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Commodity risk assessment of *Robinia pseudoacacia* plants from Israel

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Abstract

The EFSA Panel on Plant Health was requested to prepare and deliver risk assessments for commodities listed in the relevant Implementing Acts as 'High risk plants, plant products and other objects' [Commission Implementing Regulation (EU) 2018/2019 establishing a provisional list of high risk plants, plant products or other objects, within the meaning of Article 42 of Regulation (EU) 2016/2031]. The current Scientific Opinion covers all plant health risks posed by bare rooted plants for planting of *Robinia pseudoacacia* (1 year old with a stem diameter of less than 2.5 cm) imported from Israel, taking into account the available scientific information, including the technical information provided by Israel by 26 December 2019. The relevance of an EU-quarantine pest for this opinion was based on evidence that: (i) the pest is present in Israel; (ii) *R. pseudoacacia* is a host of the pest, and (iii) the pest can be associated with the commodity. The relevance of this opinion for other non EU-regulated pests was based on evidence that: (i) the pest is present in Israel (ii) the pest is absent in the EU; (iii) *R. pseudoacacia* is a host of the pest; (iv) the pest can be associated with the commodity and (v) the pest may have an impact and can pose a potential risk for the EU territory. Two pests (one insect and one fungus, *Euwallacea fornicatus* and *Fusarium euwallaceae*) that fulfilled all criteria were selected for further evaluation. For the two selected pests, the risk mitigation measures proposed in the technical dossier from Israel were evaluated. Limiting factors in the effectiveness of the measures were documented. For the selected pests an expert judgement is given on the likelihood of pest freedom taking into consideration the risk mitigation measures acting on the pest, including uncertainties associated with the assessment, therefore the Panel is 95% sure that 9,950 or more plants per 10,000 will be free from these two pests.

Keywords: black locust, European Union, expert judgement, pest risk reduction options, plant health, phytosanitary import requirements

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1. Introduction

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

1.1.1. Background

The new Plant Health Regulation (EU) 2016/2031[1], on the protective measures against pests of plants, has been applied since 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 (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 Acts as "High risk plants, plant products and other objects". Article 42, paragraphs 4 and 5, establishes that a risk assessment is needed as a follow-up to evaluate whether the commodities will remain prohibited, removed from the list and additional measures will be applied or removed from the list without any additional measures. This task is expected to be ongoing, with a regular flow of dossiers being sent by the applicant required for the risk assessment.

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

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

In view of the above and in accordance with Article 29 of Regulation (EC) No. 178/2002, the Commission asks EFSA to provide scientific opinion in the field of plant health for *Robinia pseudoacacia* from Israel taking into account the available scientific information, including the technical dossier provided by Israel.

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 specified plants for planting of *R. pseudoacacia* from Israel based on the Guidance on commodity risk assessment for the evaluation of high-risk plant dossiers (EFSA PLH Panel, 2019a).

In its evaluation the Panel:

- Checked whether the information in the technical dossier (hereafter called 'the Dossier') provided by Israel was sufficient to conduct a commodity risk assessment. When necessary, additional information was requested from the Israeli Authorities (Ministry of Agriculture and Rural Development, Plant Protection & Inspection Services – PPIS),
- Selected the relevant union – quarantine pests and protected zone quarantine pests (as specified in EU/2019/2072) and other relevant pests present in Israel and associated with the

[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.

commodity. Pests listed as union regulated non-quarantine pests in EU/2019/2072 were not considered for further evaluation,
- Evaluated the effectiveness of the proposed measures (as specified by PPIS) for the selected relevant organisms on *R. pseudoacacia* in Israel.

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 PPIS.

2. Data and methodologies

2.1. Data

The Panel considered all the data and information provided by Israel on *R. pseudoacacia* on 19 May 2019. The Dossier is managed by EFSA.

