) 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 plants per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.20.

**TABLE A.20** The uncertainty distribution of plants free of *Entoleuca mammata* per 10,000 plants calculated by Table A.19.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Values | 9830 | | | | | 9920 | | 9961 | | 9980 | | | | | 10,000 |
| EKE results | 9829 | 9847 | 9865 | 9886 | 9905 | 9923 | 9936 | 9958 | 9975 | 9982 | 9988 | 9993 | 9997 | 9998 | 9999 |

*Note*: The EKE results are the fitted values.

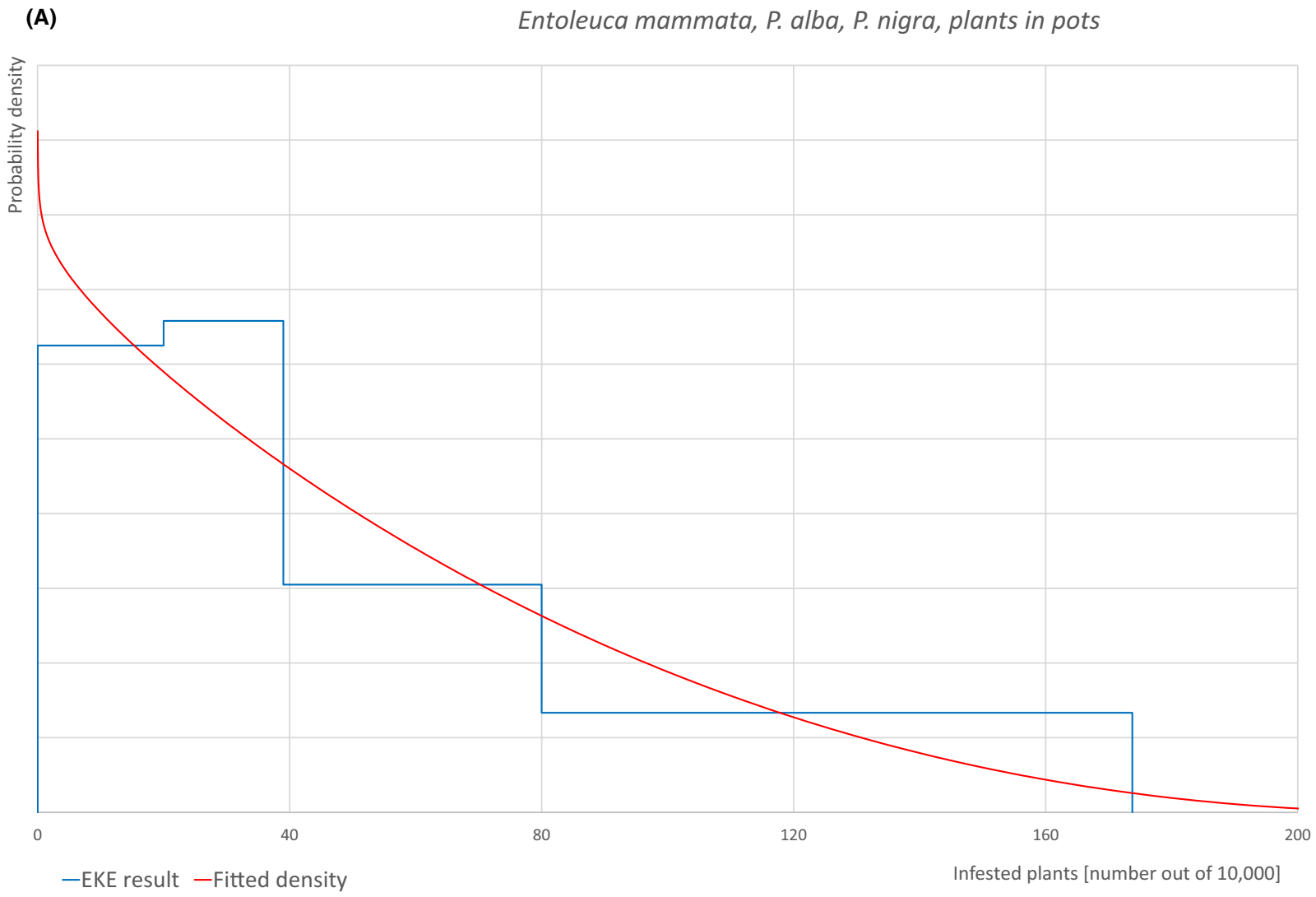


**FIGURE A.10** (Continued)

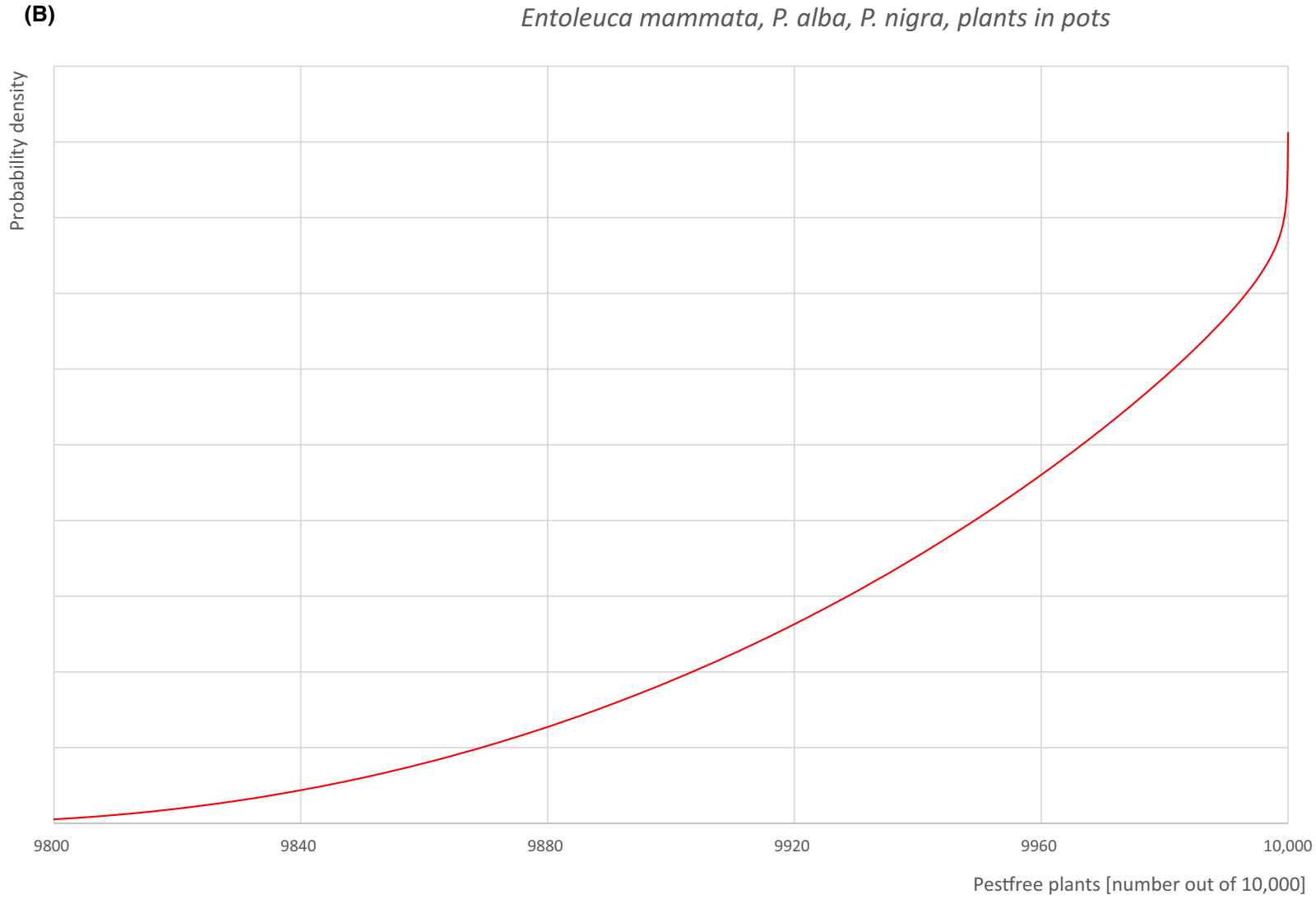


**FIGURE A.10** (Continued)

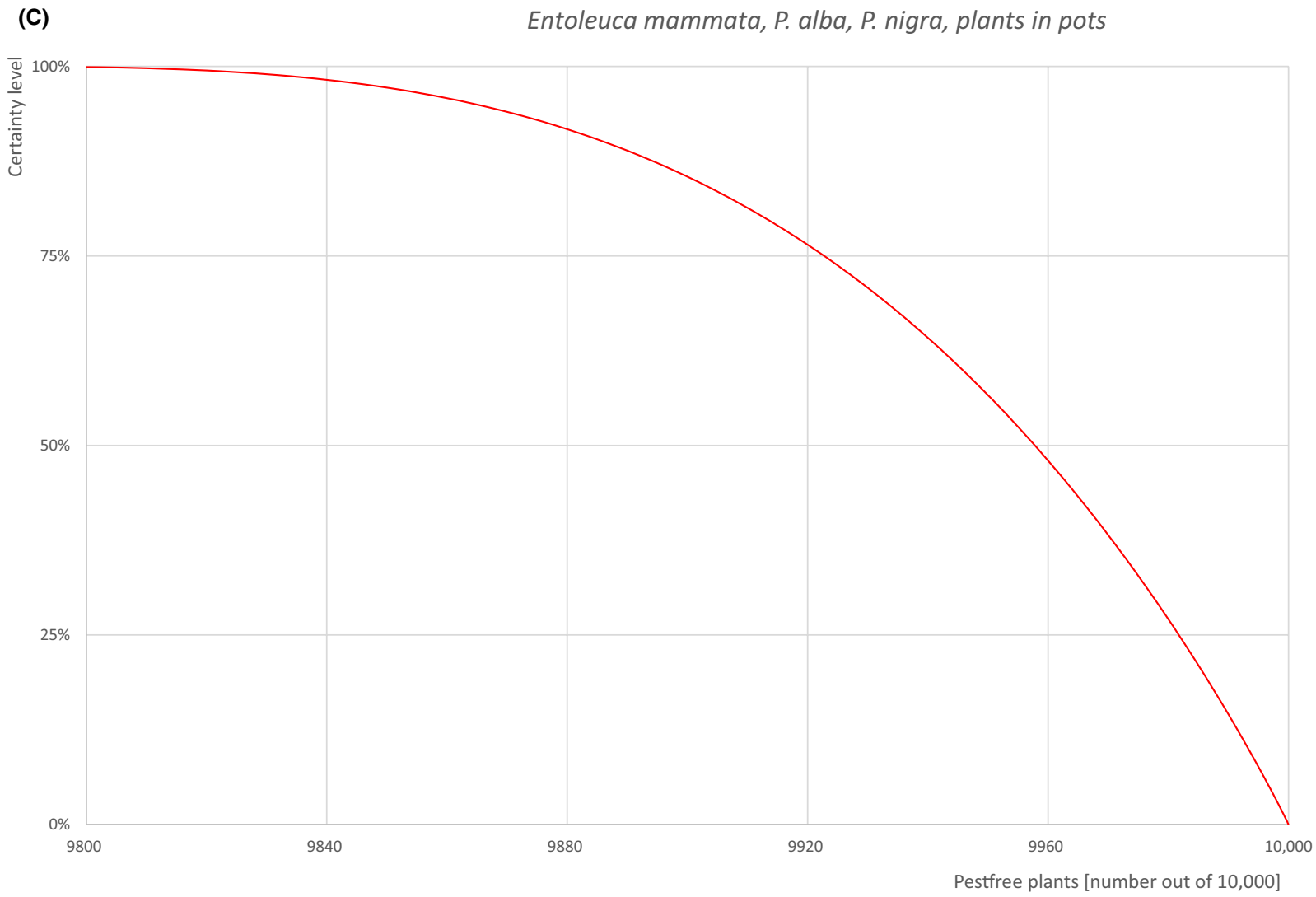


**FIGURE A.10** (A) Elicited uncertainty of pest infection per 10,000 plants (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free plants per 10,000 (i.e.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

### A.2.8.6 | Elicitation outcomes of the assessment of the pest freedom for *Entoleuca mammata* on plants in pots of *Populus tremula*

The following Tables show the elicited and fitted values for pest infection (Table A.21) and pest freedom (Table A.22).

**TABLE A.21** Elicited and fitted values of the uncertainty distribution of pest infestation by *Entoleuca mammata* per 10,000 plants.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elicited values | 0 | | | | | 40 | | 78 | | 160 | | | | | 340 |
| EKE | 1.21 | 3.12 | 6.43 | 13.4 | 23.3 | 36.5 | 50.9 | 84.4 | 127 | 155 | 189 | 227 | 270 | 305 | 341 |

*Note*: The EKE results is the BetaGeneral (0.96971, 3.2104, 0, 450) 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 plants per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.22.

**TABLE A.22** The uncertainty distribution of plants free of *Entoleuca mammata* per 10,000 plants calculated by Table A.21.

| Percentile | 1% | 2.5% | 5% | 10% | 17% | 25% | 33% | 50% | 67% | 75% | 83% | 90% | 95% | 97.5% | 99% |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Values | 9660 | | | | | 9840 | | 9922 | | 9960 | | | | | 10,000 |
| EKE results | 9659 | 9695 | 9730 | 9773 | 9811 | 9845 | 9873 | 9916 | 9949 | 9964 | 9977 | 9987 | 9994 | 9997 | 9999 |

*Note*: The EKE results are the fitted values.

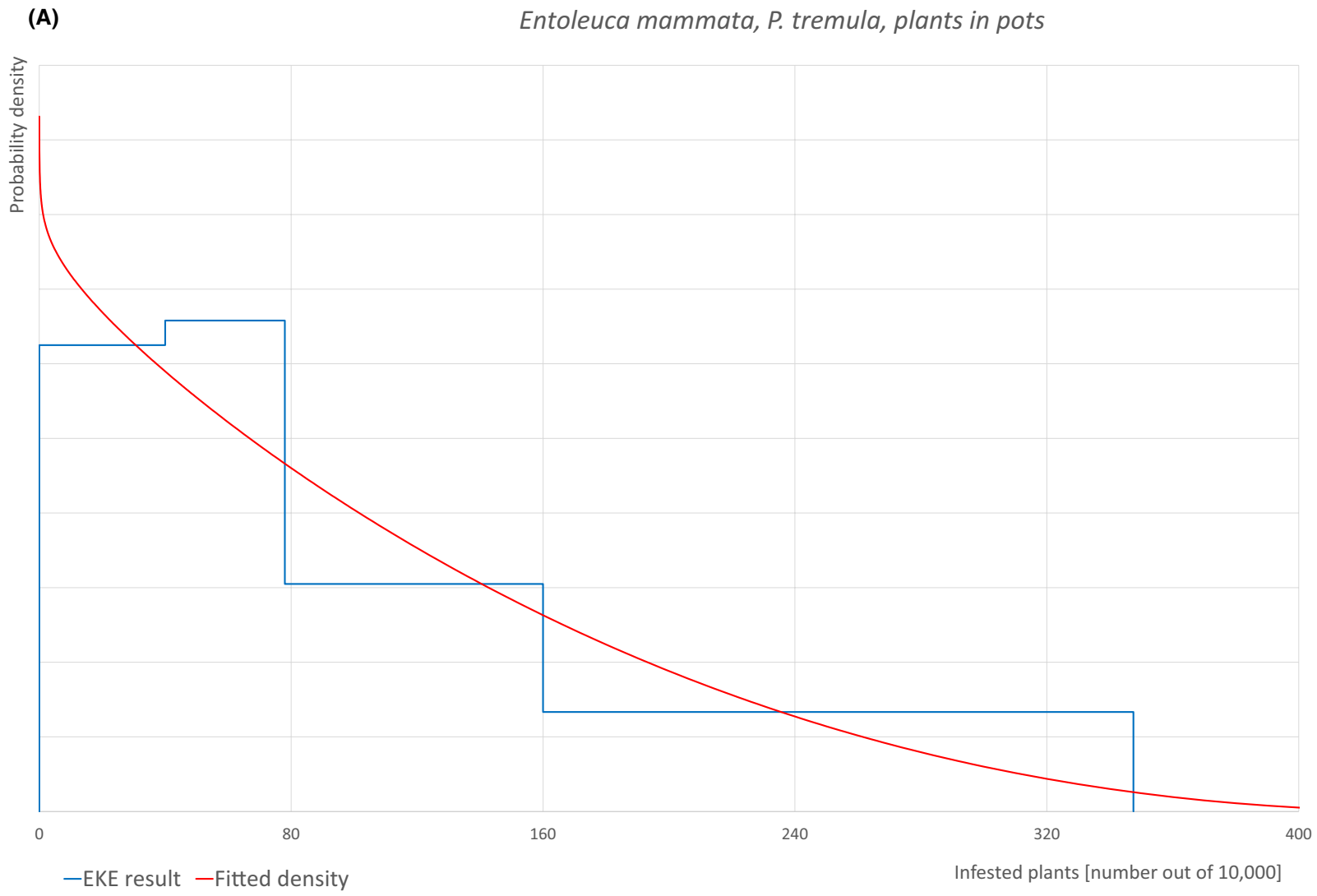


**FIGURE A.11** (Continued)

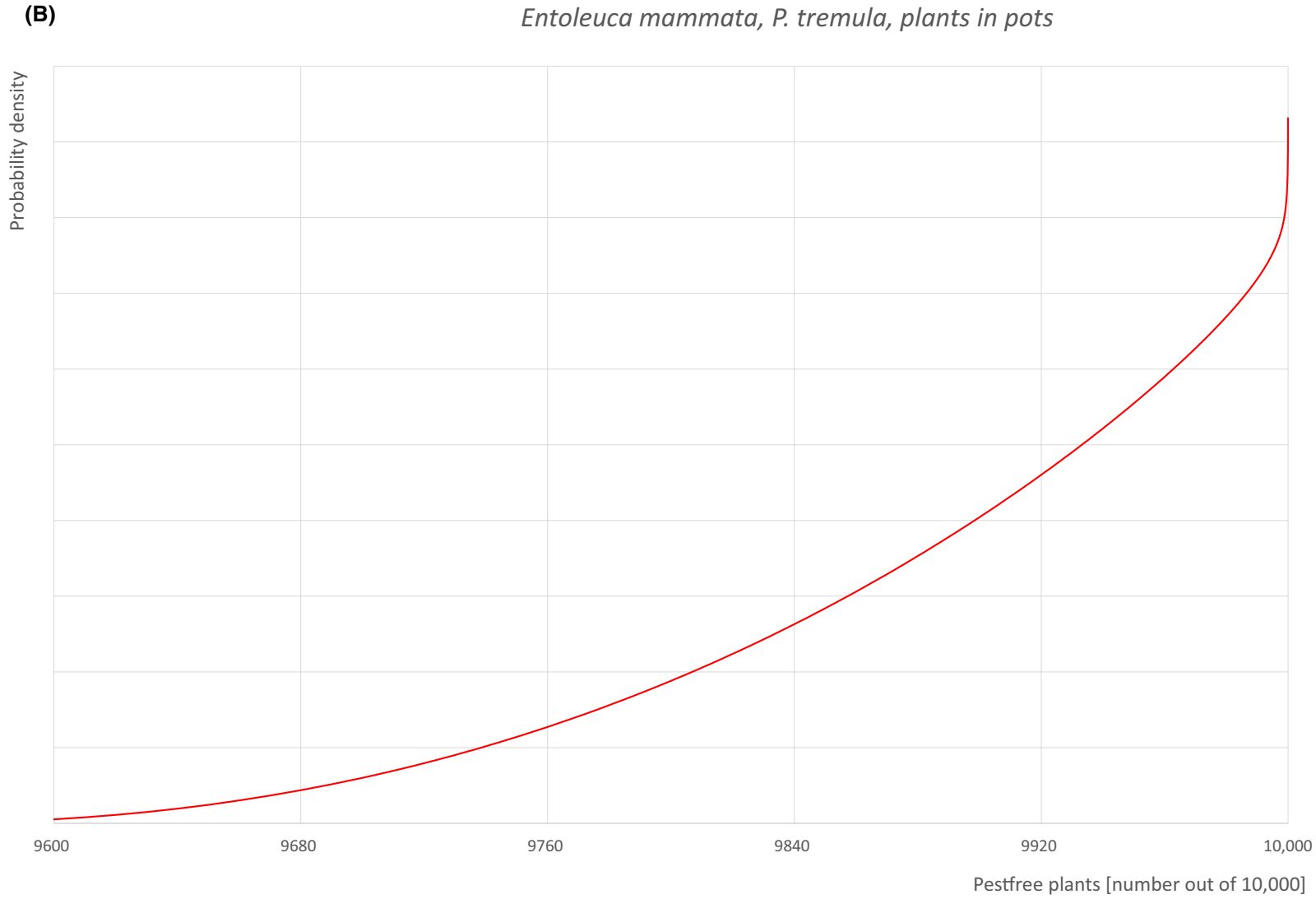


**FIGURE A.11** (Continued)

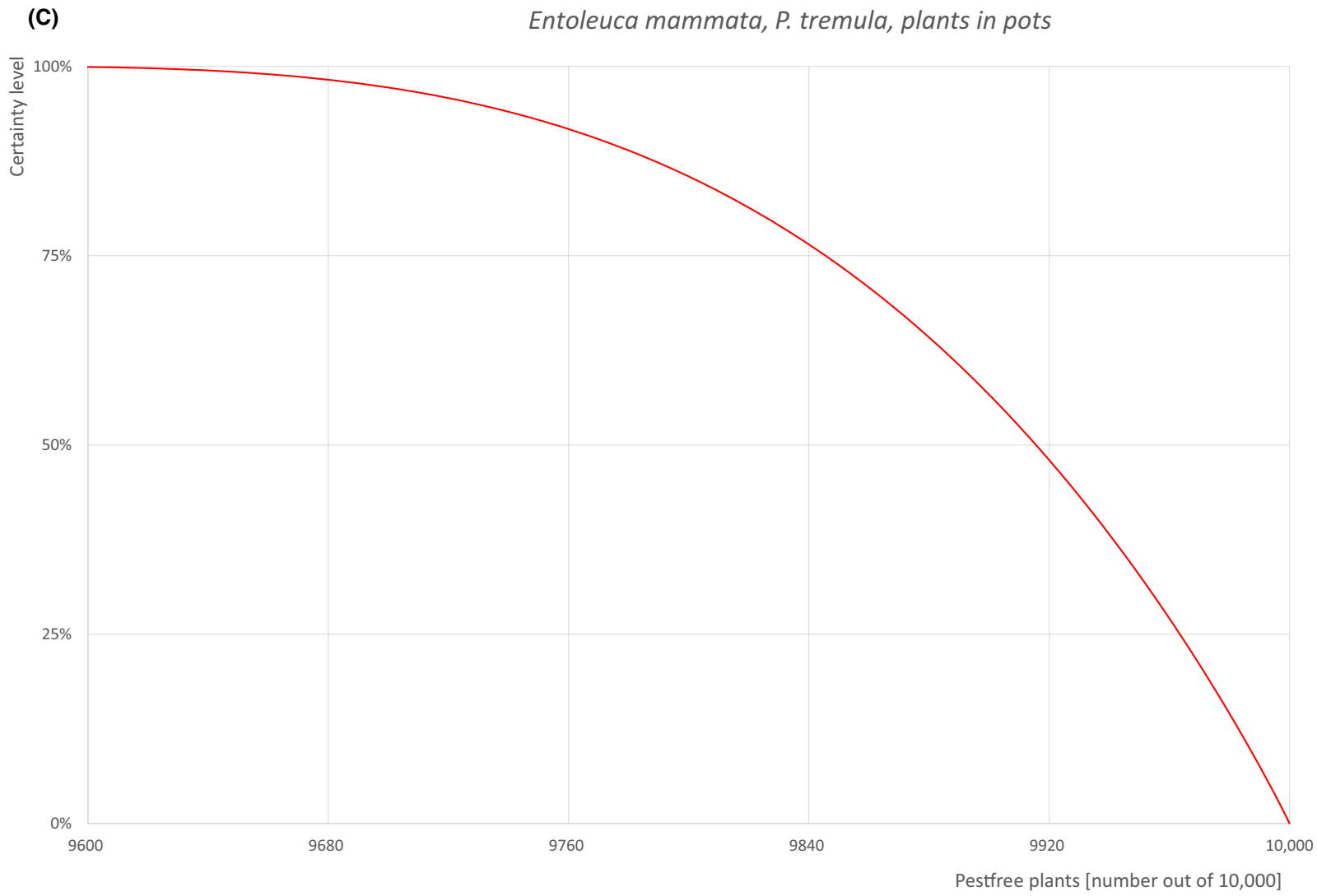


**FIGURE A.11** (A) Elicited uncertainty of pest infection per 10,000 plants (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free plants per 10,000 (i.e. = 1 – pest infection proportion expressed as percentage); (C) descending uncertainty distribution function of pest infection per 10,000 plants.

## A.2.9 | References


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# APPENDIX B

## Web of Science All Databases Search String

In the Table B.1, the search string for *Populus alba* used in Web of Science is reported. Totally, 653 papers were retrieved. Titles and abstracts were screened, and 64 pests were added to the list of pests (see Appendix F).

In the Table B.2, the search string for *Populus nigra* used in Web of Science is reported. Totally, 1230 papers were retrieved. Titles and abstracts were screened, and 60 pests were added to the list of pests (see Appendix F).

In the Table B.3, the search string for *Populus tremula* used in Web of Science is reported. Totally, 707 papers were retrieved. Titles and abstracts were screened, and 145 pests were added to the list of pests (see Appendix F).

**TABLE B.1** String for *Populus alba*.

| | |
|---|---|
| Web of Science All databases | **TOPIC:** "Populus alba" OR "P. alba" OR "abele" OR "silver-leaved poplar" OR "white poplar" OR "Bolle's poplar" OR "Leuce alba" OR "Populus bolleana" OR "Populus nivea"<br>**AND**<br>**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$" OR virosis OR viroses OR blight$ 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 rootknot OR cyst$ OR "dagger" OR "plant parasitic" OR "parasitic plant" OR "plant$parasitic" OR "root feeding" OR "root$feeding"<br>**NOT**<br>**TOPIC:** "winged seeds" OR metabolites OR *tannins OR climate OR "maple syrup" OR syrup OR mycorrhiz* OR "carbon loss" OR pollut* OR weather OR propert* OR probes OR spectr* OR antioxidant$ OR transformation OR RNA OR DNA OR "Secondary plant metabolite$" OR metabol* OR "Phenolic compounds" OR Quality OR Abiotic OR Storage OR Pollen* OR fertil* OR Mulching OR Nutrient* OR Pruning OR drought OR "human virus" OR "animal disease*" OR "plant extracts" OR immunological OR "purified fraction" OR "traditional medicine" OR medicine OR mammal* OR bird* OR "human disease*" OR biomarker$ OR "health education" OR bat$ OR "seedling$ survival" OR "anthropogenic disturbance" OR "cold resistance" OR "salt stress" OR salinity OR "aCER method" OR "adaptive cognitive emotion regulation" OR nitrogen OR hygien* OR "cognitive function$" OR fossil$ OR *toxicity OR Miocene OR postglacial OR "weed control" OR landscape<br>**NOT**<br>**TOPIC:** "Agrilus horni" OR "Anoplophora chinensis" OR "Apriona cinerea" OR "Apriona germari" OR "Chondrostereum purpureum" OR "Choristoneura conflictana" OR "Comstockaspis perniciosa" OR "Entoleuca mammata" OR "Euwallacea fornicatus sensu lato" OR "Euwallacea fornicatus sensu stricto" OR "Lopholeucaspis japonica" OR "Lycorma delicatula" OR "Megaplatypus mutatus" OR "Oemona hirta" OR "Orgyia leucostigma" OR "Phymatotrichopsis omnivora" OR "Trirachys sartus" OR "Xylotrechus namanganensis" OR "Anoplophora chinensis" OR "Chondrostereum purpureum" OR "Drepanopeziza punctiformis" OR "Earias vernana" OR "Gypsonoma aceriana" OR "Lymantria dispar asiatica" OR "Lymantria obfuscata" OR "Melampsora populnea" OR "Paranthrene tabaniformis" OR "Phloeomyzus passerinii" OR "Rhizobium radiobacter" OR "Rhizobium rhizogenes" OR "Saperda populnea" OR "Tremex fuscicornis" OR "Trirachys sartus" OR "Valsa sordida" OR "Xylotrechus namanganensis" OR "Cryptorhynchus lapathi" OR "Diplodia seriata" OR "Eulecanium tiliae" OR "Malacosoma parallela" OR "Orgyia leucostigma" OR "Phytophthora cactorum" OR "Saperda carcharias" OR "Spodoptera littoralis" OR "Longidorus euonymus" OR "Zygina nivea" OR "Aculus mogeri" OR "Alternaria alternata" OR "Armillaria gallica" OR "Armillaria mellea" OR "Armillaria tabescens" OR "Chrysomela tremula" OR "Cladosporium herbarum" OR "Gypsonoma minutana" OR "Longidorus attenuatus" OR "Longidorus elongatus" OR "Lycorma delicatula" OR "Lymantria dispar" OR "Melampsora laricis-populina" OR "Mycosphaerella populi" OR "Orientus ishidae" OR "Phyllocnistis unipunctella" OR "Chaitophorus dorocola ssp. Wuweiensis" OR "Chaitophorus leucomelas" OR "Chaitophorus indicus" OR "Chaitophorus longisetosus" OR "Chaitophorus melanosiphon" OR "Chaitophorus nassonowi" OR "Chaitophorus nigritus" OR "Chaitophorus populeti" OR "Chaitophorus populeti ssp. sensoriatus" OR "Chaitophorus populialbae" OR "Chaitophorus populialbae ssp. Yomefuri" OR "Chaitophorus populihabitans" OR "Chaitophorus tremulae" OR "Doraphis populi" OR "Epipoemphigus niisimae" OR "Gootiella alba" OR "Myzus persicae" OR "Pachypappa populi" OR "Pachypappa pseudobyrsa" OR "Pachypappa vesicalis" OR "Pachypappa warshavensis" OR "Pemphigus bursarius" OR "Pemphigus immunis" OR "Pemphigus protospirae" OR "Pemphigus vesicarius" OR "Phloeomyzus passerinii" OR "Phylloxerina populi" OR "Pterocomma anyangense" OR "Pterocomma dubium" OR "Pterocomma populeum" OR "Pterocomma sinipopulifoliae" OR "Pterocomma smithiae" OR "Pterocomma yezoense" OR "Stomaphis longirostris" OR "Tuberolachnus salignus" OR "Eriophyes populi" OR "Byctiscus betulae" OR "Byctiscus populi" OR "Saperda carcharias" OR "Saperda populnea" OR "Saperda scalaris" OR "Zeugophora subspinosa" OR "Rutidosoma globulus" OR "Cryptorhynchus lapathi" OR "Dorytomus dejeani" OR "Dorytomus filirostris" OR "Dorytomus longimanus" OR "Dorytomus tremulae" OR "Ellescus scanicus" OR "Ramphus pulicarius" OR "Rhynchaenus stigma" OR "Phyllobius pyri" OR "Agromyza albitarsis" OR "Hexomyza schineri" OR "Contarinia petioli" OR "Dasineura populeti" OR "Harmandia loewi" OR "Harmandiola cavernosa" OR "Harmandiola globuli" OR "Harmandiola tremulae" OR "Helicomyia saliciperda" OR "Lasioptera populnea" OR "Rabdophaga giraudiana" OR "Rabdophaga saliciperda" OR "Edwardsiana candidula" OR "Idiocerus albicans" OR "Idiocerus confusus" OR "Idiocerus distinguendus" OR "Idiocerus populi" OR "Idiocerus tremulae" OR "Kybos populi" OR "Kybos strigilifer" OR "Lygocoris populi" OR "Sthenarus rotermundi" OR "Chionaspis salicis" OR "Lepidosaphes ulmi" OR "Pseudaulacaspis pentagona" OR "Chaitophorus albus" OR "Chaitophorus populeti" OR "Phloeomyzus passerinii" OR "Phylloxerina populi" OR "Camarotoscena speciosa" OR "Messa glaucopis" OR "Nymphalis polychloros" OR "Lobophora halterata" OR "Poecilocampa populi" OR "Leucoma salicis" OR "Acronicta leporina" OR "Acronicta megacephala" OR "Catocala fraxini" OR "Catocala nupta" OR "Earias clorana" OR "Cerura vinula" OR "Clostera curtula" OR "Furcula bifida" OR "Pheosia tremula" OR "Pterostoma palpina" OR "Laothoe populi" OR "Tethea ocularis" OR "Gelechia nigra" OR "Phyllonorycter comparella" OR "Batrachedra praeangusta" OR "Ectoedemia turbidella" OR "Stigmella assimilella" OR "Sciota adelphella" |

(Continues)

(Continued)

OR "Gypsonoma oppressana" OR "Acleris rufana" OR "Acleris hastiana" OR "Trypophloeus granulatus" OR "Aonidiella orientalis" OR "Aspidiotus nerii" OR "Ceroplastes rusci" OR "Chionaspis salicis" OR "Chrysomphalus dictyospermi" OR "Coccus hesperidum hesperidum" OR "Comstockaspis perniciosa" OR "Diaspidiotus ancylus" OR "Diaspidiotus armenicus" OR "Diaspidiotus caucasicus" OR "Diaspidiotus gigas" OR "Diaspidiotus kaussarii" OR "Diaspidiotus lenticularis" OR "Diaspidiotus ostreaeformis" OR "Diaspidiotus slavonicus" OR "Diaspidiotus transcaspiensis" OR "Eulecanium ciliatum" OR "Eulecanium douglasi" OR "Eulecanium tiliae" OR "Hemiberlesia lataniae" OR "Hemiberlesia rapax" OR "Lepidosaphes ulmi" OR "Lopholeucaspis japonica" OR "Newsteadia floccosa" OR "Oceanaspidiotus spinosus" OR "Pseudaulacaspis pentagona" OR "Pulvinaria costata" OR "Pulvinaria loralaiensis" OR "Pulvinaria occidentalis" OR "Salicicola kermanensis" OR "Heterodera salixophila" OR "Trichodorus primitivus" OR "Meloidogyne javanica" OR "Paranthrene tabaniformis" OR "Perisomena caecigena" OR "Phalanta phalantha" OR "Phyllonorycter chiclanella" OR "Phyllonorycter comparella" OR "Phyllonorycter populiella" OR "Phyllonorycter scudderella" OR "Pyralis pictalis" OR "Sciota adelphella" OR "Sesia flavicollis" OR "Sesia tibialis" OR "Sparganothis pettitana" OR "Spiramater lutra" OR "Stigmella assimilella" OR "Stigmella trimaculella" OR "Synanthedon melliniformis" OR "Synaxis jubararia" OR "Thyridopteryx ephemeraeformis" OR "Yponomeuta gigas" OR "Yponomeuta rorrella" OR "Anacampsis innocuella" OR "Anacampsis niveopulvella" OR "Gelechia nigra" OR "Odontopera bidentata" OR "Caloptilia stigmatella" OR "Cameraria obliquifascia" OR "Malacosoma disstria" OR "Malacosoma californica" OR "Malacosoma incurva" OR "Hyphantria cunea" OR "Leucoma salicis" OR "Lymantria dispar" OR "Orgyia leucostigma" OR "Paraleucoptera albella" OR "Paraleucoptera sinuella" OR "Ectoedemia klimeschi" OR "Ectoedemia turbidella" OR "Acronicta leporina" OR "Acronicta megacephala" OR "Catocala relicta" OR "Earias vernana" OR "Cerura vinula" OR "Clostera curtula" OR "Clostera pigra" OR "Furcula furcula" OR "Notodonta ziczac" OR "Apatura ilia" OR "Basilarchia arthemis" OR "Basilarchia archippus" OR "Limenitis populi" OR "Nymphalis polychloros" OR "Nymphalis antiopa" OR "Paranthrene diaphana" OR "Laothoe populi" OR "Paonias excaecata" OR "Acleris hastiana" OR "Acleris fuscana" OR "Acleris rufana" OR "Choristoneura conflictana" OR "Evora hemidesma" OR "Gypsonoma oppressana" OR "Pandemis limitata" OR "Amphitetranychus viennensis" OR "Eotetranychus albus" OR "Eotetranychus edi" OR "Eotetranychus populi" OR "Tetranychus urticae" OR "Agromyza albitarsis" OR "Caloptilia stigmatella" OR "Fenusella glaucopis" OR "Gypsonoma oppressana" OR "Phyllonorycter comparella" OR "Phyllonorycter salictella" OR "Stigmella assimilella" OR "Stigmella trimaculella" OR "Drepanopeziza populi-albae" OR "Chondrostereum purpureum" OR "Marssonina brunnea" OR 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"Cryptosphaeria multicontinentalis" OR "Cryptosphaeria pullmanensis" OR "Cytospora chrysosperma" OR "Cytospora fugax" OR "Cytospora nivea" OR "Cytospora paratranslucens" OR "Cytospora translucens" OR "Diaporthe medusaea" OR "Dicoccum populinum" OR "Didymosphaeria populina" OR "Diplodia gongrogena" OR "Diplodia malorum" OR "Diplodia mutila" OR "Diplodia populina" OR "Discella populina" OR "Discosporium populeum" OR "Dothichiza populea" OR "Dothiorella populina" OR "Drepanopeziza castagnei" OR "Drepanopeziza populi-albae" OR "Drepanopeziza populorum" OR "Drepanopeziza tremulae" OR "Erysiphe adunca" OR "Eutypa leptoplaca" OR "Eutypa populina" OR "Eutypa sparsa" OR "Flammula argentina" OR "Fomes applanatus" OR "Fomes connatus" OR "Fomes fomentarius" OR "Fomes fomentarius subsp. fomentarius" OR "Fomes igniarius" OR "Fusarium oxysporum f. sp. tracheiphilum" OR "Fusicladium martianoffianum" OR "Fusicladium radiosum" OR "Fusicladium radiosum var. lethiferum" OR "Fusicladium radiosum var. populi-albae" OR "Fusicladium radiosum var. radiosum" OR "Fusicladium romellianum" OR "Ganoderma applanatum" OR "Ganoderma lucidum" OR "Gloeosporium castagnei" OR "Gloeosporium populi-albae" OR "Gloeosporium tremulae" OR "Glomus fasciculatum" OR "Glomus geosporum" OR "Helicobasidium mompa" OR "Helicobasidium purpureum" OR "Helicoma perelegans" OR "Helicosporium griseum" OR "Helvella pityophila" OR "Hendersonula toruloidea" OR "Hyphodiscus gemmarum" OR "Hyphodontia sambuci" OR "Hypoxylon laschii" OR "Irpex zonatus" OR "Laetiporus sulphureus" OR "Leptosphaeria aegira" OR "Leptosphaeria alcides" OR "Leucostoma niveum" OR "Lophiostoma myriocarpum" OR "Marssonia piriformis" OR "Marssonina brunnea" OR "Marssonina castagnei" OR "Marssonina piriformis" OR "Marssonina populi" OR "Melampsora abietis-canadensis" OR "Melampsora aecidioides" OR "Melampsora allii-populina" OR "Melampsora castellana" OR "Melampsora larici-tremulae" OR "Melampsora laricis" OR "Melampsora laricis-populina" OR "Melampsora magnusiana" OR "Melampsora magnusiana f. tomentosea" OR "Melampsora mercurialis-tremulae" OR "Melampsora occidentalis" OR "Melampsora pinitorqua" OR "Melampsora populina" OR "Melampsora populina subsp. populina" OR "Melampsora populnea" OR "Melampsora populnea f. sp. laricis" OR "Melampsora populnea f. sp. rostrupii" OR "Melampsora pruinosae" OR "Melampsora pulcherrima" OR "Melampsora rostrupii" OR "Melampsora tremulae" OR "Mycosphaerella maculiformis" OR "Mycosphaerella togashiana" OR "Myxosporium ellisii" OR "Nectria ditissima" OR "Neofusicoccum australe" OR "Neofusicoccum luteum" OR "Nigrospora oryzae" OR "Ocellaria ocellata" OR "Olpidium brassicae" OR "Osmoporus proteus" OR "Peyronellaea glomerata" OR "Pezicula populi" OR "Phellinus populicola" OR "Phoma exigua" OR "Phoma glomerata" OR "Phomopsis tirrenica" OR "Phyllactinia corylea" OR "Phyllactinia guttata" OR "Phyllactinia populi" OR "Phyllosticta alcides" OR "Phyllosticta brunnea" OR "Phyllosticta cinerea" OR "Phyllosticta intermixta" OR "Phyllosticta longispora" OR "Phymatotrichum omnivorum" OR "Physalospora obtusa" OR "Phytophthora cactorum" OR "Pleurotus fuscosquamulosus" OR "Pollaccia elegans" OR "Pollaccia radiosa" OR "Polyporus hirsutus" OR "Polyporus sulphureus" OR "Polyporus zonatus" OR "Pseudocercospora salicina" OR "Pseudomonas tumefaciens" OR "Pseudopeziza populi-albae" OR "Rosellinia necatrix" OR "Schizophyllum amplum" OR "Schizophyllum commune" OR "Septoria candida" OR "Septoria musiva" OR "Septoria populi" OR "Septotis populiperda" OR "Sirothecium minor" OR "Stereum purpureum" OR "Synchytrium aureum" OR "Taphrina aurea" OR "Taphrina johansonii" OR "Taphrina populina" OR "Taphrina rhizophora" OR "Trametes hirsuta" OR "Trametes trogii" OR "Trametes zonata" OR "Trichocladium angelicum" OR "Triscelophorus monosporus" OR "Truncatella hartigii" OR "Tryblidaria azarae" OR "Uncinula adunca var. adunca" OR "Uncinula salicis" OR "Valsa ambiens" OR "Valsa nivea" OR "Valsa pauperata" OR "Valsa salicina" OR "Valsa sordida" OR "Vargamyces aquaticus" OR "Venturia macularis" OR "Venturia populina" OR "Venturia tremulae" OR "Venturia tremulae var. populi-albae" OR "Verticillium albo-atrum" OR "Xanthoria parietina" OR "Perrisia populnea" OR "Lasioptera populnea" OR "Aceria populi" OR "Aculops reticulatus" OR "Aculus mogeri" OR "Aculus reticulatus" OR "Megaplatypus mutatus" OR "Longidorus aetnaeus" OR "Xiphinema simile" OR "Scolytus kirschi" OR "Trypophlocus granulatus" OR "Anisandrus dispar" OR "Euwallacea fornicatus" OR "Phyllocnistis xenia" OR "Stigmella assimilella" OR "Stigmella trimaculella" OR