The structure and overview of the Dossier is shown in Table 1. The number of the relevant section will be 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
1.0	Initial request by Israel	EFSA-Q-2019-00108_0002-ISRAEL - *Robinia pseudoacacia*_Request.pdf
2.0	Technical dossier on *Robinia pseudoacacia* (complete document)	Robinia information for EFSA 02_05_2019.docx
3.0	**COMMODITY DATA**	Robinia information for EFSA 02_05_2019.docx
3.1	Taxonomic information	Robinia information for EFSA 02_05_2019.docx
3.2	Plants for planting specification (ISPM 36 – FAO, 2019)	Robinia information for EFSA 02_05_2019.docx
3.7	Production period	Robinia information for EFSA 02_05_2019.docx
3.8	Phytosanitary status and management	Robinia information for EFSA 02_05_2019.docx
3.9	Intended use	Robinia information for EFSA 02_05_2019.docx
3.10	Production area	Robinia information for EFSA 02_05_2019.docx
3.11	Separation of production areas	Robinia information for EFSA 02_05_2019.docx
3.12	Climatic classification	Robinia information for EFSA 02_05_2019.docx
3.13	Pictures and description	Robinia information for EFSA 02_05_2019.docx
4.0	**PESTS LIST**	Pest list for Robinia in Israel – Appendix 1 02_05_2019.docx
4.1	List of all the pests potentially associated with the commodity plant species or genus in the exporting country	Pest list for Robinia in Israel – Appendix 1 02_05_2019.docx
4.3	List of non-regulated pests (Table D2)	Pest list for Robinia in Israel – Appendix 1 02_05_2019.docx
4.4	Details of the literature search according to Appendix B	Pest list for Robinia in Israel – Appendix 1 02_05_2019.docx
5.0	**DATA ON PHYTOSANITARY MITIGATION MEASURES**	Robinia information for EFSA 02_05_2019.docx
5.2	Description of phytosanitary regulations	Robinia information for EFSA 02_05_2019.docx
5.3	Description of surveillance and monitoring	Robinia information for EFSA 02_05_2019.docx
5.4	Trade volumes and frequencies	Robinia information for EFSA 02_05_2019.docx
5.5	Description of post-harvest procedures	Robinia information for EFSA 02_05_2019.docx
5.6	Integration of information	2019.9.1 – Mitigation of specific pests of Robinia according to Appendix E (Additional information).docx
5.7	Integration of information	2019.12.26 – Reply on request for clarification on *Robinia pseudoacacia* (email)

The data and supporting information provided by the PPIS formed the basis of the commodity risk assessment. The following are the main data sources used by the PPIS to compile the requested information (details on literature searches can be found in the Dossier Section 4.4):

1) Avidov Z and Harpaz I 1969. Plant Pests of Israel; translated, revised and updated, Israel Universities Press, Jerusalem.
2) Biton S, 2017. Garden Pests in Israel. The Ministry of Agriculture, Extension Service [in Hebrew].
3) Borowiak-Sobkowiak B, Durak R and Wilkaniec B, 2017. Morphology, biology and behavioral aspects of *Aphis craccivor*a (Hemiptera: Aphididae) on *Robinia pseudoacacia*. Actal Sciences Hortorum Cultus, 16, 39–49.
4) Centre for Agriculture and Bioscience International (CABI), Crop Protection Compendium (CABI CPC). Available online: https://www.cabi.org/cpc.
5) European and Mediterranean Plant Protection Organization Global Database (EPPO), online. Available online: https://gd.eppo.int/.
6) García Morales M, Denno, BD, Miller DR, Miller GL, Ben-Dov, Y and Hardy NB, 2016. ScaleNet: a literature-based model of scale insect biology and systematics. Database, online. https://doi.org/10.1093/database/bav118. http://scalenet.info
7) Google search: 'Robinia' and 'Israel' – [in English and in Hebrew (ישראל רוביניה)]. Per pest in the pest list– Google search by scientific name, scientific name and 'Israel' – [in English and in Hebrew ("ישראל")], scientific name and 'Europe', 'Distribution', 'Transmission', 'stem', 'branch', 'twig', 'roots', 'import requirements', 'Quarantine', 'Regulatory status', 'Impact', 'Damage'.
8) Halperin J, Brosh S and Eshed N, 1989. Annotated list of noxious organisms in ornamental plants in Israel. Tel Aviv, The Ministry of Agriculture, Extension Service, 92 pp. [in Hebrew, with an English summary].
9) Heller A, 2018. Deterioration of oak trees. Ministry of Agriculture and Rural Development.

2.2. Methodologies

Literature searches were undertaken by EFSA to complete a list of pests potentially associated to *R. pseudoacacia* in Israel. Two searches were combined: (i) a general search to identify pests of *Robinia*, particularly *R. pseudoacacia*, in different databases; and (ii) a tailored search to identify whether these pests are present or not in Israel. The searches were run on the 26 July 2019. No language, date or document type restrictions were applied in the search strategy.