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| | "Ectoedemia turbidella" OR "Pilophorus gallicus" OR "Prionus coriarius" OR "Xylotrechus rusticus" OR "Leiopus nebulosus" OR "Aegomorphus clavipes" OR "Morimus asper" OR "Leiopus punctulatus" OR "Anoplodera rufipes" OR "Saperda perforata" OR "Aegosoma scabricorne" OR "Obrium cantharinum" OR "Rhamnusium bicolor" OR "Poecilium fasciatum" OR "Rhaesus serricollis" OR "Thrips albopilosus" OR "Xanthia icteritia" OR "Epinotia nisella" OR "Batrachedra praeangusta" OR "Dorytomus schoenherri" OR "Dorytomus filirostris" OR "Dorytomus tremulae" OR "Dorytomus minutus" OR "Dorytomus nebulosus" OR "Dorytomus puberulus" OR "Dorytomus villosulus" OR "Dorytomus dejeani" OR "Dorytomus longimanus" OR "Egle concomitans" OR "Ellescus scanicus" OR "Taphrina rhizophora" OR "Eotetranychus populi" OR "Amphitetranychus viennensis" OR "Aegyptobia salisicola" OR "Phratora laticollis" OR "Pemphigus immunis" OR "Euura fuscomaculata" OR "Pilophorus simulans" OR "Phyllactinia populina" OR "Fusicladium romellianum" OR "Fusicladium radiosum var. populi-albae" OR "Venturia radiosa" OR "Drepanopeziza castagnei" OR "Sphaerulina frondicola" OR "Phyllosticta osteospora" OR "Agnocoris rubicundus" OR "Ectagela guttata" OR "Neolygus zebei" OR "Agnocoris rubicundus" OR "Neolygus populi" OR "Melampsora allii-populina" OR "Hyphantria cunea" OR "Noctua janthina" OR "Orthosia incerta" OR "Orthosia populeti" OR "Apterogenum ypsillon" OR "Agrochola macilenta" OR "Scoliopteryx libatrix" OR "Euproctis chrysorrhoea" OR "Lymantria dispar" OR "Macrothylacia rubi" OR "Cerura vinula" OR "Notodonta torva" OR "Notodonta ziczac" OR "Clostera pigra" OR "Tethea ocularis" OR "Lomaspilis marginata" OR "Stegania trimaculata" OR "Apatura ilia" OR "Boudinotiana puella" OR "Earias vernana" OR "Smerinthus ocellata" OR "Laothoe populi" OR "Stauronematus platycerus" OR "Monosteira unicostata" OR "Zygina tithide" OR "Tremulicerus distinguendus" OR "Zygina nivea" OR "Macropsis vicina" OR "Edwardsiana candidula" OR "Populicerus albicans" OR "Kybos populi" OR "Chrysomela tremulae" OR "Apterygothrips neolongiceps" OR "Chrysomela populi" OR "Pamphilius betulae" OR "Sciota rhenella" OR "Sciota elegiella" OR "Gelechia nigra" OR "Sthenarus rotermundi" OR "Acleris hastiana" OR "Acleris rufana" OR "Cenopalpus cumanicus" OR "Aculops knowltoni" OR "Aceria populicanescentis" OR "Phytoptus albae" OR "Byctiscus populi" OR "Chaitophorus populeti sensoriatus" OR "Pemphigus populinigrae" OR "Pemphigus protospirae" OR "Pemphigus spyrothecae" OR "Chaitophorus longisetosus" OR "Myzus persicae" OR "Gypsonoma dealbana" OR "Viridicerus ustulatus" OR "Erysiphe adunca" OR "Phyllactinia populi" OR "Chaitophorus populeti" OR "Gootiella alba" OR "Pachypappa tremulae" OR "Pachypappa vesicalis" OR "Pachypappa warshavensis" OR "Contarinia petioli" OR "Contarinia populi" OR "Dasineura populeti" OR "Harmandiola cavernosa" OR "Harmandiola globuli" OR "Harmandiola populi" OR "Harmandiola pustulans" OR "Harmandiola tremulae" OR "Lasioptera populnea" OR "Aceria populi" OR "Phyllocoptes populi" OR "Camarotoscena speciosa" OR "Taphrina populina" OR "Agromyza albitarsis" OR "Aulagromyza populi" OR "Japanagromyza salicifolii" OR "Zeugophora subspinosa" OR "Rhamphus pulicarius" OR "Tachyerges rufitarsis" OR "Caloptilia stigmatella" OR "Phyllocnistis labyrinthella" OR "Phyllocnistis xenia" OR "Phyllonorycter chiclanella" OR "Phyllonorycter comparella" OR "Phyllonorycter connexella" OR "Phyllonorycter pastorella" OR "Leucoptera sinuella" OR "Ectoedemia klimeschi" OR "Ectoedemia turbidella" OR "Stigmella assimilella" OR "Fenusella glaucopis" OR "Heterarthrus ochropoda" OR "Gypsonoma minutana" OR "Gypsonoma oppressana" OR "Cladius grandis" OR "Synchytrium aureum" OR "Melampsora aecidioides" OR "Melampsora castellana" OR "Melampsora laricis-tremulae" OR "Melampsora magnusiana" OR "Melampsora pinitorqua" OR "Melampsora populnea" OR "Melampsora pulcherrima" OR "Melampsora rostrupii" OR "Aculus mogeri" OR "Aphis fabae" OR "Macrosiphum euphorbiae" OR "Chaitophorus nassonowi" OR "Gypsonoma sociana" OR "Batrachedra praeangusta" OR "Gypsonoma dealbana" OR "Dasineura populnea" OR "Aceria dispar" OR "Crepidodera aurea" OR "Crepidodera aurata" OR "Crepidodera pluta" OR "Crepidodera lamina" OR "Crepidodera nitidula" OR "Agrilus viridis" OR "Saperda populnea" OR "Saperda carcharias" OR "Diaspidiotus armenicus" OR "Didymella macrostoma" OR "Cossus cossus" OR "Agrilus massanensis" OR "Agrilus ater" OR "Eurythyrea micans" OR "Poecilonota variolosa" OR "Eurythyrea aurata" OR "Trachypteris picta" OR "Anthaxia manca" OR "Agrilus suvorovi" OR "Agrilus pratensis" OR "Dicerca aenea" OR "Xyleborus cryptographus" OR "Trypophloeus binodulus" OR "Trypophloeus tremulae" OR "Trypophloeus granulatus" OR "Magdalis nitidipennis" OR "Gypsonoma sociana" OR "Diaspidiotus ostreaeformis" OR "Diaspidiotus gigas" OR "Lepidosaphes ulmi" OR "Chionaspis salicis" OR "Gomezmenoraspis pinicola" OR "Sesia pimplaeformis" OR "Paranthrene diaphana" OR "Synanthedon vespiformis" OR "Synanthedon melliniformis" OR "Sesia apiformis" OR "Chyliza leptogaster" OR "Phylloxerina populi" OR "Phloeomyzus passerinii" OR "Chaitophorus populialbae" OR "Hexomyza schineri" OR "Rabdophaga giraudiana" OR "Viscum album" OR "Paranthrene tabaniformis" OR "Gypsonoma aceriana" OR "Pterocomma populeum" OR "Pulvinaria vitis" OR "Phytophthora cactorum" OR "Salicicola kermanensis" OR "Psylliodes algirica" OR "Rutidosoma globulus" |

**TABLE B.2** String for *Populus nigra*.

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| Web of Science All databases | **TOPIC:** "Populus nigra" OR "P. nigra" OR "black poplar" OR "golden Lombardy poplar" OR "Aigiros nigra"<br>**AND**<br>**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$" OR virosis OR viroses OR blight$ 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 rootknot OR cyst$ OR "dagger" OR "plant parasitic" OR "parasitic plant" OR "plant$parasitic" OR "root feeding" OR "root$feeding"<br>**NOT**<br>**TOPIC:** "winged seeds" OR metabolites OR *tannins OR climate OR "maple syrup" OR syrup OR mycorrhiz* OR "carbon loss" OR pollut* OR weather OR propert* OR probes OR spectr* OR antioxidant$ OR transformation OR RNA OR DNA OR "Secondary plant metabolite$" OR metabol* OR "Phenolic compounds" OR Quality OR Abiotic OR Storage OR Pollen* OR fertil* OR Mulching OR Nutrient* OR Pruning OR drought OR "human virus" OR "animal disease*" OR "plant extracts" OR immunological OR "purified fraction" OR "traditional medicine" OR medicine OR mammal* OR bird* OR "human disease*" OR biomarker$ OR "health education" OR bat$ OR "seedling$ survival" OR "anthropogenic disturbance" OR "cold resistance" OR "salt stress" OR salinity OR "aCER method" OR "adaptive cognitive emotion regulation" OR nitrogen OR hygien* OR "cognitive function$" OR fossil$ OR *toxicity OR Miocene OR postglacial OR "weed control" OR landscape<br>**NOT** |

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**TOPIC:** "Acanthosoma haemorrhoidale" OR "Acanthothrips nodicornis" OR "Aceria dispar" OR "Aceria populi" OR "Acleris hastiana" OR "Acleris issikii" OR "Acmaeodera crinita" OR "Acmaeodera pulchra" OR "Acronicta americana" OR "Acronicta leporina" OR "Acronicta lepusculina" OR "Acronicta megacephala" OR "Acronicta oblinita" OR "Acrostalagmus cinnabarinu" OR "Aculus aegerinus" OR "Aculus mogeri" OR "Aegeria apiformis" OR "Aegomorphus clavipes" OR "Aegosoma scabricorne" OR "Aeolesthes sarta" OR "Agrilus ater" OR "Agrilus massanensis" OR "Agrilus pratensis" OR "Agrilus suvorovi" OR "Agrobacterium tumefaciens" OR "Agrochola circellaris" OR "Agrochola macilenta" OR "Agrocybe aegerita" OR "Agrocybe cylindracea" OR "Agrocybe parasitica" OR "Agromyza albitarsis" OR "Aguriahana stellulata" OR "Alebra wahlbergi" OR "Alocerus moesiacus" OR "Alternaria alternata" OR "Amphipyra perflua" OR "Amphipyra pyramidea" OR "Amphipyra pyramidoides" OR "Anacampsis innocuella" OR "Anacampsis populella" OR "Ancylis laetana" OR "Anisandrus dispar" OR "Anisarthron barbipes" OR "Anoplophora chinensis" OR "Anoplophora glabripennis" OR "Anoplus plantaris" OR "Antaeotricha leucillana" OR "Anthaxia manca" OR "Anthocoris nemoralis" OR "Apatura ilia" OR "Apatura iris" OR "Aphis galiae" OR "Aphis maculatae" OR "Apocheima cinerarium" OR "Apotomis dextrana" OR "Apriona cinerea" OR "Apterogenum ypsillon" OR "Archiearis notha" OR "Archips breviplicanus" OR "Armillaria mellea" OR "Aromia moschata" OR "Ascochyta bacteriiformis" OR "Ascochyta populina" OR "Ascochyta populorum" OR "Ascochyta tremulae" OR "Aspidiotus nerii" OR "Asteromella bacteriiformis" OR "Asteromella osteospora" OR "Asteromella populina" OR "Aulacorthum solani" OR "Aulagromyza populi" OR "Aulagromyza populicola" OR "Aulagromyza tremulae" OR "Auriculariopsis ampla" OR "Auriscalpium villipes" OR "Barrmaelia macrospora" OR "Basilarchia archippus" OR "Basilarchia arthemis" OR "Bemisia tabaci" OR "Bjerkandera adusta" OR "Boeremia exigua" OR "Boeremia populi" OR "Botryodiplodia penzigii" OR "Botryosphaeria dothidea" OR "Botryosphaeria parva" OR "Botryosphaeria populi" OR "Botryosphaeria ribis" OR "Boudinotiana notha" OR "Brachylomia viminalis" OR "Bycticus populi" OR "Cabera exanthemata" OR "Caloptilia chrysolampra" OR "Caloptilia stigmatella" OR "Camarosporidiella populina" OR "Camarosporium propinquum" OR "Camarotoscena fulgidipennis" OR "Camarotoscena speciosa" OR "Camarotoscena subrubescens" OR "Campaea honoraria" OR "Campylomma ribesi" OR "Candidatus Phytoplasma asteris" OR "Candidatus Phytoplasma fraxini" OR "Capnodium citri" OR "Capnodium footii" OR "Capnodium salicinum" OR "Carystoterpa fingens" OR "Catocala amatrix" OR "Catocala concumbens" OR "Catocala elocata" OR "Catocala fraxini" OR "Catocala meskei" OR "Catocala nupta" OR "Catocala oberthuri" OR "Catocala relicta" OR "Catocala unijuga" OR "Ceratocystis microcarpa" OR "Ceratostomella microcarpa" OR "Cercospora jamuensis" OR "Cercospora populina" OR "Cerioporus squamosus" OR "Ceriporiopsis aneirina" OR "Cerura erminea" OR "Cerura iberica" OR "Cerura vinula" OR "Chaitophorus euphraticus" OR "Chaitophorus floris" OR "Chaitophorus indicus" OR "Chaitophorus leucomelas" OR "Chaitophorus longisetosus" OR "Chaitophorus nassonowi" OR "Chaitophorus neglectus" OR "Chaitophorus populeti" OR "Chaitophorus populialbae" OR "Chaitophorus populicola" OR "Chaitophorus pruinosae" OR "Chaitophorus tremulae" OR "Chaitophorus versicolor" OR "Chalcoides aurata" OR "Chalcoides aurea" OR "Chionaspis salicis" OR "Chondroplea populea" OR "Chondrostereum purpureum" OR "Choristoneura diversana" OR "Chrysolina oricalcia" OR "Chrysomela aenea" OR "Chrysomela populi" OR "Chrysomphalus dictyospermi" OR "Ciborinia bifrons" OR "Ciborinia seaveri" OR "Ciborinia whetzelii" OR "Cirrhia icteritia" OR "Cladius grandis" OR "Cladosporium cladosporioides" OR "Cladosporium herbarum" OR "Clostera anachoreta" OR "Clostera anastomosis" OR "Clostera curtula" OR "Clostera inclusa" OR "Clostera pigra" OR "Colletotrichum populi" OR "Colotois pennaria" OR "Comstockaspis perniciosa" OR "Coprinellus micaceus" OR "Coriolopsis gallica" OR "Coryneum populicola" OR "Coryneum populinum" OR "Cossonus linearis" OR "Cossonus parallelepipedus" OR "Cossus cossus" OR "Creosphaeria sassafras" OR "Crepidodera aurata" OR "Crepidodera aurea" OR "Crepidodera fulvicornis" OR "Crepidodera nitidula" OR "Crepidotus crocophyllus" OR "Cryptodiaporthe populea" OR "Cryptodiaporthe salicina" OR "Cryptorhynchus lapathi" OR "Cryptosphaeria ligniota" OR "Cryptosphaeria pullmanensis" OR "Cryptosporium populi" OR "Cryptothrips nigripes" OR "Cryptovalsa ampelina" OR "Curvularia fallax" OR "Cyclocybe aegerita" OR "Cyclocybe cylindracea" OR "Cyclocybe parasitica" OR "Cyptotrama costesii" OR "Cytospora ambiens" OR "Cytospora atrocirrhata" OR "Cytospora chrysosperma" OR "Cytospora melnikii" OR "Cytospora nivea" OR "Cytospora populina" OR "Cytospora salicacearum" OR "Dasineura populicola" OR "Dasyneura populicola" OR "Dematophora necatrix" OR "Dendrothele tetracornis" OR "Dennisiella babingtonii " OR "Deraeocoris lutescens" OR "Diaporthe eres" OR "Diaporthe forabilis" OR "Diaporthe medusaea" OR "Diaporthe putator" OR "Diaporthe rudis" OR "Diaporthe santonensis" OR "Diaspidiotus armenicus" OR "Diaspidiotus caucasicus" OR "Diaspidiotus gigas" OR "Diaspidiotus ostreaeformis" OR "Diaspidiotus slavonicus" OR "Diatrype bullata" OR "Diatrypella populi" OR "Dicerca aenea" OR "Didymella glomerata" OR "Didymosphaeria populina" OR "Diplodia gongrogena" OR "Diplodia mutila" OR "Diplodia seriata" OR "Diplodia tumefaciens" OR "Discella populina" OR "Discohainesia oenotherae" OR "Discosporium hyalinum" OR "Discosporium populeum" OR "Discula tremulae" OR "Dorytomus affinis" OR "Dorytomus dejeani" OR "Dorytomus edoughensis" OR "Dorytomus filirostris" OR "Dorytomus ictor" OR "Dorytomus longimanus" OR "Dorytomus minutus" OR "Dorytomus nebulosus" OR "Dorytomus puberulus" OR "Dorytomus schoenherri" OR "Dorytomus suratus" OR "Dorytomus tremulae" OR "Dorytomus validirostris" OR "Dorytomus villosulus" OR "Dothichiza populea" OR "Dothiorella gregaria" OR "Dothiorella sarmentorum" OR "Drepanopeziza brunnea" OR "Drepanopeziza castagnei" OR "Drepanopeziza populi" OR "Drepanopeziza populorum" OR "Drepanopeziza punctiformis" OR "Drepanopeziza tremulae" OR "Ectoedemia hannoverella" OR "Ectoedemia turbidella" OR "Edwardsiana lethierryi" OR "Egira dolosa" OR "Ellescus scanicus" OR "Elsinoe populi" OR "Elsinoë populi" OR "Elsinoe populi" OR "Enargia abluta" OR "Enargia paleacea" OR "Eotetranychus populi" OR "Epinotia nisella" OR "Epione repandaria" OR "Epipemphigus imaicus" OR "Epipemphigus marginalis" OR "Epiphyas postvittana" OR "Erannis defoliaria" OR "Erannis golda" OR "Erannis tiliaria" OR "Eriophyes populi" OR "Erthesina fullo" OR "Erynnis icelus" OR "Erysiphe adunca" OR "Erysiphe adunca var. adunca" OR "Erysiphe horridula" OR "Erysiphe populicola" OR "Erysiphe salicis" OR "Eucosma hapalosarca" OR "Eudarluca caricis" OR "Eulecanium tiliae" OR "Euproctis chrysorrhoea" OR "Eurythyrea micans" OR "Eutypa acharii" OR "Eutypa lata" OR "Eutypa leptoplaca" OR "Eutypa maura" OR "Eutypa populina" OR "Euura amerinae" OR "Euura caeruleocarpa" OR "Euura pavida" OR "Euwallacea fornicatus" OR "Euwallacea fornicatus sensu lato" OR "Euwallacea fornicatus sensu stricto" OR "Euwallacea kuroshio" OR "Exomias pellucidus" OR "Fenusella glaucopis" OR "Fenusella hortulana" OR "Fomes applanatus" OR "Fomes connatus" OR "Fomes fomentarius" OR "Fomes igniarius" OR "Fomes ulmarius" OR "Fomitopsis pinicola" OR "Framinghamia helvalis" OR "Funalia gallica" OR "Funalia hispida" OR "Funalia trogii" OR "Furcula bifida" OR "Fusarium aquaeductuum" OR "Fusarium silvicola" OR "Fusarium solani-melongenae" OR "Fusarium sporotrichioides" OR "Fusicladium elegans" OR "Fusicladium martianoffianum" OR "Fusicladium radiosum" OR "Fusicladium romellianum" OR "Fusicoccum aesculi" OR "Fusicoccum parvum" OR "Fusicoccum populi" OR

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"Fusicolla aquaeductuum" OR "Galerucella lineola" OR "Ganoderma applanatum" OR "Ganoderma lucidum" OR "Gastropacha populifolia" OR "Gelechia nigra" OR "Gelechia rhombelliformis" OR "Gelechia turpella" OR "Glena cribrataria" OR "Gluphisia crenata" OR "Gluphisia septentrionis" OR "Gnomonia gnomon" OR "Gnophomyia viridipennis" OR "Golovinomyces cynoglossi" OR "Gonioctena decemnotata" OR "Graphium penicillioides" OR "Grifola gargal" OR "Gypsonoma aceriana" OR "Gypsonoma dealbana" OR "Gypsonoma minutana" OR "Gypsonoma oppressana" OR "Gypsonoma sociana" OR "Hadrobregmus magnus" OR "Hadrotrichum populi" OR "Haplothrips subtilissimus" OR "Harmonia axyridis" OR "Hedya salicella" OR "Helicobasidium mompa" OR "Helicobasidium purpureum" OR "Hemiberlesia lataniae" OR "Hemiberlesia rapax" OR "Hemicycliophora iberica" OR "Hemicycliophora theinemanni" OR "Heterarthrus ochropoda" OR "Heterarthrus ochropodus" OR "Heterobasidion annosum" OR "Hexomyza schineri" OR "Hoplandrothrips bidens" OR "Hoplandrothrips ellisi" OR "Hoplothrips fungi" OR "Hoplothrips ulmi" OR "Hyalopeziza millepunctata" OR "Hydnum platense" OR "Hyphantria cunea" OR "Hypocrea atrata" OR "Hypocrea contorta" OR "Hypoxylon bifrons" OR "Hypoxylon fuscum" OR "Hypoxylon rubiginosum" OR "Hypoxylon rubiginosum var. rubiginosum" OR "Hysterium pulicare" OR "Hysterobrevium mori" OR "Hysterographium mori" OR "Idiocerus distinguendus" OR "Idiocerus fulgidus" OR "Idiocerus poecilus" OR "Idiocerus tremulae" OR "Idiocerus vitreus" OR "Inonotus farlowii" OR "Inonotus hispidus" OR "Ipimorpha nanaimo" OR "Ipimorpha pleonectusa" OR "Ipimorpha retusa" OR "Ipimorpha subtus" OR "Isochnus sequensi" OR "Jalapriya toruloides" OR "Japanagromyza salicifolii" OR "Junghuhnia vincta" OR "Kalotermes brouni" OR "Kastanostachys aterrima" OR "Kleidocerys resedae" OR "Kybos abstrusus" OR "Kybos populi" OR "Lamia textor" OR "Laothoe populi" OR "Laothoë populi" OR "Leiopus nebulosus" OR "Lentinellus vulpinus" OR "Lepidosaphes malicola" OR "Lepidosaphes salicina" OR "Lepidosaphes ulmi" OR "Leptosphaeria salicinearum" OR "Leptura quadrifasciata" OR "Leucoma salicis" OR "Leucoptera sinuella" OR "Leucostoma niveum" OR "Limenitis populi" OR "Lispothrips crassipes" OR "Lobophora halterata" OR "Lomaspilis marginata" OR "Longidorus apuloides" OR "Longidorus iranicus" OR "Lophiostoma nuculoides" OR "Lophocampa maculata" OR "Lucanus cervus" OR "Luperus xanthopoda" OR "Lycia hirtaria" OR "Lycia ursaria" OR "Lyctus brunneus" OR "Lymantria dispar" OR "Lymantria monacha" OR "Lymantria obfuscata" OR "Macrophoma gongrogena" OR "Macropsis graminea" OR "Macrothylacia rubi" OR "Magdalis nitidipennis" OR "Malacosoma californica" OR "Malacosoma neustria" OR "Marasmius favrei" OR "Marssonia populina" OR "Marssonia rhabdospora" OR "Marssonina brunnea" OR "Marssonina castagnei" OR "Marssonina populi" OR "Marssonina rhabdospora" OR "Megaplatypus mutatus" OR "Melampsora abietis-canadensis" OR "Melampsora abietis-populi" OR "Melampsora allii-populina" OR "Melampsora ciliata" OR "Melampsora laricis-populina" OR "Melampsora magnusiana" OR "Melampsora medusae" OR "Melampsora medusae f.sp. deltoidis" OR "Melampsora mercurialis-tremulae" OR "Melampsora mercuriali-tremulae" OR "Melampsora microspora" OR "Melampsora occidentalis" OR "Melampsora populina" OR "Melampsora populnea" OR "Melampsora pruinosae" OR "Melampsora pulcherrima" OR "Melampsora rostrupii" OR "Melanaspis inopinata" OR "Melanconium hyalinum" OR "Menesia bipunctata" OR "Messa glaucopis" OR "Messa hortulana" OR "Mikiola populicola" OR "Mollisina flava" OR "Monosteira discoidalis" OR "Monosteira unicostata" OR "Mordwilkoja vagabunda" OR "Morganella longispina" OR "Morimus asper" OR "Mycosphaerella maculiformis" OR "Mycosphaerella populi" OR "Mycosphaerella populorum" OR "Mycosphaerella togashiana" OR "Myxosporium tremulae" OR "Myzus persicae" OR "Myzus varians" OR "Narycia monilifera" OR "Naupactus xanthographus" OR "Nectria cinnabarina" OR "Nectria coccinea" OR "Nectria galligena" OR "Neocosmospora ipomoeae" OR "Neocosmospora silvicola" OR "Neofusicoccum luteum" OR "Neofusicoccum parvum" OR "Neofusicoccum ribis" OR "Neolygus zebei" OR "Neonectria coccinea" OR "Neonectria ditissima" OR "Neoscytalidium dimidiatum" OR "Neoscytalidium hyalinum" OR "Neoscytalidium novaehollandiae" OR "Nesothrips propinquus" OR "Notodonta torva" OR "Notodonta tritophus" OR "Notodonta ziczac" OR "Nycteola asiatica" OR "Nycteola cinereana" OR "Nymphalis antiopa" OR "Nymphalis polychloros" OR "Obrium cantharinum" OR "Oceanaspidiotus spinosus" OR "Odontopera bidentata" OR "Oemona hirta" OR "Oligocentria semirufescens" OR "Ophiostoma fusiforme" OR "Orgyia antiqua" OR "Orgyia leucostigma" OR "Orientus ishidae" OR "Orius minutus" OR "Orthosia cerasi" OR "Orthosia gracilis" OR "Orthosia incerta" OR "Orthosia populeti" OR "Orthotylus prasinus" OR "Otiorhynchus ovalipennis" OR "Oxyporus populinus" OR "Pachyderris nigricans" OR "Pachypappa marsupialis" OR "Pachypappa vesicalis" OR "Pachysphinx modesta" OR "Paecilomyces variotii" OR "Pamphilius betulae" OR "Pamphilius histrio" OR "Pandemis chlorograpta" OR "Papilio cresphontes" OR "Paraleucoptera albella" OR "Paraleucoptera sinuella" OR "Paralongidorus serbicus" OR "Paranthrene tabaniformis" OR "Paraphytomyza populi" OR "Paraphytomyza populicola" OR "Parastichtis suspecta" OR "Parastichtis ypsillon" OR "Parlatoria oleae" OR "Parthenolecanium corni" OR "Pemphigus borealis" OR "Pemphigus bursarius" OR "Pemphigus dorocola" OR "Pemphigus filaginis" OR "Pemphigus gairi" OR "Pemphigus immunis" OR "Pemphigus lysimachiae" OR "Pemphigus matsumurai" OR "Pemphigus mordvilkoi" OR "Pemphigus napaeus" OR "Pemphigus passeki" OR "Pemphigus phenax" OR "Pemphigus plicatus" OR "Pemphigus populi" OR "Pemphigus populinigrae" OR "Pemphigus protospirae" OR "Pemphigus spirothecae" OR "Pemphigus spyrothecae" OR "Pemphigus trehernei" OR "Pemphigus vesicarius" OR "Periphoba hircia" OR "Perisomena caecigena" OR "Pestalotia populi-nigrae" OR "Pestalotia populi-nigrae var. italica" OR "Pestalotiopsis populi-nigrae" OR "Petriella asymmetrica" OR "Petriella asymmetrica var. cypria" OR "Petriella sordida" OR "Peyronellaea glomerata" OR "Pezicula populi" OR "Pezizella oenotherae" OR "Phaeoacremonium parasiticum" OR "Phaeoramularia maculicola" OR "Phaiogramma etruscaria" OR "Phalera bucephala" OR "Phellinus igniarius" OR "Pheosia gnoma" OR "Pheosia portlandia" OR "Pheosia tremula" OR "Phigalia pilosaria" OR "Phigalia sinuosaria" OR "Phlaeothrips coriaceus" OR "Phloeomyzus passerinii" OR "Phloeomyzus redelei" OR "Phloeophagosoma thoracicum" OR "Phobetron hipparchia" OR "Pholiota crassivela" OR "Pholiota destruens" OR "Pholiota edulis" OR "Pholiota populnea" OR "Phoma exigua" OR "Phoma exigua var. populi" OR "Phoma exigua var. exigua" OR "Phoma glomerata" OR "Phoma populicola" OR "Phoma populi-nigrae" OR "Phoma exigua f.sp. exigua" OR "Phratora laticollis" OR "Phratora tibialis" OR "Phratora vitellinae" OR "Phtheochroa micana" OR "Phtheochroa schreibersiana" OR "Phyllactinia populi" OR "Phyllactinia populina" OR "Phyllobius pyri" OR "Phyllocnistis extrematrix" OR "Phyllocnistis populiella" OR "Phyllocnistis unipunctella" OR "Phyllocoptes didelphis" OR "Phyllocoptes populi" OR "Phyllonorycter comparella" OR "Phyllonorycter connexella" OR "Phyllonorycter pastorella" OR "Phyllonorycter populiella" OR "Phyllonorycter populifoliella" OR "Phyllosticta alcides" OR "Phyllosticta intermixta" OR "Phyllosticta osteospora" OR "Phyllosticta populea" OR "Phyllosticta populina" OR "Phyllosticta populorum" OR "Phylloxerina populi" OR "Phymatotrichopsis omnivora" OR "Phymatotrichum omnivorum" OR "Phytobia cambii" OR "Phytocoris longipennis" OR "Phytophthora citricola" OR "Plagiodera versicolora" OR "Plagiostoma apiculatum" OR "Planotortrix excessana" OR "Plectosphaerella populi" OR "Pleurotus ostreatus" OR "Poecilocampa populi" OR

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| | "Poecilonota variolosa" OR "Poecilothrips albopictus" OR "Pollaccia elegans" OR "Pollaccia radiosa" OR "Polyozellus tristis" OR "Polyporus adustus" OR "Polyporus farlowii" OR "Polyporus hispidus" OR "Polyporus squamosus" OR "Popillia japonica" OR "Poplar mosaic virus" OR "Populicerus nitidissimus" OR "Pristiphora conjugata" OR "Pseudocamarosporium propinquum" OR "Pseudocercospora salicina" OR "Pseudocercospora togashiana" OR "Pseudoclavellaria amerinae" OR "Pseudomonas syringae pv. syringae" OR "Pseudopeziza populi-albae" OR "Pseudotomentella tristis" OR "Pterocomma bhutanense" OR "Pterocomma bicolor" OR "Pterocomma pilosum" OR "Pterocomma populeum" OR "Pterocomma sinipopulifoliae" OR "Pterocomma tremulae" OR "Pterocomma yezoense" OR "Pterocomma anyangense" OR "Pterocomma atuberculatum" OR "Pterostoma palpina" OR "Ptilodon capucina" OR "Pulvinaria loralaiensis" OR "Pulvinaria vitis" OR "Pygaera anastomosis" OR "Quadraspidiotus zonatus" OR "Raduliporus aneirinus" OR "Ramphus pulicarius" OR "Ramularia uredinis" OR "Raphia frater" OR "Rhabdospora longispora" OR "Rhamnusium bicolor" OR "Rhamnusium graecum" OR "Rhamphus pulicarius" OR "Rhynchaenus decoratus" OR "Rhynchaenus rusci" OR "Rhynchaenus salicis" OR "Rhynchaenus stigma" OR "Rhytidodus decimusquartus" OR "Rhytidodus wagneri" OR "Ribautiana ulmi" OR "Rigidoporus ulmarius" OR "Rigidoporus vinctus" OR "Ropalopus macropus" OR "Rosellinia corticalis" OR "Rosellinia necatrix" OR "Rosellinia novae-zelandiae" OR "Salicicola kermanensis" OR "Saliciphaga acharis" OR "Saperda carcharias" OR "Saperda perforata" OR "Saperda populnea" OR "Saperda scalaris" OR "Schizophyllum amplum" OR "Sciota rhenella" OR "Scleroderma bovista" OR "Scoliopteryx libatrix" OR "Scolytus intricatus" OR "Scolytus multistriatus" OR "Scolytus scolytus" OR "Selenia tetralunaria" OR "Septoria populi" OR "Sesia apiformis" OR "Sesia flavicollis" OR "Sesia siningensis" OR "Sesia yezoensis" OR "Sillia ferruginea" OR "Smerinthus cerisyi" OR "Smerinthus ocellata" OR "Speira toruloides" OR "Sphaceloma populi" OR "Sphaerellopsis filum" OR "Sphaerulina frondicola" OR "Sphaerulina musiva" OR "Sphinx luscitiosa" OR "Spongipellis spumea" OR "Spongipellis spumeus" OR "Sporocadus populinus" OR "Sporothrix fusiformis" OR "Stauronematus compressicornis" OR "Stauronematus platycerus" OR "Stegania trimaculata" OR "Stenidiocerus poecilus" OR "Stereum purpureum" OR "Stictochorella populi-nigrae" OR "Stigmella trimaculella" OR "Stomaphis longirostris" OR "Stomaphis sp. nr graffii" OR "Subacronicta megacephala" OR "Synanthedon melliniformis" OR "Synanthedon vespiformis" OR "Tachyerges decoratus" OR "Tachyerges pseudostigma" OR "Tachyerges rufitarsis" OR "Tachyerges salicis" OR "Tachyerges stigma" OR "Taphrina aurea" OR "Taphrina populina" OR "Teichospora macrosperma" OR "Teichospora pruniformis" OR "Tethea ocularis" OR "Tethea or" OR "Tetra populi" OR "Tetranychus ludeni" OR "Tetranychus urticae" OR "Thecabius affinis" OR "Thecabius lysimachiae" OR "Thyridaria macrostomoides" OR "Thyridopteryx ephemeraeformis" OR "Trachypteris picta" OR "Trachysmia schreibersiana" OR "Trametes hirsuta" OR "Trametes hispida" OR "Trametes trogii" OR "Trematosphaeria pertusa" OR "Tremex fuscicornis" OR "Tremulicerus fulgidus" OR "Tremulicerus vitreus" OR "Trichoderma citrinoviride" OR "Trichoferus fasciculatus" OR "Trirachys sartus" OR "Tritophia tritophus" OR "Trochila populorum" OR "Trypophloeus asperatus" OR "Trypophloeus binodulus" OR "Trypophloeus granulatus" OR "Trypophloeus rybinskii" OR "Trypophloeus tremulae" OR "Tubercularia vulgaris" OR "Tuberolachnus salignus" OR "Typhula setipes" OR "Uncinula adunca" OR "Uncinula adunca var. adunca" OR "Uncinula populi" OR "Uncinula salicis" OR "Uncinula tenuitunicata" OR "Uraba lugens" OR "Uredo tholopsora" OR "Valsa ambiens" OR "Valsa nivea" OR "Valsa sordida" OR "Venturia macularis" OR "Venturia martianoffiana" OR "Venturia populina" OR "Venturia radiosa" OR "Venturia tremulae" OR "Verbasciola petioli" OR "Verticillium tenerum" OR "Viscum album" OR "Xanthia icteritia" OR "Xanthia ocellaris" OR "Xanthomonas arboricola pv. populi" OR "Xanthomonas populi" OR "Xyleborinus attenuatus" OR "Xyleborinus saxesenii" OR "Xyleborus cryptographus" OR "Xyleborus dispar" OR "Xylotoles griseus" OR "Xylotrechus namanganensis" OR "Xylotrechus rusticus" OR "Ypsolopha parenthesella" OR "Zeugophora flavicollis" OR "Zeugophora scutellaris" OR "Zeugophora subspinosa" OR "Zignoella aterrima" OR "Zygina nivea" |

**TABLE B.3** String for *Populus tremula*.

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| Web of Science All databases | **TOPIC:** "Populus tremula" OR "P. tremula" OR "European aspen" OR "trembling poplar" OR "Populus australis" OR "Populus bonatii" OR "Populus duclouxiana" OR "Populus microcarpa" OR "Populus pseudotremula" OR "Populus repanda" OR "Populus rotundifolia" OR "Populus villosa" OR "Tremula vulgaris"<br>**AND**<br>**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$" OR virosis OR viroses OR blight$ 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 rootknot OR cyst$ OR "dagger" OR "plant parasitic" OR "parasitic plant" OR "plant$parasitic" OR "root feeding" OR "root$feeding"<br>**NOT**<br>**TOPIC:** "winged seeds" OR metabolites OR *tannins OR climate OR "maple syrup" OR syrup OR mycorrhiz* OR "carbon loss" OR pollut* OR weather OR propert* OR probes OR spectr* OR antioxidant$ OR transformation OR RNA OR DNA OR "Secondary plant metabolite$" OR metabol* OR "Phenolic compounds" OR Quality OR Abiotic OR Storage OR Pollen* OR fertil* OR Mulching OR Nutrient* OR Pruning OR drought OR "human virus" OR "animal disease*" OR "plant extracts" OR immunological OR "purified fraction" OR "traditional medicine" OR medicine OR mammal* OR bird* OR "human disease*" OR biomarker$ OR "health education" OR bat$ OR "seedling$ survival" OR "anthropogenic disturbance" OR "cold resistance" OR "salt stress" OR salinity OR "aCER method" OR "adaptive cognitive emotion regulation" OR nitrogen OR hygien* OR "cognitive function$" OR fossil$ OR *toxicity OR Miocene OR postglacial OR "weed control" OR landscape<br>**NOT** |

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**TOPIC:** "Acalyptus carpini" OR "Acanthonitschkea tristis" OR "Acanthosoma haemorrhoidale" OR "Aceria dispar" OR "Aceria populi" OR "Aceria varia" OR "Aceria varius" OR "Acleris emargana" OR "Acleris roscidana" OR "Acleris variegana" OR "Acossus terebra" OR "Acremonium murorum" OR "Acrobeles elaboratus" OR "Acronicta alni" OR "Acronicta leporina" OR "Acronicta megacephala" OR "Acronicta psi" OR "Actinonema populorum" OR "Aculops granulatus" OR "Aculus aegerinus" OR "Aculus aegirinus" OR "Aculus dispar" OR "Aculus mogeri" OR "Aculus reticulatus" OR "Aculus unctus" OR "Aegomorphus clavipes" OR "Aegosoma scabricorne" OR "Aegyptobia salisicola" OR "Agonopterix ocellana" OR "Agrilus ater" OR "Agrilus fleischeri" OR "Agrilus horni" OR "Agrilus pratensis" OR "Agrilus pseudocyaneus" OR "Agrilus subauratus" OR "Agrilus suvorovi" OR "Agrilus suvorovi populneus" OR "Agrilus viridis" OR "Agriopis marginaria" OR "Agrochola circellaris" OR "Agrochola macilenta" OR "Agromyza albitarsis" OR "Alcis repandata" OR "Aleurodiscus polygonius" OR "Aleurodiscus roseus" OR "Allygidius commutatus" OR "Alosterna tabacicolor" OR "Alsophila aescularia" OR "Alternaria alternata" OR "Alternaria tenuis" OR "Amauronematus krausi" OR "Amauronematus puniceus" OR "Ametastegia albipes" OR "Amphipyra berbera" OR "Amphipyra perflua" OR "Amphisphaerella amphisphaerioides" OR "Amphisphaerella dispersella" OR "Amphisphaeria millepunctata" OR "Anacampsis populella" OR "Ancylis laetana" OR "Ancylis tineana" OR "Angerona prunaria" OR "Anisandrus dispar" OR "Anisandrus maiche" OR "Anoplophora chinensis" OR "Anoplophora glabripennis" OR "Anorthoa munda" OR "Anthaxia manca" OR "Anthostomella anserina" OR "Antrodia macra" OR "Antrodia mellita" OR "Antrodia pulvinascens" OR "Aonidiella citrina" OR "Apatura ilia" OR "Apatura iris" OR "Aphis fabae" OR "Aphis fabae fabae" OR "Apiognomonia errabunda" OR "Apocheima pilosaria" OR "Apoda limacodes" OR "Apoderus coryli" OR "Aporcelaimellus obscurus" OR "Apotomis inundana" OR "Apriona cinerea" OR "Apriona germari" OR "Apriona rugicollis" OR "Arboridia spathulata" OR "Archiearis notha" OR "Archips betulana" OR "Archips crataegana" OR "Archips xylosteana" OR "Archips xylosteanus" OR "Arctia caja" OR "Armillaria borealis" OR "Armillaria mellea" OR "Arrhenia tenella" OR "Arrhenodes minutus" OR "Arthopyrenia cinereopruinosa" OR "Ascochyta tremulae" OR "Asiphum tremulae" OR "Aspen mosaic-associated virus" OR "Aspergillus fumigatus" OR "Aspidiotus juglandis" OR "Asterodon ferruginosum" OR "Asterodon ferruginosus" OR "Asteroma frondicola" OR "Asteroscopus sphinx" OR "Athelicium hallenbergii" OR "Aulagromyza populi" OR "Aulagromyza populicola" OR "Aulagromyza tremulae" OR "Auriculariopsis ampla" OR "Bacidia fraxinea" OR "Baltazaria galactina" OR "Barrmaelia oxyacanthae" OR "Batrachedra praeangusta" OR "Biscogniauxia mediterranea" OR "Biston betularia" OR "Biston strataria" OR "Botryobasidium laeve" OR "Botryosphaeria berengeriana" OR "Botryosphaeria dothidea" OR "Botryosphaeria populi" OR "Botrytis asperula" OR "Boudinotiana notha" OR "Brachionycha nubeculosa" OR "Brachyarthrum limitatum" OR "Brachylomia viminalis" OR "Brachyopa pilosa" OR "Brachyopa scutellaris" OR "Brachysporium fusiforme" OR "Bryobia rubrioculus" OR "Bursaphelenchus populi" OR "Bursaphelenchus trypophloei" OR "Byctiscus betulae" OR "Byctiscus populi" OR "Cabera exanthemata" OR "Cabera pusaria" OR "Caliciopsis calicioides" OR "Caliroa annulipes" OR "Caliroa tremulae" OR "Calliteara pudibunda" OR "Caloptilia stigmatella" OR "Camarosporium propinquum" OR "Camarotoscena speciosa" OR "Candelabrochaete septocystidia" OR "Capnodium citri" OR "Capnodium elongatum" OR "Capronia mansonii" OR "Capronia pulcherrima" OR "Carestiella socia" OR "Carlavirus populi" OR "Catocala elocata" OR "Catocala fraxini" OR "Catocala nupta" OR "Centrotus cornutus" OR "Cerambyx scopolii" OR "Ceratocystiopsis synnemata" OR "Ceratosphaeria lampadophora" OR "Cerioporus leptocephalus" OR "Cerioporus squamosus" OR "Ceriporia septocystidia" OR "Ceriporiopsis aneirina" OR "Ceriporiopsis niger" OR "Ceriporiopsis nigra" OR "Ceroplastes ceriferus" OR "Ceroplastes rusci" OR "Cerrena unicolor" OR "Cerura erminea" OR "Cerura vinula" OR "Ceuthospora pulvinata" OR "Chaetospermum carneum" OR "Chaetospermum chaetosporum" OR "Chaetospermum tubercularioides" OR "Chaetosphaeria pulviscula" OR "Chaitophorus albus" OR "Chaitophorus leucomelas" OR "Chaitophorus longisetosus" OR "Chaitophorus nassonowi" OR "Chaitophorus populeti" OR "Chaitophorus populeti sensoriatus" OR "Chaitophorus populialbae" OR "Chaitophorus tremulae" OR "Chaitophorus tremulae ssp. Sorini" OR "Chalara cylindrosperma" OR "Chalcoides aurea" OR "Chalcoides nitidula" OR "Chionaspis salicis" OR "Chloroclysta miata" OR "Chloroclysta siterata" OR "Chlorophorus varius" OR "Chondrostereum purpureum" OR "Choristoneura diversana" OR "Chrysobothris affinis" OR "Chrysomela cuprea" OR "Chrysomela populi" OR "Chrysomela tremula" OR "Chyliza leptogaster" OR "Cimbex luteus" OR "Cladius grandis" OR "Cladobotryum mycophilum" OR "Cladosporium cladosporioides" OR "Cladosporium epiphyllum" OR "Cladosporium fumago" OR "Cladosporium herbarum" OR "Cladosporium nigrellum" OR "Cladosporium populicola" OR "Clostera anachoreta" OR "Clostera anastomosis" OR "Clostera curtula" OR "Clostera pigra" OR "Coccomyces tumidus" OR "Coleophora lusciniaepennella" OR "Colobochyla salicalis" OR "Colocasia coryli" OR "Colotois pennaria" OR "Comstockaspis perniciosa" OR "Coniella populina" OR "Coniochaeta dakotensis" OR "Conioscinella gallarum" OR "Coniothyrium fuckelii" OR "Conistra vaccinii" OR "Contarinia petioli" OR "Contarinia populi" OR "Contarinia tremulae" OR "Coronophora ovipara" OR "Corticium roseum" OR "Cortinarius cumatilis" OR "Coryneum populinum" OR "Cosmia trapezina" OR "Cossus cossus" OR "Crepidodera aurata" OR "Crepidodera aurea" OR "Crepidodera fulvicornis" OR "Crepidodera lamina" OR "Crepidodera nitidula" OR "Crepidodera pluta" OR "Cresporhaphis wienkampii" OR "Crocallis elinguaria" OR "Cryptadelphia fusiformis" OR "Cryptocephalus frontalis" OR "Cryptocephalus parvulus" OR "Cryptocephalus sexpunctatus" OR "Cryptocline dubia" OR "Cryptocoryneum condensatum" OR "Cryptodiaporthe populea" OR "Cryptorhynchus lapathi" OR "Cryptosphaeria ligniota" OR "Cryptosphaeria populina" OR "Cryptosporiopsis fasciculata" OR "Cydia corollana" OR "Cylindrosporium populinum" OR "Cyrtidula hippocastani" OR "Cytospora ambiens" OR "Cytospora chrysosperma" OR "Cytospora leucostoma" OR "Cytospora nivea" OR "Cytospora populina" OR "Daedalea unicolor" OR "Daldinia concentrica" OR "Daldinia pyrenaica" OR "Daruvedia bacillata" OR "Dasineura populeti" OR "Dasineura populnea" OR "Descarpentriesina variolosa" OR "Diaphora mendica" OR "Diaspidiotus gigas" OR "Diaspidiotus lenticularis" OR "Diaspidiotus ostreaeformis" OR "Diaspidiotus perniciosus" OR "Diaspidiotus pyri" OR "Diatrype bullata" OR "Dicallomera fascelina" OR "Dicerca aenea" OR "Dictyotrichiella mansonii" OR "Didymella barbieri" OR "Didymosphaeria congruella" OR "Dinemasporium strigosum" OR "Dinoptera collaris" OR "Diplococcium spicatum" OR "Diplodia gongrogena" OR "Diplodia mutila" OR "Diplodia tumefaciens" OR "Discosia artocreas" OR "Discosia julia" OR "Diurnea fagella" OR "Doraphis populi" OR "Doraphis populi ssp. Tremulae" OR "Dorytomus affinis" OR "Dorytomus dejeani" OR "Dorytomus edoughensis" OR "Dorytomus ictor" OR "Dorytomus longimanus" OR "Dorytomus nordenskioldi" OR "Dorytomus rubrirostris" OR "Dorytomus suratus" OR "Dorytomus taeniatus" OR "Dorytomus tortrix" OR "Dorytomus tremulae" OR "Dothichiza populina" OR "Dothiopsis tremulae" OR "Dothiora sphaeroides" OR "Dothiorella crepinii" OR "Drepana falcataria" OR "Drepanopeziza brunnea" OR "Drepanopeziza castagnei" OR "Drepanopeziza populi" OR "Drepanopeziza punctiformis" OR "Drepanopeziza tremulae" OR "Echinosphaeria canescens" OR "Ectoedemia argyropeza" OR "Ectropis crepuscularia" OR "Egle ciliata" OR