The Panel used the following databases (Table 2) to compile the pest list:

- **European and Mediterranean Plant Protection Organization Global Database**

EPPO (online)

The European and Mediterranean Plant Protection Organization (EPPO) Global Database is maintained by the EPPO Secretariat. The aim of the database is to provide all pest-specific information that has been produced or collected by EPPO. It includes host range data, distribution ranges and pest status information.

- **CABI Crop Protection Compendium**

CABI (online)

The Crop Protection Compendium is an encyclopaedic resource that brings together a wide range of different types of science-based information on all aspects of crop protection. It comprises detailed datasheets on pests, diseases, weeds, host crops and natural enemies.

- **Other databases**

In addition to CABI and EPPO sources of data, other thematic databases have been used to compile the list of potential pests of *R. pseudoacacia*. The complete list of the database used for compiling the pest list is reported in Table 2. In particular, on Web of Science, the literature search was performed using a specific, ad hoc established search string. The string was run in 'All Databases' with no range limits for time or language filters.

- **Other sources**

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

Table 2: Databases used for compiling the pest list

Database	Platform/Link
Aphids on World Plants	http://www.aphidsonworldsplants.info/C_HOSTS_AAIntro.htm
CABI Crop Protection Compendium	https://www.cabi.org/cpc/
Database of Insects and their Food Plants	http://www.brc.ac.uk/dbif/hosts.aspx
Database of the World's Lepidopteran Hostplants	https://www.nhm.ac.uk/our-science/data/hostplants/search/index.dsml
EPPO Global Database	https://gd.eppo.int/
Leaf-miners	http://www.leafmines.co.uk/html/plants.htm
Nemaplex	http://nemaplex.ucdavis.edu/Nemabase2010/PlantNematodeHostStatusDDQuery.aspx
Plant Viruses Online	http://bio-mirror.im.ac.cn/mirrors/pvo/vide/famindex.htm
Scalenet	http://scalenet.info/associates/
Spider Mites Web	https://www1.montpellier.inra.fr/CBGP/spmweb/advanced.php
USDA ARS Fungi Database	https://nt.ars-grin.gov/fungaldatabases/fungushost/fungushost.cfm
Web of Science: All Databases (Web of Science Core Collection, CABI: CAB Abstracts, BIOSIS Citation Index, Chinese Science Citation Database, Current Contents Connect, Data Citation Index FSTA, KCI-Korean Journal Database, Russian Science Citation Index, MEDLINE SciELO Citation Index, Zoological Record)	Web of Science https://www.webofknowledge.com
World Agroforestry	http://www.worldagroforestry.org/treedb2/speciesprofile.php?Spid=1749

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, 2019a).

In the first step, pests associated with the commodity in the country of origin (EU-quarantine pests and other pests) that may require risk mitigation measures were identified. Pests not known to occur in the EU and not regulated 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 overall efficacy of the proposed risk mitigation measures for each pest was evaluated. A conclusion on the likelihood of the commodity being free from each of the relevant pests was determined and uncertainties identified using expert judgements.

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

2.2.1. Commodity data

Based on the information provided by the PPIS, the characteristics of the commodity were summarised.

2.2.2. Identification of pests potentially associated with the commodity

To evaluate the pest risk associated with the importation of *R. pseudoacacia* plants from Israel a pest list was compiled. The pest list is based on information provided in Dossier Section 4 and Dossier Appendix 1 and on searches performed by the Panel. The pest list (see Microsoft Excel® file in Appendix C) is a document that includes pests that use the host plant at genus level (*Robinia* spp.),

retrieved from EPPO GD, CABI CPD. Other databases were consulted at plant species level. An overview of the consulted sources is listed in Table 2.

In case pests with limited information on potential impact are present in the export country, they will be listed in Appendix B (Pests that can potentially cause an impact not further assessed).

2.2.3. Listing and evaluation of risk mitigation measures

All current risk mitigation measures were listed and evaluated. When evaluating the likelihood of pest freedom at origin the following types of potential infection sources for *R. pseudoacacia* in nurseries were considered (see also Figure 1):

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

The risk mitigation measures adopted in the plant nurseries (as communicated by the PPIS) were evaluated with expert knowledge elicitation (EKE) according to the Guidance on uncertainty analysis in scientific assessment (EFSA Scientific Committee, 2018).