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"Egle muscaria" OR "Elasmostethus interstinctus" OR "Elasmucha grisea" OR "Eligmodonta ziczac" OR "Ellescus scanicus" OR "Enargia paleacea" OR "Encoelia fascicularis" OR "Endoxyla populi" OR "Ennomos erosaria" OR "Ennomos quercinaria" OR "Entoleuca mammata" OR "Eotetranychus populi" OR "Epinotia cinereana" OR "Epinotia maculana" OR "Epinotia nisella" OR "Epinotia solandriana" OR "Epione paralellaria" OR "Epione repandaria" OR "Epione vespertaria" OR "Epirranthis diversata" OR "Epirrita autumnata" OR "Epirrita christyi" OR "Epirrita dilutata" OR "Erannis defoliaria" OR "Eriogaster lanestris" OR "Eriophyes diversipunctatus" OR "Eriophyes populi" OR "Erostella minima" OR "Erysiphe adunca" OR "Erysiphe penicillata" OR "Erysiphe salicis" OR "Eulecanium douglasi" OR "Eulecanium tiliae" OR "Eulecanium transvittatum" OR "Eulithis populata" OR "Eulithis testata" OR "Euphydryas maturna" OR "Eupithecia subfuscata" OR "Euproctis chrysorrhoea" OR "Eupsilia transversa" OR "Eutypa sparsa" OR "Eutypella stellulata" OR "Euura amerinae" OR "Euura atra" OR "Euura cadderensis" OR "Euura fahraei" OR "Euura fuscomaculata" OR "Euura krausi" OR "Euura miliaris" OR "Euura nigricornis" OR "Euura papillosa" OR "Euura pavida" OR "Euura ranini" OR "Euura sylvestris" OR "Euwallacea kuroshio" OR "Exophiala calicioides" OR "Favolus pseudobetulinus" OR "Fenusella glaucopis" OR "Flavidoporia mellita" OR "Flavidoporia pulvinascens" OR "Fomes annosus" OR "Fomes connatus" OR "Fomes fomentarius" OR "Fomes igniarius" OR "Fomitopsis pinicola" OR "Furcula bifida" OR "Furcula furcula" OR "Fusarium sambucinum" OR "Fusicladium asteroma" OR "Fusicladium martianoffianum" OR "Fusicladium radiosum" OR "Fusicladium radiosum var. radiosum" OR "Fusicladium romellianum" OR "Fusidium griseum" OR "Ganoderma lipsiense" OR "Garella musculana" OR "Gelechia muscosella" OR "Gelechia nigra" OR "Gibberifera simplana" OR "Gliomastix cerealis" OR "Gliomastix convoluta" OR "Gloeosporium dubium" OR "Gloeosporium naevioides" OR "Gloeosporium tremulae" OR "Gloniopsis curvata" OR "Gluphisia crenata" OR "Glyphium elatum" OR "Gnomonia cerastis" OR "Gnomonia fahrendorffii" OR "Gonioctena decemnotata" OR "Gonioctena viminalis" OR "Gootiella tremulae" OR "Gypsonoma aceriana" OR "Gypsonoma imparana" OR "Gypsonoma minutana" OR "Gypsonoma nitidulana" OR "Gypsonoma sociana" OR "Hammerschmidtia ferruginea" OR "Harmandia loewi" OR "Harmandiola cavernosa" OR "Harmandiola cavinosa" OR "Harmandiola globuli" OR "Harmandiola populi" OR "Harmandiola pustulans" OR "Harmandiola tremulae" OR "Harzia acremonioides" OR "Hedya salicella" OR "Helicogloea aquilonia" OR "Helicogloea pellucida" OR "Helicogloea septifera" OR "Helicogloea sputum" OR "Helicoma fumosum" OR "Helicomyia saliciperda" OR "Heliococcus bohemicus" OR "Hericium erinaceus" OR "Heterarthrus ochropoda" OR "Heterobasidion annosum" OR "Heterobasidion parviporum" OR "Heteroradulum deglubens" OR "Hexomyza schineri" OR "Hilberina caudata" OR "Hyalinia rubella" OR "Hydria undulata" OR "Hydriomena furcata" OR "Hydropisphaera peziza" OR "Hylecoetus dermestoides" OR "Hymenoscyphus phyllogenus" OR "Hyphantria cunea" OR "Hyphoderma lapponicum" OR "Hypochnicium bombycinum" OR "Hypomyces pseudopolyporinus" OR "Hypoxylon macrocarpum" OR "Hypoxylon mammatum" OR "Hypoxylon mediterraneum" OR "Hypoxylon morsei" OR "Hypoxylon rubiginosum" OR "Hypoxylon rubiginosum var. rubiginosum" OR "Hysterobrevium curvatum" OR "Idiocerus distinguendus" OR "Idiocerus fulgidus" OR "Idiocerus laminatus" OR "Idiocerus populi" OR "Idiocerus tremulae" OR "Inocutis dryophila" OR "Inocutis rheades" OR "Inonotus hispidus" OR "Ipimorpha contusa" OR "Ipimorpha subtusa" OR "Janus luteipes" OR "Jikradia olitoria" OR "Jodis lactearia" OR "Kalmusia coniothyrium" OR "Kalmusia ebuli" OR "Kretzschmaria deusta" OR "Kybos populi" OR "Lacanobia thalassina" OR "Lachnella karstenii" OR "Lachnum corticale" OR "Laetiporus sulphureus" OR "Lahmia kunzei" OR "Lamia textor" OR "Laothoe populi" OR "Lasiobelonium corticale" OR "Lasiocampa quercus" OR "Lasiocampa trifolii" OR "Lasioptera populnea" OR "Lasiosphaeria caudata" OR "Lasiosphaeria crinita" OR "Lasiosphaeria ovina" OR "Lasiosphaeria pyramidata" OR "Lecanidion clavisporum" OR "Ledra aurita" OR "Leiopus linnei" OR "Leiopus nebulosus" OR "Leiopus punctulatus" OR "Lentinus brumalis" OR "Lentinus substrictus" OR "Lepidosaphes malicola" OR "Lepidosaphes ulmi" OR "Lepidosaphes ussuriensis" OR "Leptographium alneum" OR "Leptographium alni" OR "Leptosillia wienkampii" OR "Leptosphaeria immunda" OR "Leptothyrium populi" OR "Leptura annularis" OR "Leptura quadrifasciata" OR "Lepturalia nigripes" OR "Leucoma salicis" OR "Leucoptera sinuella" OR "Leucostoma niveum" OR "Leucostoma persoonii" OR "Limenitis populi" OR "Lindbergina aurovittata" OR "Linospora ceuthocarpa" OR "Linospora populina" OR "Lispothrips crassipes" OR "Lithophane ornitopus" OR "Lobophora halterata" OR "Lochmaea caprea" OR "Lochmaea capreae" OR "Lomaspilis bithynica" OR "Lomaspilis marginata" OR "Lomographa temerata" OR "Longidorus attenuatus" OR "Lophiostoma compressum" OR "Lophiostoma macrostomoides" OR "Lophiostoma nucula" OR "Lophiotrema nucula" OR "Luperus longicornis" OR "Lycia graecarius" OR "Lycia hirtaria" OR "Lygaeonematus compressicornis" OR "Lygocoris pabulinus" OR "Lygocoris populi" OR "Lymantria dispar asiatica" OR "Lymantria monacha" OR "Macrolabis bedeguariformis" OR "Macroleptura thoracica" OR "Macrophoma gongrogena" OR "Macrophoma tumefaciens" OR "Macropsis fuscinervis" OR "Magdalis nitidipennis" OR "Malacosoma disstria" OR "Malacosoma neustria" OR "Malacosoma parallela" OR "Marasmius favrei" OR "Marssonina castagnei" OR "Marssonina populi" OR "Megaplatypus mutatus" OR "Melampsora aecidioides" OR "Melampsora allii-populina" OR "Melampsora caprearum" OR "Melampsora farinosa" OR "Melampsora laricis-populina" OR "Melampsora laricis-tremulae" OR "Melampsora larici-tremulae" OR "Melampsora magnusiana" OR "Melampsora medusae" OR "Melampsora medusae f. sp. deltoidis" OR "Melampsora mercurialis-tremulae" OR "Melampsora pinitorqua" OR "Melampsora populnea" OR "Melampsora populnea f. sp. laricis" OR "Melampsora populnea f. sp. magnusiana" OR "Melampsora populnea f. sp. pinitorqua" OR "Melampsora populnea f. sp. rostrupii" OR "Melampsora pulcherrima" OR "Melampsora rostrupii" OR "Melampsora tremulae" OR "Melanophila picta" OR "Melanospora fimbriata" OR "Melittosporiella pulchella" OR "Melomastia mastoidea" OR "Membranomyces spurius" OR "Menesia bipunctata" OR "Menispora caesia" OR "Menispora glauca" OR "Menispora libertiana" OR "Menispora tortuosa" OR "Messa glaucopis" OR "Microsphaera penicillata" OR "Microthecium fimbriatum" OR "Monodictys melanopa" OR "Monosteira unicostata" OR "Morimus asper" OR "Mycoporum hippocastani" OR "Mycosphaerella populi" OR "Mycosphaerella punctiformis" OR "Mycosphaerella togashiana" OR "Mycosphaerella tremulicola" OR "Mycterothrips salicis" OR "Mytilinidion gemmigenum" OR "Naeviopsis carneopallida" OR "Napicladium asteroma" OR "Nectria cinnabarina" OR "Nectria dematiosa" OR "Nectria ditissima" OR "Nectria peziza" OR "Necydalis major" OR "Nemania serpens" OR "Nemania serpens var. serpens" OR "Nematus fahraei" OR "Nematus fuscomaculatus" OR "Nematus incompletus" OR "Nematus melanaspis" OR "Nematus nigricornis" OR "Nematus pavidus" OR "Neofusicoccum luteum" OR "Neolygus zebei" OR "Neomecomma bilineatus" OR "Neonectria ditissima" OR "Neta patuxentica" OR "Niesslia exilis" OR "Nivellia sanguinosa" OR "Noctua comes" OR "Noctua fimbriata" OR "Notodonta dromedarius" OR "Notodonta torva" OR "Notodonta tritophus" OR "Notodonta ziczac" OR "Nymphalis antiopa" OR "Nymphalis polychloros" OR "Nymphalis vaualbum" OR "Obrium cantharinum" OR "Oligoporus cerifluus" OR "Operophtera brumata" OR "Operophtera fagata" OR "Ophiostoma tremuloaureum" OR

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"Ophiostoma tremulo-aureum" OR "Orbilia rubella" OR "Orchestes jota" OR "Orgya antiqua" OR "Orgya recens" OR "Orgyia antiqua" OR "Orgyia leucostigma" OR "Orgyia recens" OR "Orthosia cerasi" OR "Orthosia gracilis" OR "Orthosia incerta" OR "Orthosia munda" OR "Orthosia populeti" OR "Orthotylus bilineatus" OR "Oxyporus corticola" OR "Oxyporus populinus" OR "Pachypappa marsupialis" OR "Pachypappa populi" OR "Pachypappa rosettei" OR "Pachypappa tremulae" OR "Pachypappella lactea" OR "Palaeolecanium bituberculatum" OR "Pamphilius betulae" OR "Pamphilius brevicornis" OR "Pamphilius festivus" OR "Pamphilius histrio" OR "Pamphilius latifrons" OR "Pamphilius maculosus" OR "Pamphilius silvaticus" OR "Pamphilius sylvaticus" OR "Panonychus ulmi" OR "Pappia fissilis" OR "Paraleucoptera sinuella" OR "Paranthrene tabaniformis" OR "Paraphytomyza tremulae" OR "Parastichtis suspecta" OR "Parlatoria oleae" OR "Parthenolecanium corni" OR "Patellariopsis clavispora" OR "Patinellaria sanguinea" OR "Pedostrangalia revestita" OR "Penicillium canescens" OR "Penicillium citrinum" OR "Penicillium purpurogenum var. rubri" OR "Peniophora polygonia" OR "Peniophora rufa" OR "Periconia hispidula" OR "Pestalotiopsis populi-nigrae" OR "Pezicula populi" OR "Phaeoacremonium minimum" OR "Phaeocalicium praecedens" OR "Phaeoramularia maculicola" OR "Phalera bucephala" OR "Phellinus igniarius" OR "Phellinus populicola" OR "Phellinus tremulae" OR "Pheosia tremula" OR "Phigalia pilosaria" OR "Phlebia rufa" OR "Phloeomyzus passerinii" OR "Phloeospora tremulae" OR "Phlyctis argena" OR "Phlyctis erythrosora" OR "Phoma cinerea" OR "Phoma crepini" OR "Phoma tremulae" OR "Phoma urens" OR "Phomatospora dinemasporium" OR "Phomopsis pallida" OR "Phratora atrovirens" OR "Phratora laticollis" OR "Phratora vitellinae" OR "Phratora vulgatissima" OR "Phyllactinia guttata" OR "Phyllactinia populi" OR "Phyllactinia populina" OR "Phyllactinia suffulta" OR "Phyllobius calcaratus" OR "Phyllobius glaucus" OR "Phyllobius maculicornis" OR "Phyllobius pyri" OR "Phyllobius viridiaeris" OR "Phyllocnistis labyrinthella" OR "Phyllocnistis ramulicola" OR "Phyllocnistis xenia" OR "Phyllocoptes didelphis" OR "Phyllocoptes populi" OR "Phyllocoptes populinus" OR "Phyllodecta laticollis" OR "Phyllodecta vitellinae" OR "Phyllodecta vulgatissima" OR "Phyllodesma ilicifolia" OR "Phyllodesma tremulifolia" OR "Phyllonorycter apparella" OR "Phyllonorycter sagitella" OR "Phyllonorycter salicicolella" OR "Phyllonorycter salictella" OR "Phyllosticta alcides" OR "Phyllosticta cinerea" OR "Phyllosticta populea" OR "Phyllosticta populina" OR "Phyllosticta populi-nigrae" OR "Phylloxerina populi" OR "Physatocheila dumetorum" OR "Phytobia cambii" OR "Phytocoris tiliae" OR "Phytodecta decemnotata" OR "Phytodecta viminalis" OR "Picipes tubaeformis" OR "Plagodis dolabraria" OR "Platystomum populinae" OR "Pleurophomopsis salicina" OR "Pleurotheciopsis bramleyi" OR "Pleurotus calyptratus" OR "Pleurotus dryinus" OR "Pleurotus ostreatus" OR "Poecilocampa populi" OR "Poecilonota variolosa" OR "Pollaccia radiosa" OR "Polydrusus cervinus" OR "Polydrusus flavipes" OR "Polydrusus pterygomalis" OR "Polydrusus tereticollis" OR "Polydrusus undatus" OR "Polyporus brumalis" OR "Polyporus dryadeus" OR "Polyporus dryophilus" OR "Polyporus hispidus" OR "Polyporus leptocephalus" OR "Polyporus lipsiensis" OR "Polyporus pseudobetulinus" OR "Polyporus squamosus" OR "Polyporus sulphureus" OR "Polyporus tubaeformis" OR "Polyporus zonatus" OR "Populicerus laminatus" OR "Populicerus populi" OR "Postia ceriflua" OR "Pristiphora conjugata" OR "Psallus confusus" OR "Psallus perrisi" OR "Psallus variabilis" OR "Psallus wagneri" OR "Pseudaulacaspis pentagona" OR "Pseudocamarosporium propinquum" OR "Pseudocercospora togashiana" OR "Pseudochermes fraxini" OR "Pseudoclavellaria amerinae" OR "Pseudococcus comstocki" OR "Pseudoinonotus dryadeus" OR "Pseudoips fagana" OR "Pseudoips prasinana" OR "Pseudomonas syringae pv. syringae" OR "Pseudosciaphila branderiana" OR "Pseudotrichia mutabilis" OR "Pterocomma populeum" OR "Pterocomma tremulae" OR "Pterostoma palpina" OR "Ptilodon capucina" OR "Ptycholoma lecheana" OR "Pulvinaria tremulae" OR "Pulvinaria vitis" OR "Pyrenopeziza petiolaris" OR "Pyrenophora buddleiae" OR "Pyrenophora buddlejae" OR "Rabdophaga giraudiana" OR "Rabdophaga saliciperda" OR "Raduliporus aneirinus" OR "Radulodon erikssonii" OR "Ramphus pulicarius" OR "Ramularia jaczevskii" OR "Ramularia rosea" OR "Resseliella quercivora" OR "Rhagium bifasciatum" OR "Rhagium mordax" OR "Rhamphus pulicarius" OR "Rheumaptera undulata" OR "Rhogogaster chlorosoma" OR "Rhogogaster dryas" OR "Rhogogaster punctulata" OR "Rhogogaster viridis" OR "Rhynchaenus salicis" OR "Rhynchites longiceps" OR "Rhynchites tomentosus" OR "Rhynchostoma minutum" OR "Rhytidiella moriformis" OR "Ropalopus femoratus" OR "Rosellinia subsimilis" OR "Rutidosoma globulus" OR "Rutidosoma graminosum" OR "Saccosoma farinaceum" OR "Saperda carcharias" OR "Saperda perforata" OR "Saperda populnea" OR "Saperda scalaris" OR "Saturnia pavonia" OR "Schizophyllum amplum" OR "Schizophyllum commune" OR "Schizotetranychus garmani" OR "Schizotetranychus schizopus" OR "Schizoxylon albescens" OR "Sciota hostilis" OR "Sciota rhenella" OR "Sclerencoelia fascicularis" OR "Scoliopteryx libatrix" OR "Scytinostroma galactinum" OR "Semioscopis strigulana" OR "Septogloeum populiperdum" OR "Septoria marmorata" OR "Septoria populi" OR "Septotinia populiperda" OR "Septotis populiperda" OR "Sesia apiformis" OR "Sesia melanocephala" OR "Smerinthus ocellata" OR "Smerinthus ocellatus" OR "Sphaerulina frondicola" OR "Spilonota ocellana" OR "Sporocadus populinus" OR "Stachybotrys alternans" OR "Stauronematus compressicornis" OR "Stauronematus platycerus" OR "Stauropus fagi" OR "Stegania cararia" OR "Stegania trimaculata" OR "Stegonsporium taphrinum" OR "Stenocorus meridianus" OR "Stenostola dubia" OR "Stenostola ferrea" OR "Sthenarus rotermundi" OR "Stictis brunnescens" OR "Stictis confusa" OR "Stictis populorum" OR "Stictochorella populi-nigrae" OR "Stigmella assimilella" OR "Stigmella trimaculella" OR "Stomaphis longirostris" OR "Strangalia attenuata" OR "Strangalia aurulenta" OR "Strangalia maculata" OR "Subacronicta megacephala" OR "Sympodiella acicola" OR "Synanthedon formicaeformis" OR "Synanthedon melliniformis" OR "Synanthedon spuleri" OR "Syndemis musculana" OR "Tachyerges rufitarsis" OR "Tachyerges salicis" OR "Talaromyces purpureogenus" OR "Tapesia cinerella" OR "Taphrina johansonii" OR "Taphrina populina" OR "Taphrina rhizophora" OR "Taphrorychus bicolor" OR "Tectella calyptrata" OR "Teichospora abducens" OR "Teichospora pruniformis" OR "Temnocerus coeruleus" OR "Temnocerus longiceps" OR "Tethea ocularis" OR "Tethea or" OR "Tetheella fluctuosa" OR "Tetranychus turkestani" OR "Tetranychus urticae" OR "Tetropium castaneum" OR "Thecabius affinis" OR "Thyridaria macrostomoides" OR "Titaeosporina tremulae" OR "Tomentella asperula" OR "Trachypteris picta" OR "Trachypteris picta decostigma" OR "Trachys minutus" OR "Tracylla julia" OR "Trametes cervina" OR "Trametes gibbosa" OR "Trametes ochracea" OR "Trametes pubescens" OR "Trametes trogii" OR "Trametes versicolor" OR "Trametopsis cervina" OR "Trematosphaeria pertusa" OR "Tremex fuscicornis" OR "Tremulicerus fulgidus" OR "Tremulicerus tremulae" OR "Trichiocampus grandis" OR "Trichiosoma pusillum" OR "Trichiura crataegi" OR "Trichoderma lignorum" OR "Trichoderma strictipile" OR "Trichoderma viride" OR "Trichoferus campestris" OR "Trichopeziza karstenii" OR "Trichopteryx carpinata" OR "Trichothecium roseum" OR "Triposporium elegans" OR "Tritophia tritophus" OR "Troposporella fumosa" OR "Trypodendron domesticum" OR "Trypophloeus asperatus" OR "Trypophloeus bispinulus" OR "Trypophloeus granulatus" OR "Trypophloeus tremulae" OR "Tympanis alpina" OR "Tympanis spermatiospora" OR "Typhula ochraceosclerotiata" OR "Tyromyces fissilis" OR "Tyromyces fumidiceps" OR "Tyromyces vivii" OR "Uncinula adunca" OR "Uncinula adunca var. adunca" OR

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| | |
|---|---|
| | "Uncinula salicis" OR "Ustulina vulgaris" OR "Valsa ambiens" OR "Valsa nivea" OR "Valsa sordida" OR "Valsaria anserina" OR "Valsella nigroannulata" OR "Venturia macularis" OR "Venturia maculiformis" OR "Venturia martianoffiana" OR "Venturia populina" OR "Venturia radiosa" OR "Venturia tremulae" OR "Venturia tremulae var. tremulae" OR "Venturia viennotii" OR "Verticillium alboatrum" OR "Verticillium albo-atrum" OR "Viridicerus ustulatus" OR "Vuilleminia comedens" OR "Xanthia icteritia" OR "Xanthia ocellaris" OR "Xanthomonas populi" OR "Xenasma rimicola" OR "Xenosporium pleurococcum" OR "Xestia castanea" OR "Xiphydria camelus" OR "Xylaria hypoxylon" OR "Xyleborinus attenuatus" OR "Xyleborus cryptographus" OR "Xyleborus dispar" OR "Xyleborus pfeili" OR "Xylella fastidiosa" OR "Xylosandrus crassiusculus" OR "Xylosandrus germanus" OR "Xylotrechus rusticus" OR "Ypsolopha parenthesella" OR "Ypsolopha ustella" OR "Zeugophora flavicollis" OR "Zeugophora frontalis" OR "Zeugophora scutellaris" OR "Zeugophora subspinosa" OR "Zeugophora turneri" OR "Zeuzera pyrina" OR "Zignoella ovoidea" OR "Zygina nivea" |

# APPENDIX C

## Plant taxa reported to be present in the nurseries of *Populus alba, P. nigra* and *P. tremula*

**TABLE C.1** Plant taxa reported in the Dossier Sections 3.1, 3.2 and 3.3 to be present in the nurseries of *Populus alba, P. nigra* and *P. tremula*.

| Number | Plant taxa | Number | Plant taxa |
|---|---|---|---|
| 1 | *Abelia* | 610 | *Malus* 'Scotch Dumpling' |
| 2 | *Abies alba* | 611 | *Malus* 'Scrumptious' |
| 3 | *Abies fraserii* | 612 | *Malus* 'Somerset Redstreak' |
| 4 | *Abies grandis* | 613 | *Malus* 'Spartan' |
| 5 | *Abies nobilis* | 614 | *Malus* 'St Edmund's Russet' |
| 6 | *Abies nordmanniana* | 615 | *Malus* 'Stirling Castle' |
| 7 | *Acacia* | 616 | *Malus* 'Stoke Red' |
| 8 | *Acanthus* | 617 | *Malus* 'Sun Rival' |
| 9 | *Acer* | 618 | *Malus* 'Sunset' |
| 10 | *Acer campestre* | 619 | *Malus* 'Surprize' |
| 11 | *Acer macrocarpa* | 620 | *Malus* sylvestris |
| 12 | *Acer palmatum* 'Pixie' | 621 | *Malus* 'Three Counties' |
| 13 | *Acer palmatum* 'Sango kaku' | 622 | *Malus* 'TICKLED PINK Baya Marisa' |
| 14 | *Acer palmatum* 'Seiryu' | 623 | *Malus* 'Tom Putt' |
| 15 | *Acer palmatum* 'Shaina' | 624 | *Malus toringo* subsp. *sargentii* 'Tina' |
| 16 | *Acer palmatum* 'Suminagashi' | 625 | *Malus transitoria* |
| 17 | *Acer palmatum* 'Tamukeyama' | 626 | *Malus transitoria* 'Thornhayes Tansy' |
| 18 | *Acer palmatum* 'Trompenburg' | 627 | *Malus* 'Tremlett's Bitter' |
| 19 | *Acer palmatum* 'Villa Taranto' | 628 | *Malus trilobata* 'Guardsman' |
| 20 | *Acer platanoides* | 629 | *Malus* 'Trinity' |
| 21 | *Acer platanoides* 'Crimson King' | 630 | *Malus tschonoskii* |
| 22 | *Acer platanoides* 'Crimson Sentry' | 631 | *Malus tschonoskii* 'Belmonte' |
| 23 | *Acer platanoides* 'Drummondii' | 632 | *Malus* 'Van Eseltine' |
| 24 | *Acer platanoides* 'Princeton Gold' | 633 | *Malus* 'Vicky' |
| 25 | *Acer pseudoplatanus* | 634 | *Malus* 'Warner's King' |
| 26 | *Acer pseudoplatanus* 'Brilliantissimum' | 635 | *Malus* 'William Crump' |
| 27 | *Acer pseudoplatanus* 'Esk Sunset' | 636 | *Malus* 'Winter Gem' |
| 28 | *Acer pseudoplatanus* 'Leopoldii' | 637 | *Malus* 'Worcester Pearmain' |
| 29 | *Acer pseudoplatanus* 'Prinz Handjery' | 638 | *Malus* × *moerlandsii* 'Profusion Improved' |
| 30 | *Acer rubrum* | 639 | *Malus* 'Yarlington Mill' |
| 31 | *Acer rubrum* 'Autumn Flame' | 640 | *Matteuccia* |
| 32 | *Acer rubrum* 'Brandywine' | 641 | *Meconopsis* |
| 33 | *Acer rubrum* 'October Glory' | 642 | *Mespilus* 'Nottingham' |
| 34 | *Acer rubrum* 'Red Sunset' | 643 | *Metasequoia glyptostroboides* |
| 35 | *Acer rubrum* 'Scanlon' | 644 | *Miscanthus* |
| 36 | *Acer rubrum* 'Sun Valley' | 645 | *Molinia* |
| 37 | *Acer saccharum* | 646 | *Monarda* |
| 38 | *Acer shirasawanum* 'Autumn Moon' | 647 | *Morus* 'Carman' |
| 39 | *Acer* × *freemanii* 'Autumn Blaze' | 648 | *Morus* 'Chelsea' |
| 40 | *Acer* × *freemanii* 'Morgan' | 649 | *Morus* 'Giant Fruit' |
| 41 | *Achillea* | 650 | *Morus* 'Mojo Berry' |
| 42 | *Acorus* | 651 | *Morus* 'Pendula' |
| 43 | *Actaea* | 652 | *Myrtus* |
| 44 | *Aesculus* × *carnea* 'Briotii' | 653 | *Nandina* |
| 45 | *Aesculus parviflora* | 654 | *Nemesia* |
| 46 | *Agapanthus* | 655 | *Nepeta* |

(Continues)

**TABLE C.1** (Continued)

| Number | Plant taxa | Number | Plant taxa |
|---|---|---|---|
| 47 | *Agastache* | 656 | *Nothofagus* |
| 48 | *Ajuga* | 657 | *Nothofagus antarctica* |
| 49 | *Akebia* | 658 | *Nyssa sylvatica* |
| 50 | *Albizia julibrissin* 'Chocolate Fountain' | 659 | *Nyssa sylvatica* 'Red Rage' |
| 51 | *Albizia julibrissin* 'Evys Pride" | 660 | *Nyssa sylvatica* 'Wisley Bonfire' |
| 52 | *Albizia julibrissin* 'Ombrella' | 661 | *Olearia* |
| 53 | *Albizia julibrissin* 'Shidare' | 662 | *Ophiopogon* |
| 54 | *Albizia julibrissin* 'Summer Chocolate' | 663 | *Osmanthus* |
| 55 | *Alchemilla* | 664 | *Osmunda* |
| 56 | *Allium* | 665 | *Pachysandra* |
| 57 | *Alnus* | 666 | *Pachystegia* |
| 58 | *Alnus cordata* | 667 | *Paeonia* |
| 59 | *Alnus glutinosa* | 668 | *Panicum* |
| 60 | *Alnus glutinosa* 'Imperialis' | 669 | *Parrotia persica* |
| 61 | *Alnus incana* | 670 | *Parrotia persica* 'Bella' |
| 62 | *Alnus incana* 'Aurea' | 671 | *Parrotia persica* 'Persian Spire' |
| 63 | *Alnus rubra* | 672 | *Parrotia persica* 'Vanessa' |
| 64 | *Alnus spaethii* | 673 | *Paulownia tomentosa* |
| 65 | *Alstroemeria* | 674 | *Pennisetum* |
| 66 | *Amelanchier* | 675 | *Penstemon* |
| 67 | *Amelanchier alnifolia* 'Northline' | 676 | *Perovskia* |
| 68 | *Amelanchier alnifolia* 'Obelisk' | 677 | *Persicaria* |
| 69 | *Amelanchier canadensis* 'Rainbow Pillar' | 678 | *Philadelphus* |
| 70 | *Amelanchier* 'Edelweiss' | 679 | *Phlomis* |
| 71 | *Amelanchier* 'La Paloma' | 680 | *Phlox* |
| 72 | *Amelanchier laevis* 'R.J. Hilton' | 681 | *Phormium* |
| 73 | *Amelanchier laevis* 'Snowflakes' | 682 | *Photinia* |
| 74 | *Amelanchier lamarckii* | 683 | *Photinia* × *fraseri* 'Red Robin' |
| 75 | *Amelanchier* × *grandiflora* 'Ballerina' | 684 | *Phygelius* |
| 76 | *Amelanchier* × *grandiflora* 'Robin Hill' | 685 | *Physocarpus* |
| 77 | *Ammonophylla* | 686 | *Physocarpus opulifolius* 'Diablo' |
| 78 | *Anemanthele* | 687 | *Physocarpus opulifolius* 'Lady in Red' |
| 79 | *Anemone* | 688 | *Physostegia* |
| 80 | *Aquilegia* | 689 | *Picea abies* |
| 81 | *Araucaria araucana* | 690 | *Picea orientalis* |
| 82 | *Arbutus* | 691 | *Picea ormorika* |
| 83 | *Arbutus unedo* | 692 | *Picea pungens* 'Erich Frahm' |
| 84 | *Armeria* | 693 | *Picea pungens* 'Iseli Fastigiate' |
| 85 | *Artemisia* | 694 | *Picea sitchensis* |
| 86 | *Arum* | 695 | *Picea smithiana* 'Aurea' |
| 87 | *Aruncus* | 696 | *Pinus* |
| 88 | *Asplenium* | 697 | *Pinus densiflora* 'Umbraculifera' |
| 89 | *Astelia* | 698 | *Pinus flexilis* 'Vanderwolf's Pyramid' |
| 90 | *Aster* | 699 | *Pinus mugo* 'Winter Sun' |
| 91 | *Astilbe* | 700 | *Pinus nigra* 'Bright Eyes' |
| 92 | *Astrantia* | 701 | *Pinus nigra* 'Obelisk' |
| 93 | *Athyrium* | 702 | *Pinus peuce* |
| 94 | *Aucuba* | 703 | *Pinus pinaster* |
| 95 | *Baptisia* | 704 | *Pinus pungens glauca* |

**TABLE C.1** (Continued)

| Number | Plant taxa | Number | Plant taxa |
|---|---|---|---|
| 96 | *Berberis* | 705 | *Pinus radiata* 'Aurea' |
| 97 | *Bergenia* | 706 | *Pinus strobus* 'Minima' |
| 98 | *Betula* | 707 | *Pinus strobus* 'Tiny Kurls' |
| 99 | *Betula alba pendula* | 708 | *Pinus sylvestris* |
| 100 | *Betula albosinensis* 'Chinese Ruby' | 709 | *Pinus sylvestris* 'Chantry Blue' |
| 101 | *Betula costata* 'Daleside' | 710 | *Pinus sylvestris* 'Gold Medal' |
| 102 | *Betula ermanii* 'Mount Zao Purple' | 711 | *Pinus sylvestris* 'Westonbirt' |
| 103 | *Betula ermanii* 'Polar Bear' | 712 | *Pinus thunbergii* 'Banshosho' |
| 104 | *Betula ermanii* 'White Chocolate' | 713 | *Pinus wallichiana* |
| 105 | *Betula* 'Fascination' | 714 | *Pinus* × *holdfordiana* |
| 106 | *Betula* 'Fetisowii' | 715 | *Pittosporum* |
| 107 | *Betula nigra* 'Shiloh Splash' | 716 | *Platanus* |
| 108 | *Betula pendula* | 717 | *Platanus* × *hispanica* |
| 109 | *Betula pendula* 'Dalecarlica' | 718 | *Polemonium* |
| 110 | *Betula pendula* 'Fastigiata Joes' | 719 | *Polygonatum* |
| 111 | *Betula pendula* 'Royal Frost' | 720 | *Polypodium* |
| 112 | *Betula pendula* 'Spider Alley' | 721 | *Polystichum* |
| 113 | *Betula pendula* 'Tristis' | 722 | *Populus* |
| 114 | *Betula pendula* 'Youngii' | 723 | *Populus nigra* |
| 115 | *Betula pubescens* | 724 | *Populus tremula* |
| 116 | *Betula utilis* 'Cinnamon' | 725 | *Potentilla* |
| 117 | *Betula utilis* 'Dark-Ness' | 726 | *Primula* |
| 118 | *Betula utilis* 'Edinburgh' | 727 | *Prunus* |
| 119 | *Betula utilis* 'Melony Sanders' | 728 | *Prunus* 'Accolade' |
| 120 | *Betula utilis* 'Moonbeam' | 729 | *Prunus* 'Amanogawa' |
| 121 | *Betula utilis* 'Mount Luoji' | 730 | *Prunus* 'Amber Heart' |
| 122 | *Betula utilis* 'Snow Queen' | 731 | *Prunus* 'Amsden June' |
| 123 | *Betula utilis* ssp. *Jacquemontii* | 732 | *Prunus* 'Aprikyra' |
| 124 | *Betula utilis* ssp. *jacquemontii* 'Grayswood Ghost' | 733 | *Prunus* 'Aprimira' |
| 125 | *Betula utilis* ssp. *jacquemontii* 'Jermyns' | 734 | *Prunus* 'Aprisali' |
| 126 | *Betula utilis* ssp. *Jacquemontii* 'Silver Shadow' | 735 | *Prunus* 'Areko' |
| 127 | *Betula utilis* ssp. *jacquemontii* 'Trinity College' | 736 | *Prunus* 'Asano' |
| 128 | *Betula utilis* subsp. *albosinensis* 'Cacao' | 737 | *Prunus* 'Athos' |
| 129 | *Betula utilis* subsp. *albosinensis* 'China Rose' | 738 | *Prunus* 'Avalon' |
| 130 | *Betula utilis* subsp. *albosinensis* 'Hergest' | 739 | *Prunus* 'Avalon Pride' |
| 131 | *Betula utilis* subsp. *albosinensis* 'Kansu' | 740 | *Prunus avium* |
| 132 | *Betula utilis* subsp. *albosinensis* 'Pink Champagne' | 741 | *Prunus avium* 'Plena' |
| 133 | *Betula utilis* subsp. *albosinensis* 'Red Panda' | 742 | *Prunus* 'Aylesbury Prune' |
| 134 | *Betula utilis* subsp. *jacquemontii* 'McBeath' | 743 | *Prunus* 'Belle de Louvain' |
| 135 | *Betula utilis* 'Wakehurst Place Chocolate' | 744 | *Prunus* 'Beni-yutaka' |
| 136 | *Blechnum* | 745 | *Prunus* 'Bergeron' |
| 137 | *Brachyglottis* | 746 | *Prunus* 'Bergeval' |
| 138 | *Brunnera* | 747 | *Prunus* 'Black Oliver' |
| 139 | *Buddleja* | 748 | *Prunus* 'Blaisdon Red' |
| 140 | *Buxus* | 749 | *Prunus* 'Blue Tit' |
| 141 | *Buxus sempervirens* | 750 | *Prunus* 'Blushing Bride' |
| 142 | *Calamagrostis* | 751 | *Prunus* 'Burcombe' |
| 143 | *Callicarpa bodinieri* var. *giraldii* 'Profusion' | 752 | *Prunus* 'Cambridge' |
| 144 | *Calluna* | 753 | *Prunus* 'Candy Floss' |

(Continues)

**TABLE C.1** (Continued)

| Number | Plant taxa | Number | Plant taxa |
|---|---|---|---|
| 145 | *Calycanthus* 'Aphrodite' | 754 | *Prunus* 'Catherine' |
| 146 | *Campanula* | 755 | *Prunus* 'Celeste' |
| 147 | *Carex* | 756 | *Prunus cera* |
| 148 | *Carpinus* | 757 | *Prunus cera* 'Crimson Pointe' |
| 149 | *Carpinus betulus* | 758 | *Prunus cera* 'Nigra' |
| 150 | *Carpinus betulus* 'Chartreuse' | 759 | *Prunus cerasifera myrobalan* |
| 151 | *Carpinus betulus* 'Frans Fontaine' | 760 | *Prunus* 'Chocolate Ice' |
| 152 | *Carpinus betulus* 'Lucas' | 761 | *Prunus* 'Coes Golden Drop' |
| 153 | *Carpinus betulus* 'Rockhampton Red' | 762 | *Prunus* 'Collingwood Ingram' |
| 154 | *Caryopteris* | 763 | *Prunus* 'Compacta' |
| 155 | *Castanea* | 764 | *Prunus* 'Countess' |
| 156 | *Castanea sativa* | 765 | *Prunus* 'Czar' |
| 157 | *Catalpa bignonioides* 'Aurea' | 766 | *Prunus* 'Daikoku' |
| 158 | *Catalpa* × *erubescens* 'Purpurea' | 767 | *Prunus* 'de Nancy' |
| 159 | *Ceanothus* | 768 | *Prunus* 'Denniston's Superb' |
| 160 | *Ceanothus arboreus* 'Trewithen Blue' | 769 | *Prunus* 'Early Red Maraly' |
| 161 | *Cedrus atlantica* | 770 | *Prunus* 'Early Transparent' |
| 162 | *Cedrus atlantica* 'Glauca' | 771 | *Prunus* 'Edda' |
| 163 | *Cedrus atlantica* 'Glauca Pendula' | 772 | *Prunus* 'Excalibur' |
| 164 | *Cedrus deodara* 'Karl Fuchs' | 773 | *Prunus* 'Farleigh' |
| 165 | *Cedrus deodara* 'Klondyke' | 774 | *Prunus* 'Ferbleue' |
| 166 | *Cedrus libani* | 775 | *Prunus* 'Fertile' |
| 167 | *Centaurea* | 776 | *Prunus* 'Fice' |
| 168 | *Centranthus* | 777 | *Prunus* 'Flavor King' |
| 169 | *Ceratostigma* | 778 | *Prunus* 'Folfer' |
| 170 | *Cercidiphyllum japonicum* | 779 | *Prunus* 'Fragrant Cloud' |
| 171 | *Cercidiphyllum japonicum* 'Pendulum' | 780 | *Prunus* 'Frilly Frock' |
| 172 | *Cercis canadensis* 'Alley Cat' | 781 | *Prunus* 'Fugenzo' |
| 173 | *Cercis canadensis* 'Carolina Sweetheart' | 782 | *Prunus* 'Garden Aprigold' |
| 174 | *Cercis canadensis* 'Eternal Flame' | 783 | *Prunus* 'Garden Beauty' |
| 175 | *Cercis canadensis* 'Forest Pansy' | 784 | *Prunus* 'Garden Lady' |
| 176 | *Cercis canadensis* 'Golden Falls' | 785 | *Prunus* 'Goldcot' |
| 177 | *Cercis canadensis* 'Hearts of Gold' | 786 | *Prunus* 'Golden Glow' |
| 178 | *Cercis canadensis* 'Lavender Twist' | 787 | *Prunus* 'Golden Sphere' |
| 179 | *Cercis canadensis* 'Merlot' | 788 | *Prunus* 'Gordon Castle' |
| 180 | *Cercis canadensis* 'Pink Pom Pom' | 789 | *Prunus* 'Gorgeous' |
| 181 | *Cercis canadensis* 'Rising Sun' | 790 | *Prunus* 'Guinevere' |
| 182 | *Cercis canadensis* 'Ruby Falls' | 791 | *Prunus* 'Gyoiko' |
| 183 | *Cercis canadensis* 'Vanilla Twist' | 792 | *Prunus* 'Gypsy' |
| 184 | *Cercis chinensis* 'Avondale' | 793 | *Prunus* 'Haganta' |
| 185 | *Cercis chinensis* 'Diane' | 794 | *Prunus* 'Hales Early' |
| 186 | *Cercis reniformis* 'Oklahoma' | 795 | *Prunus* 'Hally Jolivette' |
| 187 | *Cercis reniformis* 'Texan White' | 796 | *Prunus* 'HELENA DU ROUSSILLON Aviera' |
| 188 | *Cercis siliquastrum* 'Bodnant' | 797 | *Prunus* 'Henriette' |
| 189 | *Chaenomeles* | 798 | *Prunus* 'Herman' |
| 190 | *Chamaecyparis* | 799 | *Prunus* 'Hertford' |
| 191 | *Choisya* | 800 | *Prunus* 'Hokusai' |
| 192 | *Cistus* | 801 | *Prunus* 'Horinji' |
| 193 | *Cladrastis kentuckea* | 802 | *Prunus* 'Ichiyo' |