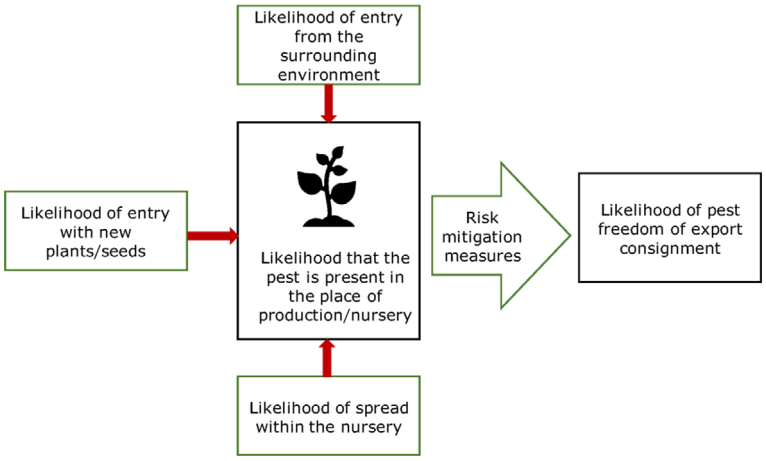

Figure 1: Conceptual framework to assess likelihood that plants are exported free from relevant pests. Source: EFSA PHL Panel (2019b)

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

To estimate the pest freedom of the commodity a semi-formal EKE was performed following EFSA guidance (Annex B.8 of EFSA Scientific Committee, 2018). The specific question for the semi-formal 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 *R. pseudoacacia* plants will be infested with the relevant pest/pathogen when arriving in the EU?' The EKE question was common to all pests for which the pest freedom of the commodity was estimated. The uncertainties associated with the EKE were taken into account and quantified in the probability distribution applying the semi-formal method described in Section 3.5.2 of the EFSA-PLH Guidance on Quantitative Pest Risk Assessment (EFSA PLH Panel, 2018). Finally, the results were reported in terms of the likelihood of pest freedom. The lower 5% percentile of the uncertainty distribution reflects the opinion that pest freedom is with 95% certainty above this limit.

3. Commodity data

3.1. Description of the commodity

The commodity to be imported is *R. pseudoacacia* (common name: black locust; family: Fabaceae) plants of the variety Twisty baby™, dwarf twisted growing plant (formerly Lace Lady).

The plants are 1 year old, up to 80 cm height and 2.5 cm diameter, bare rooted, dormant grafted plants (root washed, without leaves). Plants are delivered to container production nurseries.

According to ISPM 36 (FAO, 2019), the commodity can be classified as 'plants for planting – bare root plants'.

3.2. Description of the production areas

The plants destined for export, are grown in different fields from the plants destined for the local market, with 10s to 100s of metres as a minimum distance between a field for the local market and a field for export.

Figure 2 presents the two current sites of *R. pseudoacacia* cultivation in Israel: Bizaron and Kefar Yehoshua (the southern and the northern spots on the map, respectively).

Based on the global Köppen–Geiger climate zone classification (Kottek et al., 2006), the climate of both production sites of *R. pseudoacacia* in Israel is similar to that found in some regions of the southern EU (subgroup Csa, Mediterranean hot summer climates – see Figure 3).

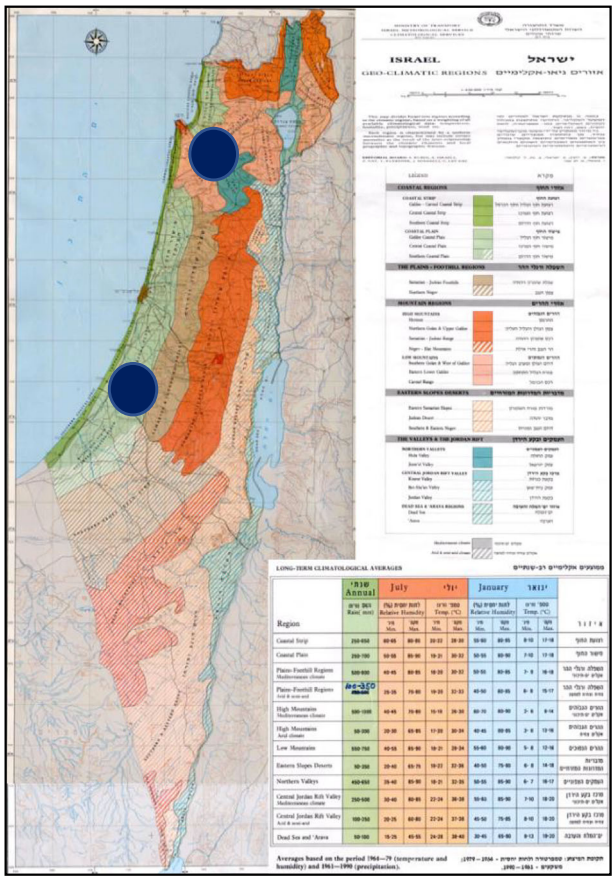

Figure 2: Current sites of *R. pseudoacacia* cultivation in Israel

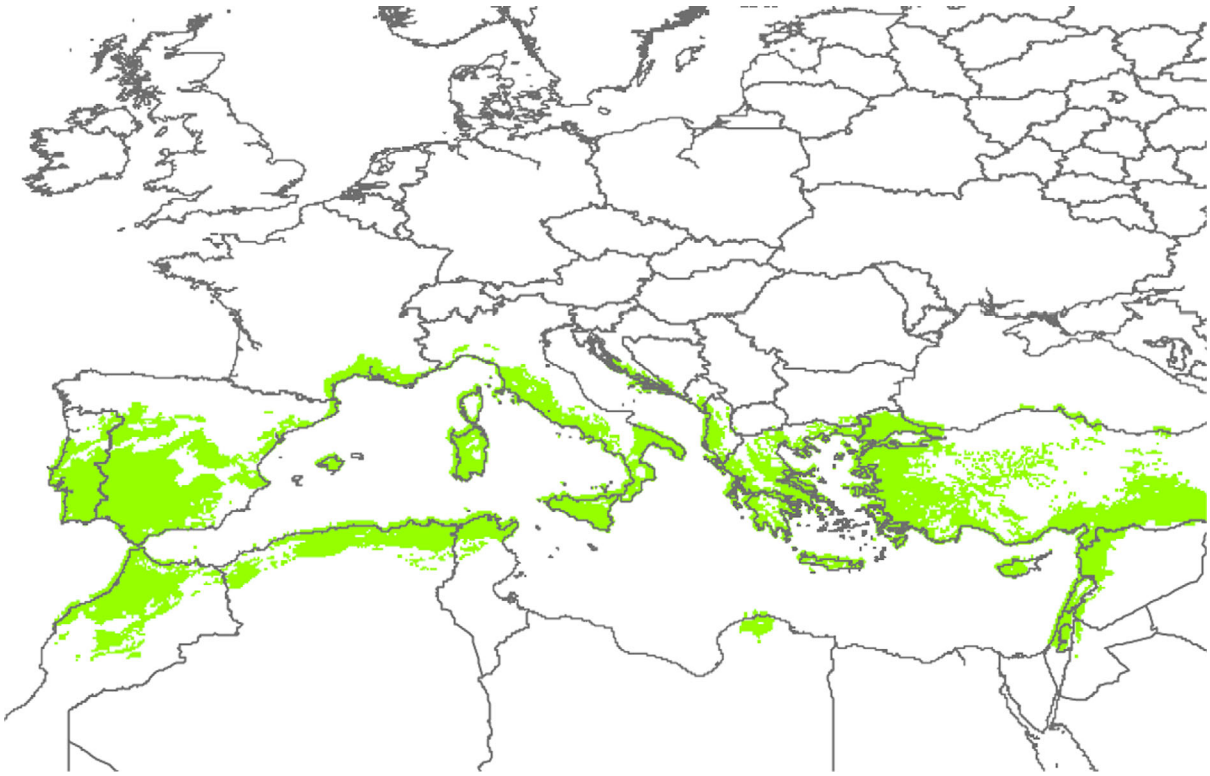

Figure 3: Distribution of Köppen-Geiger climate subgroup Csa (Mediterranean hot summer climates) areas in the Mediterranean basin (MacLeod and Korycinska, 2019)

3.3. Production and handling processes

3.3.1. Growing conditions

Plants are grown in open fields.