**TABLE C.1** (Continued)

| Number | Plant taxa | Number | Plant taxa |
|---|---|---|---|
| 194 | *Clematis* | 803 | *Prunus incisa* 'Kojo-no-mai' |
| 195 | *Convolvulus* | 804 | *Prunus incisa* 'Mikinori' |
| 196 | *Coprosma* | 805 | *Prunus incisa* 'Oshidori PRINCESSE' |
| 197 | *Coreopsis* | 806 | *Prunus incisa* 'Pendula' |
| 198 | *Cornus* | 807 | *Prunus incisa* 'Praecox' |
| 199 | *Cornus sanguinea* | 808 | *Prunus incisa* 'Yamadei' |
| 200 | *Cortaderia* | 809 | *Prunus* 'Ingrid' |
| 201 | *Corydalis* | 810 | *Prunus* 'Jacqueline' |
| 202 | *Corylus* | 811 | *Prunus* 'Jefferson' |
| 203 | *Corylus avellana* | 812 | *Prunus* 'Jubilee' |
| 204 | *Corylus avellana* 'Contorta' | 813 | *Prunus* 'Kanzan' |
| 205 | *Corylus* 'Cosford' | 814 | *Prunus* 'Katinka' |
| 206 | *Corylus* 'Gunslebert' | 815 | *Prunus* 'Ki 2004 R11 B93' |
| 207 | *Corylus* 'Hall's Giant' | 816 | *Prunus* 'Ki 2004 R14 B56' |
| 208 | *Corylus* 'Lang Tidlig Zeller' | 817 | *Prunus* 'Kiku-shidare-zakura' |
| 209 | *Corylus* 'Nottingham' | 818 | *Prunus* 'King of the Damsons' |
| 210 | *Corylus* 'Red Filbert' | 819 | *Prunus* 'Kioto' |
| 211 | *Corylus* 'Te-Terra Red' | 820 | *Prunus* 'KIR LAMOUR' |
| 212 | *Corylus* 'Tonda Di Giffoni' | 821 | *Prunus* 'KIR ROSSO' |
| 213 | *Corylus* 'Tonda Gentile de le Romana' | 822 | *Prunus* 'KIR VULCANO' |
| 214 | *Corylus* 'Tonda Gentile Trilobata' | 823 | *Prunus* 'Knights Early Black' |
| 215 | *Corylus* 'Webbs Prize Cob' | 824 | *Prunus* 'Kobuku-zakura POWDER PUFF' |
| 216 | *Cosmos* | 825 | *Prunus* 'Kofugen' |
| 217 | *Cotinus* | 826 | *Prunus* 'Kordia' |
| 218 | *Cotoneaster* | 827 | *Prunus* 'Kursar' |
| 219 | *Cotoneaster frigidus* 'Cornubia' | 828 | *Prunus* 'Lapins Cherokee' |
| 220 | *Cotoneaster* 'Hybridus Pendulus' | 829 | *Prunus laurocerasus* |
| 221 | *Cotoneaster lacteus* | 830 | *Prunus* 'Lindsey Gage' |
| 222 | *Cotoneaster salicifolius* 'Exburiensis' | 831 | *Prunus litigiosa* |
| 223 | *Cotoneaster salicifolius* 'Repens' | 832 | *Prunus* 'Little Pink Perfection' |
| 224 | *Cotoneaster* × *suecicus* 'Coral Beauty' | 833 | *Prunus* 'Lord Napier' |
| 225 | *Cotoneaster* × *suecicus* 'Juliette' | 834 | *Prunus lusitanica* |
| 226 | *Crataegus* | 835 | *Prunus* 'Malling Elizabeth' |
| 227 | *Crataegus azarolus* | 836 | *Prunus* 'Marjorie's Seedling' |
| 228 | *Crataegus laevigata* 'Crimson Cloud' | 837 | *Prunus* 'Merchant' |
| 229 | *Crataegus laevigata* 'Pauls Scarlet' | 838 | *Prunus* 'Meritare' |
| 230 | *Crataegus laevigata* 'Plena' | 839 | *Prunus* 'Merryweather' |
| 231 | *Crataegus laevigata* 'Rosea Flore Pleno' | 840 | *Prunus* 'Merton Glory' |
| 232 | *Crataegus monogyna* | 841 | *Prunus* 'Mesembrine' |
| 233 | *Crataegus monogyna* 'Stricta' | 842 | *Prunus* 'Mikurama-gaeshi' |
| 234 | *Crataegus persimilis* 'Prunifolia Splendens' | 843 | *Prunus* 'Morello' |
| 235 | *Crataegus pinnatifida* var. *major* 'Big Golden Star' | 844 | *Prunus* 'Nabella' |
| 236 | *Crataegus schraderiana* | 845 | *Prunus* 'Napoleon Bigarreau' |
| 237 | *Crataegus succulenta* 'Jubilee' | 846 | *Prunus* 'Nectarella' |
| 238 | *Crataegus* × *dippeliana* | 847 | *Prunus* 'Nimba' |
| 239 | *Crataegus* × *lavallei* 'Carrierei' | 848 | *Prunus* 'Okame' |
| 240 | *Crocosmia* | 849 | *Prunus* 'Old Green Gage' |
| 241 | *Cryptomeria japonica* | 850 | *Prunus* 'Opal' |
| 242 | *Cryptomeria japonica* 'Gracilis' | 851 | *Prunus* 'Oullins Golden' |

(Continues)

**TABLE C.1** (Continued)

| Number | Plant taxa | Number | Plant taxa |
|---|---|---|---|
| 243 | *Cryptomeria japonica* 'Sekkan-sugi' | 852 | *Prunus padus* |
| 244 | *Cupressocyparis* | 853 | *Prunus padus* 'Le Thoureil' |
| 245 | *Cupressocyparis leylandii* | 854 | *Prunus* 'Pandora' |
| 246 | *Cupressus* | 855 | *Prunus* 'Papillon' |
| 247 | *Cupressus arizonica* var. *glabra* 'Blue Ice' | 856 | *Prunus pendula* 'Ascendens Rosea' |
| 248 | *Cupressus macrocarpa* 'Wilma' | 857 | *Prunus pendula* 'Pendula Rubra' |
| 249 | *Cupressus sempervirens* 'Totem' | 858 | *Prunus pendula* 'Stellata' |
| 250 | *Cydonia* 'Aromatnaya' | 859 | *Prunus* 'Penny' |
| 251 | *Cydonia* 'Bereczki' | 860 | *Prunus* 'Peregrine' |
| 252 | *Cydonia* 'Isfahan' | 861 | *Prunus* 'Petit Noir' |
| 253 | *Cydonia* 'Meech's Prolific' | 862 | *Prunus* 'Pineapple' |
| 254 | *Cydonia* 'Serbian Gold' | 863 | *Prunus* 'Pink Marry' |
| 255 | *Cydonia* 'Vranja' | 864 | *Prunus* 'Pink Parasol' |
| 256 | *Cynoglossum* | 865 | *Prunus* 'Pink Perfection' |
| 257 | *Cytisus* | 866 | *Prunus* 'Pink Shell' |
| 258 | *Dahlia* | 867 | *Prunus* 'Purple Pershore' |
| 259 | *Daphne* | 868 | *Prunus* 'Queen's Crown' |
| 260 | *Davidia involucrata* | 869 | *Prunus* 'Red Haven' |
| 261 | *Davidia involucrata* 'Sonoma' | 870 | *Prunus* 'Reeves' |
| 262 | *Delosperma* | 871 | *Prunus* 'Regina' |
| 263 | *Delphinium* | 872 | *Prunus* 'Reine Claude de Bavay' |
| 264 | *Deschampsia* | 873 | *Prunus* 'River's Early Prolific' |
| 265 | *Deutzia* | 874 | *Prunus* 'Robada' |
| 266 | *Dicentra* | 875 | *Prunus* 'Robijn' |
| 267 | *Diervilla* | 876 | *Prunus* 'Rochester' |
| 268 | *Digitalis* | 877 | *Prunus* 'Roundel Heart' |
| 269 | *Doronicum* | 878 | *Prunus* 'Royal Burgundy' |
| 270 | *Dryopteris* | 879 | *Prunus* 'Royal Flame' |
| 271 | *Echinacea* | 880 | *Prunus* 'Ruby COLUMNAR' |
| 272 | *Echinops* | 881 | *Prunus rufa* |
| 273 | *Elaeagnus* | 882 | *Prunus* 'Sanctus Hubertus' |
| 274 | *Elaeagnus angustifolia* 'Quicksilver' | 883 | *Prunus sargentii* |
| 275 | *Epimedium* | 884 | *Prunus* 'Saturn' |
| 276 | *Eremurus* | 885 | *Prunus* 'Seneca' |
| 277 | *Erigeron* | 886 | *Prunus serrula* |
| 278 | *Eriophorum* | 887 | *Prunus serrula* 'Branklyn' |
| 279 | *Eriostemon* | 888 | *Prunus* 'Shepherds Bullace' |
| 280 | *Eryngium* | 889 | *Prunus* 'Shirotae' |
| 281 | *Erysimum* | 890 | *Prunus* 'Shosar' |
| 282 | *Escallonia* | 891 | *Prunus* 'Shropshire Prune' |
| 283 | *Eucalyptus* | 892 | *Prunus* 'Skeena' |
| 284 | *Eucalyptus* 'Azura' | 893 | *Prunus* 'Snow Goose' |
| 285 | *Eucalyptus glaucescens* | 894 | *Prunus* 'Snow Showers' |
| 286 | *Eucalyptus gunnii* | 895 | *Prunus spinosa* |
| 287 | *Euonymus* | 896 | *Prunus* 'Spire' |
| 288 | *Euonymus alatus* 'Compactus' | 897 | *Prunus* 'Spring Snow' |
| 289 | *Euonymus clivicola* | 898 | *Prunus* 'STARDUST COVEU' |
| 290 | *Euonymus europaeus* | 899 | *Prunus* 'Stella' |
| 291 | *Euonymus europaeus* 'Brilliant' | 900 | *Prunus* 'Stella's Star' |

**TABLE C.1** (Continued)

| Number | Plant taxa | Number | Plant taxa |
|---|---|---|---|
| 292 | *Euonymus europaeus* 'Red Cascade' | 901 | *Prunus* 'Summer Sun' |
| 293 | *Euonymus hamiltonianus* 'Indian Summer' | 902 | *Prunus* 'Sunburst' |
| 294 | *Euonymus hamiltonianus* 'Koi Boy' | 903 | *Prunus* 'Sunset Boulevard' |
| 295 | *Euonymus phellomanus* | 904 | *Prunus* 'Swan' |
| 296 | *Euonymus planipes* | 905 | *Prunus* 'Sweet Prune' |
| 297 | *Euonymus planipes* 'Sancho' | 906 | *Prunus* 'Sweetheart' |
| 298 | *Euphorbia* | 907 | *Prunus* 'Sylvia' |
| 299 | *Exochorda* | 908 | *Prunus* 'Tai-haku' |
| 300 | *Exochorda* × *macrantha* 'The Bride' | 909 | *Prunus* 'Taoyame' |
| 301 | *Fagus* | 910 | *Prunus* 'Terrace Amber' |
| 302 | *Fagus sylvatica* | 911 | *Prunus* 'The Bride' |
| 303 | *Fagus sylvatica* 'Black Swan' | 912 | *Prunus* 'Tiltstone Hellfire' |
| 304 | *Fagus sylvatica* 'Dawyck' | 913 | *Prunus* 'Tomcot' |
| 305 | *Fagus sylvatica* 'Dawyck Gold' | 914 | *Prunus* 'Topend Plus' |
| 306 | *Fagus sylvatica* 'Dawyck Purple' | 915 | *Prunus* 'Topfive' |
| 307 | *Fagus sylvatica* 'Midnight Feather' | 916 | *Prunus* 'Tophit Plus' |
| 308 | *Fagus sylvatica* 'Pendula' | 917 | *Prunus* 'Toptaste Kulinaria' |
| 309 | *Fagus sylvatica* 'Purple Fountain' | 918 | *Prunus* 'Trailblazer' |
| 310 | *Fagus sylvatica* 'Purpurea' | 919 | *Prunus* 'Ukon' |
| 311 | *Fagus sylvatica* 'Purpurea Pendula' | 920 | *Prunus* 'Vanda' |
| 312 | *Fagus sylvatica* 'Purpurea Tricolor' | 921 | *Prunus* 'Victoria' |
| 313 | *Fagus sylvatica* 'Riversii' | 922 | *Prunus* 'Violet' |
| 314 | *Fagus sylvatica* var. *heterophylla* 'Aspleniifolia' | 923 | *Prunus* 'Walter' |
| 315 | *Fagus sylvestris* 'Atropurpurea' | 924 | *Prunus* 'Warwickshire Drooper' |
| 316 | *Fargesia* | 925 | *Prunus* 'Waterloo' |
| 317 | *Fatsia* | 926 | *Prunus* 'Weeping Yoshino' |
| 318 | *Festuca* | 927 | *Prunus* 'Willingham' |
| 319 | *Ficus* 'Brown Turkey' | 928 | *Prunus* × *persicoides* 'Spring Glow' |
| 320 | *Ficus* 'Dalmatie' | 929 | *Prunus* × *subhirtella* 'Autumnalis' |
| 321 | *Ficus* 'Ice Crystal' | 930 | *Prunus* × *subhirtella* 'Autumnalis Rosea' |
| 322 | *Ficus* 'Little Miss Figgy' | 931 | *Prunus* × *subhirtella* 'Pendula Plena Rosea' |
| 323 | *Ficus* 'Panache' | 932 | *Prunus* × *yedoensis* |
| 324 | *Filipendula* | 933 | *Prunus* 'Yellow Pershore' |
| 325 | *Foeniculum* | 934 | *Pseudotsuga menziesii* |
| 326 | *Forsythia* | 935 | *Pulmonaria* |
| 327 | *Forsythia* × *intermedia* 'Lynwood Variety' | 936 | *Pyracantha* |
| 328 | *Forsythia suspensa* 'Nymans' | 937 | *Pyrus* |
| 329 | *Fraxinus ornus* 'Obelisk' | 938 | *Pyrus* 'Barnet' |
| 330 | *Fuchsia* | 939 | *Pyrus* 'Benita Rafzas' |
| 331 | *Galium* | 940 | *Pyrus* 'Beth' |
| 332 | *Garrya* | 941 | *Pyrus* 'Beurre Hardy' |
| 333 | *Gaura* | 942 | *Pyrus* 'Beurre Superfin' |
| 334 | *Genista* | 943 | *Pyrus* 'Black Worcester' |
| 335 | *Geranium* | 944 | *Pyrus* 'Blakeney Red' |
| 336 | *Geum* | 945 | *Pyrus* 'Brandy' |
| 337 | *Ginkgo biloba* | 946 | *Pyrus calleryana* 'Chanticleer' |
| 338 | *Ginkgo biloba* 'Blagon' | 947 | *Pyrus* 'Catillac' |
| 339 | *Ginkgo biloba* 'Menhir' | 948 | *Pyrus* 'Celebration NUVAR' |
| 340 | *Gleditsia triacanthos* 'Sunburst' | 949 | *Pyrus* 'Christie' |

(Continues)

**TABLE C.1** (Continued)

| Number | Plant taxa | Number | Plant taxa |
|---|---|---|---|
| 341 | *Griselinia* | 950 | *Pyrus communis* |
| 342 | *Hakonechloa* | 951 | *Pyrus* 'Concorde' |
| 343 | *Halesia carolina* | 952 | *Pyrus* 'Concorde'/'Conference'/'Comice' |
| 344 | *Halimium* | 953 | *Pyrus* 'Conference' |
| 345 | *Hamamelis* × *intermedia* 'Arnold Promise' | 954 | *Pyrus* 'Conference Moors Giant' |
| 346 | *Hamamelis* × *intermedia* 'Diane' | 955 | *Pyrus* 'Conference'/'Comice'/'Williams' |
| 347 | *Hamamelis* × *intermedia* 'Jelena' | 956 | *Pyrus* 'Doyenne du Comice' |
| 348 | *Hamamelis* × *intermedia* 'Pallida' | 957 | *Pyrus elaeagrifolia* 'Silver Sails' |
| 349 | *Hebe* | 958 | *Pyrus* 'Fondante d'Automne' |
| 350 | *Hedera* | 959 | *Pyrus* 'Gin' |
| 351 | *Helenium* | 960 | *Pyrus* 'Glou Morceau' |
| 352 | *Helichrysum* | 961 | *Pyrus* 'Gorham' |
| 353 | *Helleborus* | 962 | *Pyrus* 'Green Horse' |
| 354 | *Hemerocallis* | 963 | *Pyrus* 'Hellens Early' |
| 355 | *Heptacodium miconioides* | 964 | *Pyrus* 'Hendre Huffcap' |
| 356 | *Heuchera* | 965 | *Pyrus* 'Humbug' |
| 357 | *Heucherella* | 966 | *Pyrus* 'Invincible delwinor fertilia' |
| 358 | *Hippophae* | 967 | *Pyrus* 'Jargonelle' |
| 359 | *Hoheria sexstylosa* 'Snow White' | 968 | *Pyrus* 'Josephine de Malines' |
| 360 | *Hosta* | 969 | *Pyrus* 'Judge Amphlet' |
| 361 | *Houttuynia* | 970 | *Pyrus* 'Kumoi' |
| 362 | *Hydrangea* | 971 | *Pyrus* 'Louise Bonne of Jersey' |
| 363 | *Hypericum* | 972 | *Pyrus* 'Merton Pride' |
| 364 | *Iberis* | 973 | *Pyrus* 'Moonglow' |
| 365 | *Ilex* | 974 | *Pyrus* 'Obelisk' |
| 366 | *Ilex* × *altaclerensis* 'Golden King' | 975 | *Pyrus* 'Olympic' |
| 367 | *Ilex aquifolium* | 976 | *Pyrus* 'Onward' |
| 368 | *Ilex aquifolium* 'Alaska' | 977 | *Pyrus* 'Packham's Triumph' |
| 369 | *Ilex aquifolium* 'Argentea Marginata' | 978 | *Pyrus* 'Pitmaston Dutchess' |
| 370 | *Ilex aquifolium* 'Handsworth New Silver' | 979 | *Pyrus* 'Red Pear' |
| 371 | *Ilex aquifolium* 'J.C. van Tol' | 980 | *Pyrus salicifolia* 'Pendula' |
| 372 | *Ilex aquifolium* 'Nellie R Stevens' | 981 | *Pyrus* 'Sensation' |
| 373 | *Imperata* | 982 | *Pyrus* 'Shinseiki' |
| 374 | *Iris* | 983 | *Pyrus* 'Shipover' |
| 375 | *Jasminum* | 984 | *Pyrus* 'Thorn' |
| 376 | *Juglans* 'Apollo' | 985 | *Pyrus* 'Williams' Bon Chrétien' |
| 377 | *Juglans* 'Broadview' | 986 | *Pyrus* 'Winnal's Longdon' |
| 378 | *Juglans* 'Buccaneer' | 987 | *Pyrus* 'Winter Nelis' |
| 379 | *Juglans* 'Chandler' | 988 | *Pyrus* 'Yellow Huffcap' |
| 380 | *Juglans* 'Fernette' | 989 | *Quercus* |
| 381 | *Juglans* 'Fernor' | 990 | *Quercus ilex* |
| 382 | *Juglans* 'Franquette' | 991 | *Quercus myrsinifolia* |
| 383 | *Juglans* 'Mars' | 992 | *Quercus palustris* 'Pringreen' |
| 384 | *Juglans nigra* | 993 | *Quercus petraea* |
| 385 | *Juglans regia* | 994 | *Quercus robur* |
| 386 | *Juniperus* | 995 | *Quercus rubra* |
| 387 | *Juniperus communis* | 996 | *Quercus texana* 'New Madrid' |
| 388 | *Juniperus scopulorum* 'Blue Arrow' | 997 | *Quercus* × *warei* 'Regal Prince' |
| 389 | *Knautia* | 998 | *Rhamnus* |