3.3.2. Source of planting material

Seeds imported from the Netherlands are used to produce rootstocks plants that are grafted (chip budding) with plant material originated from mother plants grown in the nurseries.

3.3.3. Production cycle

The propagation protocol is described as follows:

- Summer before the growing season - open field soil preparation - Solar disinfection;
- March – seeding *R. pseudoacacia* seeds;
- June – chip budding;
- The mother plants are grown in a mother plant stock and treated in the same manner as the young plants:
  - During the growing season, production fields are treated in a 3-week cycle with preventative treatments, i.e. rotation of the following pesticides: Atlas® (Bifenthrin), Ipon® (Dinotefuran), Imidan® (Phosmet) and EOS® (Eco Oil Spray).
  - Against nematodes: treatment with Nemakor® (Fenamiphos).
  - Weeds are treated with Faster® (Glufosinate ammonium).
  - The nursery staff monitor all their production fields for pest presence on a weekly basis.
  - Soil and root samples are tested for nematodes.
- December – lifting the plants from the field, washing the soil off the roots, selecting, grading and packing them in boxes. Storing them in cold storage at 2°C.

3.3.4. Export procedure

The following information on the post-harvest and export procedure was provided by PPIS (Dossier Section 5).

The bare-rooted plants are rinsed and checked individually for selecting and grading. The plants are then soaked in Merpan® 0.5% (broad spectrum fungicide, 800 g/kg captan).

The plants are packed after Merpan® has evaporated to dryness. Here, 20–100 cm tall plants are packed in 60 μm nylon bags and placed in cardboard boxes (120 × 50 × 25) – approximately 200 plants per box. The taller plants are packed in 180 μm nylon bags, approximately 30 plants per bag. The chilled storage rooms are at a temperature of 2°C and 70% humidity.

The plants are transferred from the storage rooms directly to a reefer container which maintains 2–4°C. The container is transported by ship to the EU and plants removed from the reefer on arrival at the customers, so that the refrigerated conditions are maintained throughout shipment.

From Israel, 2,500 to 5,000 *R. pseudoacacia* plants are annually exported to the EU.

4. Identification of pests potentially associated with the commodity

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.

Five EU-quarantine species that are reported to use *Robinia* spp. as a host plant were selected (Table 3) for their potential relevance.

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

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

Pests that fulfilled all three criteria were selected for further evaluation.

Table 3 presents an overview of the evaluation of the five EU-quarantine pest species that are reported to use *Robinia* spp. as a host in regards of their relevance for this Opinion.

Table 3: Overview of the evaluation of the four EU-quarantine pest species known to use *Robinia* spp. as a host plant for their relevance for this Opinion

Pest name according to the EU legislation[(a)]	EPPO code	Taxa[(b)]	Presence in Israel	*Robinia pseudoacacia* confirmed as a host (reference)	Pest can be associated with the commodity[(c)]	Pest relevant for the opinion
Anoplophora chinensis	ANOLCN	INS	No	Yes (CABI CPC)		**No**
Anoplophora glabripennis	ANOLGL	INS	No	Yes (CABI CPC)		**No**
Phymatotrichopsis omnivora	PHMPOM	FUN	No	Yes (CABI CPC)		**No**
Phytophthora ramorum	PHYTRA	FUN	No	Yes (CABI CPC)		**No**
Thaumetopoea processionea	THAUPR	INS	Yes	Yes (CABI CPC)	No	**No**

(a)**:** Commission Implementing Regulation (EU) 2019/2072.
(b)**:** INS: insect; FUN: fungus.
(c)**:** The question if the pest can be associated with the commodity is evaluated if the previous two questions are answered with 'yes'.

4.2. Selection of other relevant pests (not regulated in the EU) associated with the commodity

The information provided by the PPIS, integrated with the search EFSA performed, was evaluated to assess whether there are other relevant potential quarantine pests of *R. pseudoacacia* present in the country of export. For these pests that are not regulated in the EU, pest risk assessment information on the probability of introduction, establishment, spread and impact is usually lacking. Therefore, these non-EU-regulated pests that are present on *R. pseudoacacia* were evaluated to determine their relevance for this opinion based on evidence that:

a) the pest is present in Israel;
b) the pest is absent or has a limited distribution in the EU;
c) *R. pseudoacacia* 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.

Pests that fulfilled all five criteria were selected for further evaluation.

Based on the information collected, more than 800 potential harmful organisms known to be associated with *Robinia spp.* were evaluated for their relevance to this opinion. Species were excluded from further evaluation when at least one of the conditions listed above (a–e) was not met. Details can be found in the Appendix C (Microsoft Excel® file). Of the evaluated non-EU-regulated species, two pests (*Euwallacea fornicatus*[4] and *Fusarium euwallaceae*[5]) were selected for further evaluation because they met all of the selection criteria. *E. fornicatus* and *F. euwallaceae* are pests affecting avocado production in Israel and are listed in the EPPO A2 list). *E. fornicatus* and its symbiont fungus *F. euwallaceae* were dealt with within a single pest data sheet (Appendix A).

4.3. Overview of interceptions

Based on the information provided by the applicant, the number of plants of *R. pseudoacacia* exported to the EU range between 2,500 and 5,000 per year.

Data on the interception of harmful organisms on plants of *R. pseudoacacia* can provide information on some of the organisms that can be present on the exported plants despite the current measures taken. EUROPHYT (online) database reports no interceptions on *R. pseudoacacia* from all origins.

4.4. List of potential pests not further assessed

There were no pests retained in this list.

4.5. Summary of pests selected for further evaluation

The two pests identified to be present in Israel while having potential for association with *R. pseudoacacia* destined for export are listed in Table 4. The effectiveness of the risk mitigation measures applied to the commodity was evaluated for these selected pests. The ambrosia beetle (*E. fornicatus*) and its symbiotic fungus (*F. euwallaceae*) were evaluated together.

Table 4: List of relevant pests selected for further evaluation

No	Current scientific name	EPPO code	Name used in the EU legislation	Taxonomic information	Group[(a)]	Regulatory status
1	*Euwallacea fornicatus*	XYLBFO	*Euwallacea fornicatus*	Coleoptera, Curculionidae,	INS	Union Quarantine Pest, listed as non-EU Scolytidae in Implementing Regulation 2019/2072
2	*Fusarium euwallaceae*	FUSAEW	*Fusarium euwallaceae*	Hypocreales, Nectriaceae	FUN	Not regulated in the EU

(a): FUN: fungi; INS: insect.

[4] Starting from the 14 December 2019 *E.fornicatus* is regulated as Union Quarantine Pest, listed as Scolytidae spp. (non-EU) in Implementing Regulation 2019/2072. In Section 4.2 of the current Opinion this pest is still classified as non EU-regulated pest (the change in classification was noted during the adoption process), but the result of the assessment is not affected.

[5] According to Sandoval-Denis et al. (2019) the current scientific name for *Fusarium euwallaceae* is *Neocosmospora euwallaceae.* In this opinion, we will use *Fusarium euwallaceae* species name.

5. Risk mitigation measures

For each pest the Panel assessed the possibility that it could be present in a *R. pseudoacacia* nursery and assessed the probability that pest freedom of a consignment is achieved by the proposed risk mitigation measures acting on the pest under evaluation.

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

5.1. Possibility of pest presence in the nurseries

For each pest, the Panel evaluated the likelihood that the pest could be present in an *R. pseudoacacia* nursery by evaluating the possibility that *R. pseudoacacia* in the nursery are infected either by:

- introduction of the pest (e.g. insects, spores) from the environment surrounding the nursery;
- introduction of pest with new plants/seeds;
- spread of the pest within the nursery.

5.2. Risk mitigation measures applied in Israel

The Dossier Section 5.2 contains information on the phytosanitary regulations and inspection systems related to the plant of interest (*R. pseudoacacia*) where it has been reported:

- The PPIS, Ministry of Agriculture and Rural Development is the regulatory body that oversees the regulations for the production of this commodity is adhered. Although there are no specific regulations for the production of *R. pseudoacacia* in Israel, there are general requirements as required by The Law of Supervision of Plant and Plant Product Export (1954).[6]
- The Israeli Plant and Plant Products Exportation Supervision Regulations (1979).[7]
- ISPM standards (adopted).[8]

With the information provided by PPIS (Dossier Sections 3 and 5), the Panel summarised the risk mitigation measures (Table 5) that are currently applied in the production nurseries.