**TABLE C.1** (Continued)

| Number | Plant taxa | Number | Plant taxa |
|---|---|---|---|
| 390 | *Kniphofia* | 999 | *Rheum* 'Strawberry Surprise' |
| 391 | *Koelreuteria paniculata* 'Coral Sun' | 1000 | *Rheum* 'Timperley Early' |
| 392 | *Laburnum* | 1001 | *Rheum* 'Victoria' |
| 393 | *Laburnum anagyroides* 'Yellow Rocket' | 1002 | *Rhus* |
| 394 | *Lamium* | 1003 | *Ribes* |
| 395 | *Larix* | 1004 | *Ribes* 'Ben Connan' |
| 396 | *Larix* × *decidua* | 1005 | *Ribes* 'Ben Sarek' |
| 397 | *Larix* × *eurolepsis* | 1006 | *Ribes* 'Black 'n' Red Premiere' |
| 398 | *Lavandula* | 1007 | *Ribes* 'Blackbells' |
| 399 | *Lavatera* | 1008 | *Ribes* 'Blanka' |
| 400 | *Leucanthemum* | 1009 | *Ribes* 'Captivator' |
| 401 | *Leucothoe* | 1010 | *Ribes* 'Hinnonmaki Red' |
| 402 | *Leycesteria* | 1011 | *Ribes* 'Hinnonmaki Yellow' |
| 403 | *Leymus* | 1012 | *Ribes* 'Invicta' |
| 404 | *Liatris* | 1013 | *Ribes* 'Jonkheer van Tets' |
| 405 | *Ligularia* | 1014 | *Ribes* 'Junifer' |
| 406 | *Ligustrum* | 1015 | *Ribes* 'Lowberry Little Black Sugar' |
| 407 | *Ligustrum ovalifolium* | 1016 | *Ribes* 'Mucurines' |
| 408 | *Ligustrum vulgare* | 1017 | *Ribes* 'Ojebyn' |
| 409 | *Liquidambar* | 1018 | *Ribes* 'Rovada' |
| 410 | *Liquidambar styraciflua* | 1019 | *Ribes* 'Titania' |
| 411 | *Liquidambar styraciflua* 'Lane Roberts' | 1020 | *Robinia* |
| 412 | *Liquidambar styraciflua* 'Palo Alto' | 1021 | *Robinia* × *margaretta* 'Pink Cascade' |
| 413 | *Liquidambar styraciflua* 'Slender Silhouette' | 1022 | *Robinia pseudoacacia* 'Frisia' |
| 414 | *Liquidambar styraciflua* 'Stared' | 1023 | *Robinia pseudoacacia* 'Lace Lady Twisty Babe' |
| 415 | *Liquidambar styraciflua* 'Worplesdon' | 1024 | *Rosa* |
| 416 | *Liriodendron tulipifera* | 1025 | *Rosa canina* |
| 417 | *Liriodendron tulipifera* 'Snow Bird' | 1026 | *Rosa rugosa* |
| 418 | *Liriope* | 1027 | *Rosmarinus* |
| 419 | *Lithodora* | 1028 | *Rubus* 'Allgold' |
| 420 | *Lobelia* | 1029 | *Rubus* 'Arapaho' |
| 421 | *Lonicera* | 1030 | *Rubus* 'Autumn Bliss' |
| 422 | *Lonicera nitida* | 1031 | *Rubus* 'Buckingham' |
| 423 | *Lonicera periclymenum* | 1032 | *Rubus* 'Cascade Delight' |
| 424 | *Lupinus* | 1033 | *Rubus* 'Glen Ample' |
| 425 | *Luzula* | 1034 | *Rubus* 'Glen Carron' |
| 426 | *Lycium barbarum* 'Lubera Instant Success' | 1035 | *Rubus* 'Golden Everest' |
| 427 | *Lysimachia* | 1036 | *Rubus* 'Joan J' |
| 428 | *Magnolia* | 1037 | *Rubus* 'Loch Ness' |
| 429 | *Magnolia* 'Aphrodite' | 1038 | *Rubus* 'Lowberry Goodasgold' |
| 430 | *Magnolia* 'Black Tulip' | 1039 | *Rubus* 'Lowberry Little Black Prince' |
| 431 | *Magnolia* 'Blue Opal' | 1040 | *Rubus* 'Lowberry Little Sweet Sister' |
| 432 | *Magnolia* 'Cleopatra' | 1041 | *Rubus* 'Malling Juno' |
| 433 | *Magnolia* 'Daphne' | 1042 | *Rubus* 'Navaho Summerlong' |
| 434 | *Magnolia* 'Daybreak' | 1043 | *Rubus* 'Octavia' |
| 435 | *Magnolia* 'Eskimo' | 1044 | *Rubus* 'Oregon Thornless' |
| 436 | *Magnolia* 'Fairy Blush' | 1045 | *Rubus* 'Thornfree' |
| 437 | *Magnolia* 'Fairy Cream' | 1046 | *Rubus* 'Tulameen' |

(Continues)

**TABLE C.1** (Continued)

| Number | Plant taxa | Number | Plant taxa |
|---|---|---|---|
| 438 | *Magnolia* 'Fairy White' | 1047 | *Rudbeckia* |
| 439 | *Magnolia* 'Felix Jury' | 1048 | *Salix* |
| 440 | *Magnolia* 'Galaxy' | 1049 | *Salix aurita* |
| 441 | *Magnolia* 'Genie' | 1050 | *Salix caprea* |
| 442 | *Magnolia* 'Golden Pond' | 1051 | *Salix caprea* 'Pendula' |
| 443 | *Magnolia grandiflora* 'Alta' | 1052 | *Salix cinerea* |
| 444 | *Magnolia grandiflora* 'Kay Parris' | 1053 | *Salix erythroflexuosa* 'Golden Curls' |
| 445 | *Magnolia* 'Heaven Scent' | 1054 | *Salix* 'Hakuro Nishiki' |
| 446 | *Magnolia* 'Honey Tulip' | 1055 | *Salix pentandra* |
| 447 | *Magnolia* 'Hot Flash' | 1056 | *Salix viminalis* |
| 448 | *Magnolia* 'Joli Pompom' | 1057 | *Salvia* |
| 449 | *Magnolia* 'Livingstone' | 1058 | *Sambucus* |
| 450 | *Magnolia* 'March-Till-Frost' | 1059 | *Sambucus nigra* 'Black Beauty' |
| 451 | *Magnolia* 'Peachy' | 1060 | *Sambucus nigra* 'Black Lace' |
| 452 | *Magnolia* 'Red as Red' | 1061 | *Sambucus nigra* 'Black Tower Eiffel' |
| 453 | *Magnolia* 'Satisfaction' | 1062 | *Sambucus* 'Sampo' |
| 454 | *Magnolia* 'Shirazz' | 1063 | *Sanguisorba* |
| 455 | *Magnolia* 'Spectrum' | 1064 | *Santolina* |
| 456 | *Magnolia* 'Sunsation' | 1065 | *Scabiosa* |
| 457 | *Magnolia* 'Susan' | 1066 | *Schizostylis* |
| 458 | *Magnolia* 'Watermelon' | 1067 | *Sedum* |
| 459 | *Magnolia wilsonii* 'Eileen Baines' | 1068 | *Senecio* |
| 460 | *Magnolia* × *brooklynensis* 'Yellow Bird' | 1069 | *Sequoia sempervirens* |
| 461 | *Mahonia* | 1070 | *Sequoiadendron giganteum* |
| 462 | *Malus* | 1071 | *Sequoiadendron* 'Pendulum' |
| 463 | *Malus* × *purpurea* 'Crimson Cascade' | 1072 | *Sesleria* |
| 464 | *Malus* × *robusta* 'Red Sentinel' | 1073 | *Sophora japonica* 'Gold Standard' |
| 465 | *Malus* 'Adam's Pearmain' | 1074 | *Sorbaria* |
| 466 | *Malus* 'Admiration' | 1075 | *Sorbaronia* 'Likjormaja Liquorice' |
| 467 | *Malus* 'Angela' | 1076 | *Sorbus* |
| 468 | *Malus* 'Annie Elizabeth' | 1077 | *Sorbus alnifolia* 'Red Bird' |
| 469 | *Malus* 'Aros' | 1078 | *Sorbus* 'Amber Light' |
| 470 | *Malus* 'Arthur Turner' | 1079 | *Sorbus aria* |
| 471 | *Malus* 'Ashmead's Kernel' | 1080 | *Sorbus aria* 'Lutescens' |
| 472 | *Malus* baccata | 1081 | *Sorbus arranensis* |
| 473 | *Malus* 'Ballerina Flamenco' | 1082 | *Sorbus aucuparia* |
| 474 | *Malus* 'Ballerina Samba' | 1083 | *Sorbus aucuparia* 'Aspleniifolia' |
| 475 | *Malus* 'Bardsey' | 1084 | *Sorbus aucuparia* 'Beissneri' |
| 476 | *Malus* 'Beauty of Bath' | 1085 | *Sorbus aucuparia* 'Croft Coral' |
| 477 | *Malus* 'Black Dabinett' | 1086 | *Sorbus aucuparia* 'Fingerprint' |
| 478 | *Malus* 'Bladon Pippin' | 1087 | *Sorbus* 'Autumn Spire' |
| 479 | *Malus* 'Blenheim Orange' | 1088 | *Sorbus bissetii* 'Pearls' |
| 480 | *Malus* 'Bloody Ploughman' | 1089 | *Sorbus* 'Cardinal Royal' |
| 481 | *Malus* 'Bountiful' | 1090 | *Sorbus carmesina* 'Emberglow' |
| 482 | *Malus* 'Braeburn' | 1091 | *Sorbus cashmiriana* |
| 483 | *Malus* 'Braeburn Mariri Red' | 1092 | *Sorbus* 'Chinese Lace' |
| 484 | *Malus* 'Bramley 20' | 1093 | *Sorbus* 'Copper Kettle' |
| 485 | *Malus* 'Bramley 20'/'Christmas P'/'Scrumptious' | 1094 | *Sorbus discolor* |
| 486 | *Malus* 'Bramley Original' | 1095 | *Sorbus* 'Eastern Promise' |

**TABLE C.1** (Continued)

| Number | Plant taxa | Number | Plant taxa |
|---|---|---|---|
| 487 | *Malus* 'Bramley's Seedling' | 1096 | *Sorbus* 'Ghose' |
| 488 | *Malus brevipes* 'Wedding Bouquet' | 1097 | *Sorbus* 'Glendoick Spire' |
| 489 | *Malus* 'Browns' | 1098 | *Sorbus* 'Glendoick White Baby' |
| 490 | *Malus* 'Butterball' | 1099 | *Sorbus gonggashanica* 'Snow Balls' |
| 491 | *Malus* 'Candymint' | 1100 | *Sorbus hemsleyi* 'John Bond' |
| 492 | *Malus* 'Cardinal' | 1101 | *Sorbus hupehensis* |
| 493 | *Malus* 'Charles Ross' | 1102 | *Sorbus hupehensis* 'Pink Pagoda' |
| 494 | *Malus* 'Chivers Delight' | 1103 | *Sorbus hybrida* 'Gibbsii' |
| 495 | *Malus* 'Christmas Pippin' | 1104 | *Sorbus japonica* |
| 496 | *Malus* 'Cinderella' | 1105 | *Sorbus* 'Joseph Rock' |
| 497 | *Malus* 'Cobra' | 1106 | *Sorbus* 'Leonard Messel' |
| 498 | *Malus* 'Comtesse de Paris' | 1107 | *Sorbus* 'Matthew Ridley' |
| 499 | *Malus* 'Coralburst' | 1108 | *Sorbus* 'Pink Ness' |
| 500 | *Malus* 'Core Blimey' | 1109 | *Sorbus* 'Pink Pearl' |
| 501 | *Malus* 'Cornish Aromatic' | 1110 | *Sorbus pseudovilmorinii* |
| 502 | *Malus coronaria* 'Elk River' | 1111 | *Sorbus* 'Ravensbill' |
| 503 | *Malus* 'Coul Blush' | 1112 | *Sorbus* 'Rose Queen' |
| 504 | *Malus* 'Cox Lavera' | 1113 | *Sorbus sargentiana* |
| 505 | *Malus* 'Cox Self Fertile' | 1114 | *Sorbus scalaris* |
| 506 | *Malus* 'Cox SF'/'James Grieve'/'Katy' | 1115 | *Sorbus* 'Splendens' |
| 507 | *Malus* 'Cox'/'Fiesta'/'Herefordshire Russet' | 1116 | *Sorbus* 'Sunshine' |
| 508 | *Malus* 'Cox's Orange Pippin' | 1117 | *Sorbus thibetica* 'John Mitchell' |
| 509 | *Malus* 'Dabinett' | 1118 | *Sorbus torminalis* |
| 510 | *Malus* 'Devonshire Quarrenden' | 1119 | *Sorbus ulleungensis* 'Olympic Flame' |
| 511 | *Malus* 'Discovery' | 1120 | *Sorbus vilmorinii* |
| 512 | *Malus* 'Discovery NFT' | 1121 | *Sorbus vilmorinii* 'Pink Charm' |
| 513 | *Malus* 'Donald Wyman' | 1122 | *Sorbus wardii* |
| 514 | *Malus* 'Dr Campbells' | 1123 | *Sorbus* 'Wisley Gold' |
| 515 | *Malus* 'Eden' | 1124 | *Spiraea* |
| 516 | *Malus* 'Egremont Russet' | 1125 | *Stachys* |
| 517 | *Malus* 'Ellison's Orange' | 1126 | *Stachyurus* |
| 518 | *Malus* 'Evereste' | 1127 | *Stipa* |
| 519 | *Malus* 'Fiesta' | 1128 | *Styrax japonicus* 'Fragrant Fountain' |
| 520 | *Malus florentina* | 1129 | *Styrax japonicus* 'June Snow' |
| 521 | *Malus floribunda* | 1130 | *Styrax japonicus* 'Pink Snowbell' |
| 522 | *Malus* 'Fortune' | 1131 | *Symphiocarpus* |
| 523 | *Malus* 'Gala' | 1132 | *Symphoricarpos* |
| 524 | *Malus* 'Gala Brookfield' | 1133 | *Symphytum* |
| 525 | *Malus* 'Galloway Pippin' | 1134 | *Syringa* |
| 526 | *Malus* 'Gilly' | 1135 | *Syringa* 'Pink Perfume' |
| 527 | *Malus* 'Golden Delicious' | 1136 | *Syringa vulgaris* 'Beauty of Moscow' |
| 528 | *Malus* 'Golden Gem' | 1137 | *Syringa vulgaris* 'Charles Joly' |
| 529 | *Malus* 'Golden Glory' | 1138 | *Syringa vulgaris* 'Katherine Havemeyer' |
| 530 | *Malus* 'Golden Hornet' | 1139 | *Syringa vulgaris* 'Madame Lemoine' |
| 531 | *Malus* 'Gorgeous' | 1140 | *Syringa vulgaris* 'Mrs Edward Harding' |
| 532 | *Malus* 'Granny Smith' | 1141 | *Syringa vulgaris* 'Primrose' |
| 533 | *Malus* 'Greensleeves' | 1142 | *Syringa vulgaris* 'Sensation' |
| 534 | *Malus* 'Grenadier' | 1143 | *Syringa vulgaris* 'Souvenir de Louis Spaeth' |
| 535 | *Malus* 'Halloween' | 1144 | *Taxodium distichum* |

(Continues)

**TABLE C.1** (Continued)

| Number | Plant taxa | Number | Plant taxa |
|---|---|---|---|
| 536 | *Malus* 'Harry Baker' | 1145 | *Taxodium distichum* 'Shawnee Brave' |
| 537 | *Malus* 'Harry M Jersey' | 1146 | *Taxodium distichum* var. *imbricarium* 'Nutans' |
| 538 | *Malus* 'Hastings' | 1147 | *Taxus* |
| 539 | *Malus* 'Herefordshire Russet' | 1148 | *Taxus baccata* |
| 540 | *Malus* 'Hidden Rose' | 1149 | *Taxus baccata* 'Fastigiata Robusta' |
| 541 | *Malus* 'Honeycrisp' | 1150 | *Taxus baccata* 'Standishii' |
| 542 | *Malus* 'Howgate Wonder' | 1151 | *Tellima* |
| 543 | *Malus hupehensis* | 1152 | *Tetradium daniellii* |
| 544 | *Malus* 'Indian Magic' | 1153 | *Thalictrum* |
| 545 | *Malus ioensis* 'Fimbriata' | 1154 | *Thuja* |
| 546 | *Malus ioensis* 'Purpurea EVELYN' | 1155 | *Thuja plicata* |
| 547 | *Malus* 'Irish Peach' | 1156 | *Thymus* |
| 548 | *Malus* 'Isaac Newton' | 1157 | *Tiarella* |
| 549 | *Malus* 'James Grieve' | 1158 | *Tilia* |
| 550 | *Malus* 'Jelly King' | 1159 | *Tilia* × *europaea* 'Golden Sunset' |
| 551 | *Malus* 'John Downie' | 1160 | *Tilia* × *europaea* 'Wratislaviensis' |
| 552 | *Malus* 'Julia's Late Golden' | 1161 | *Tilia cordata* |
| 553 | *Malus* 'Jumbo' | 1162 | *Tilia cordata* 'Greenspire' |
| 554 | *Malus* 'Jupiter' | 1163 | *Tilia cordata* 'Winter Orange' |
| 555 | *Malus* 'Katy' | 1164 | *Tilia euchlora* |
| 556 | *Malus* 'Keswick Codlin' | 1165 | *Tilia henryana* 'Arnold Select' |
| 557 | *Malus* 'Kidd's Orange Red' | 1166 | *Tilia platanoides* |
| 558 | *Malus* 'King of the Pippins' | 1167 | *Tilia platanoides* 'Tiltstone Filigree' |
| 559 | *Malus* 'King's Acre Pippin' | 1168 | *Tilia platyphyllos* |
| 560 | *Malus* 'Kingston Black' | 1169 | *Trachelospermum* |
| 561 | *Malus* 'Lady Henniker' | 1170 | *Tradescantia* |
| 562 | *Malus* 'Lane's Prince Albert' | 1171 | *Tricyrtis* |
| 563 | *Malus* 'Laura' | 1172 | *Trollius* |
| 564 | *Malus* 'Laxton's Superb' | 1173 | *Tsuga heterophylla* |
| 565 | *Malus* 'Limelight' | 1174 | *Ulex* |
| 566 | *Malus* 'Little Pax' | 1175 | *Ulmus* |
| 567 | *Malus* 'Lord Derby' | 1176 | *Ulmus* × *hollandica* 'Wredei' |
| 568 | *Malus* 'Lord Lambourne' | 1177 | *Ulmus glabra* |
| 569 | *Malus* 'Louisa' | 1178 | *Ulmus* × Wingham |
| 570 | *Malus* 'Major' | 1179 | *Uncinia* |
| 571 | *Malus* 'Marble NUVAR' | 1180 | *Vaccinium* 'Bluecrop' |
| 572 | *Malus* 'Melrose Belmonte' | 1181 | *Vaccinium* 'Chandler' |
| 573 | *Malus* 'Meridian' | 1182 | *Vaccinium* 'Darrow' |
| 574 | *Malus* 'Michelin' | 1183 | *Vaccinium* 'Duke' |
| 575 | *Malus* 'Newton Wonder' | 1184 | *Vaccinium* 'Liberty' |
| 576 | *Malus* 'Orleans Reinette' | 1185 | *Vaccinium* 'Northland' |
| 577 | *Malus* 'Paradice Gold' | 1186 | *Vaccinium* 'Patriot' |
| 578 | *Malus* 'Peasgood's Nonsuch' | 1187 | *Vaccinium* 'Pink Lemonade' |
| 579 | *Malus* 'Pink Glow' | 1188 | *Vaccinium* 'Sunshine Blue' |
| 580 | *Malus* 'Pink Perfection' | 1189 | *Verbena* |
| 581 | *Malus* 'Pinot Prince SUPERNOVA' | 1190 | *Veronica* |
| 582 | *Malus* 'Pitmaston Pine Apple' | 1191 | *Viburnum* |
| 583 | *Malus* 'Pixie' | 1192 | *Viburnum lantana* |

**TABLE C.1** (Continued)

| Number | Plant taxa | Number | Plant taxa |
|---|---|---|---|
| 584 | *Malus* 'Porters Perfection' | 1193 | *Viburnum opulus* |
| 585 | *Malus* 'Prairie Fire' | 1194 | *Viburnum opulus* 'Roseum' |
| 586 | *Malus* 'Prince William' | 1195 | *Viburnum plicatum* 'Kilimanjaro' |
| 587 | *Malus* 'Professor Sprenger' | 1196 | *Vinca* |
| 588 | *Malus* 'Queen Cox S.F 18' | 1197 | *Vitis* Bacchus' |
| 589 | *Malus* 'Queen of the Realm' | 1198 | *Vitis* 'Dornfelder' |
| 590 | *Malus* 'Red Devil' | 1199 | *Vitis* 'Lakemont' |
| 591 | *Malus* 'Red Falstaff' | 1200 | *Vitis* 'Muscat Bleu' |
| 592 | *Malus* 'Red Foxwhelp' | 1201 | *Vitis* 'Phoenix' |
| 593 | *Malus* 'Red Jonaprince' | 1202 | *Vitis* 'Polo Muscat' |
| 594 | *Malus* 'Red Obelisk' | 1203 | *Vitis* 'Regent' |
| 595 | *Malus* 'Red Topaz' | 1204 | *Vitis* 'Strawberry' |
| 596 | *Malus* 'Red Windsor' | 1205 | *Vitis* 'Suffolk Red' |
| 597 | *Malus* 'Reverend W. Wilks' | 1206 | *Weigela* |
| 598 | *Malus* 'Ribston Pippin' | 1207 | *Wisteria brachybotrys* 'Golden Dragon' |
| 599 | *Malus* 'Rosehip' | 1208 | *Wisteria brachybotrys* 'Kapiteyn Fugi' |
| 600 | *Malus* 'Rosemary Russet' | 1209 | *Wisteria brachybotrys* 'Okayama' |
| 601 | *Malus* 'Rosette' | 1210 | *Wisteria brachybotrys* 'Shiro Beni' |
| 602 | *Malus* 'Royal Beauty' | 1211 | *Wisteria* 'Burford' |
| 603 | *Malus* 'Royalty' | 1212 | *Wisteria floribunda* 'Black Dragon' |
| 604 | *Malus* 'Rudolph' | 1213 | *Wisteria floribunda* 'Hon-beni' |
| 605 | *Malus* 'Santana' | 1214 | *Wisteria sinensis* 'Prolific' |
| 606 | *Malus* 'Saturn' | 1215 | *Xanthocyparis nootkatensis* 'Pendula' |
| 607 | *Malus* 'Scarlet Brandywine' | 1216 | *Yucca* |
| 608 | *Malus* 'Scarlett' | 1217 | *Zelkova serrata* 'Kiwi Sunset' |
| 609 | *Malus* 'Scotch Bridget' | | |

## APPENDIX D

### Water used for irrigation

All mains water 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 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 (Dossier Sections 1.1, 1.2 and 1.3).

Bore hole water supply: 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 (Dossier Sections 1.1, 1.2 and 1.3).

Rainwater or freshwater watercourse supply: some nurseries contributing to this application for both environmental and efficiency reasons 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 (Dossier Sections 1.1, 1.2 and 1.3).

# APPENDIX E

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

**TABLE E.1** List of potential pests not further assessed.

| N | Pest name | EPPO Code | Group | Pest present in the UK | Present in the EU | *Populus* confirmed as a host (reference) | Pest can be associated with the commodity | Impact | Justification for inclusion in this list |
|---|---|---|---|---|---|---|---|---|---|
| 1 | *Elsinoe populi* | | Fungi | Yes | Limited | *Populus nigra* (Farr & Rossman, 2024) | Yes | No data | Uncertainty on the impact |
| 2 | *Meloidogyne mali* | MELGMA | Nematodes | Yes | Limited | Wide host range (Dossier) | Uncertain | Uncertain | Uncertainty on the association with *Populus* and its impact on Populus |
| 3 | *Pemphigus populitransversus* | PEMPPO | Insects | Yes | Limited | *Populus nigra* (Aphids on World's Plants, 2024) | Yes | Uncertain | There is uncertainty on the impact on *Populus* |

## APPENDIX F

### Excel file with the pest list of *Populus alba, Populus nigra* and *Populus tremula*

Appendix F is available under the Supporting Information section.