Table 5: Overview of currently applied risk mitigation measures for *R. pseudoacacia* plants designated for export to the EU from Israel described as reported in the PPIS declaration and classified according to the type of Risk Reducing Options (RROs) listed in EFSA PLH (2018)

Number of the RRO	Risk reduction options	Current measures in Israel
RRO1	Characteristics of the production field	The crops designated for export, are grown in different fields from the crops designated for the local market, with 10s to 100s of metres as a minimum distance between a field for the local market and a field for export
RRO2	Soil treatment	Summer - open field soil preparation. Before a new crop, the field is treated with soil solarisation
RRO3	Rotation of the growing fields	Rotation of the growing fields between different locations in the manner of a 'growing cycle.
RRO4	Insecticide treatment	During the growing season, production fields and mother plants are treated in a 3-week cycle with preventative treatments, i.e. rotation of the following pesticides: Atlas® (Bifenthrin), Ipon® (Dinotefuran), Imidan® (Phosmet) and EOS® (Eco Oil Spray)
RRO5	Fungicide treatment	Post-harvest treatment: The bare-rooted plants are rinsed and checked individually for selecting and grading. The plants are then soaked in Merpan® 0.5% and stored at 2°C. The chilled storage rooms are at a temperature of 2°C and 70% humidity. The plants are packed after Merpan® has evaporated to dryness

[6] https://fs.knesset.gov.il//2/law/2_lsr_208430.PDF [In Hebrew, no English version]
[7] https://www.moag.gov.il/ppis/Laws/Regulation/Pages/1979-%20pikuah%20al%20yatzu.aspx [In Hebrew, no English version]
[8] https://www.ippc.int/en/core-activities/standards-setting/ispms/

Number of the RRO	Risk reduction options	Current measures in Israel
RRO6	Nematicide treatment	Against nematodes: treatment with Nemakor® (Fenamiphos)
RRO7	Treatment against weeds	Weeds are treated with Faster® (glufosinate ammonium)
RRO8	Root treatment washing	December – lifting the plants from the field, washing the soil off the roots, selecting, grading and packing them in boxes. Storing them in cold storage at 2°C
RRO9	Sampling and testing	Soil and root samples are tested for nematodes
RRO10	Official Supervision by PPIS	All fields are under control and inspection of PPIS inspector during the growing and delivery season All plants for planting exported from Israel originate from nurseries that are approved by PPIS and are under PPIS inspection The production sites are regularly monitored. Every 21 days, the Plant Protection and Inspection Service of Israel carries out an official inspection in the nursery and an additional regular comprehensive inspection by nursery staff is performed weekly Whenever a harmful organism of interest is found at any production site, the grower is required to inform PPIS and to treat the site as appropriate. During consecutive inspections, if there is no further evidence to the presence of the pest, the PPIS considers the site of production to be free from this harmful organism. (Dossier, FVO report) Additional information on the applied phytosanitary procedures in plants destined for export in Israel can be found in the European Commission report of an audit performed in Israel in March 2018, on the export controls of plants.[9] Report No. 2018-6493
RRO11	Inspections of nurseries that export plants	Every 21 days, the PPIS of Israel carries out an official inspection in the nursery and an additional regular comprehensive self-inspection is performed weekly Before export the bare-rooted plants are rinsed and checked individually for selecting and grading
RRO12	Surveillance and monitoring	No information available on specific surveys in the natural environment or the surrounding environment of the production areas (i.e. inspections outside production fields)

5.3. Evaluation of the current measures for the selected relevant pests including uncertainties

For each relevant pest, the effective risk mitigation measures 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 relevant pest, an expert judgement has been given for the likelihood of pest freedom taking into consideration the risk mitigation measures acting on the pest and their combination.

An overview of the evaluation of the relevant pests is given in the section below (Section 5.3.1).

[9] Report number 2018-6493, http://ec.europa.eu/food/auditsanalysis/audit_reports/details.cfm?rep_id=4008

5.3.1. Summary of *Euwallacea fornicatus* and *Fusarium euwallaceae* pest datasheet

Rating of the likelihood of pest freedom	**Pest free with some exceptional cases (99.5%–99.9%) (between 9,950 and 9,990 of 10,000 plants) (EFSA PLH Panel, 2019a)**				
Percentile of the distribution of pest infestation	5%	25%	50%	75%	95%
Proportion of infested plants	2 out of 10,000	6 out of 10,000	10 out of 10,000	20 out of 10,000	43 out of 10,000
Summary of the information used for the evaluation	**Possibility that the pest could enter exporting nurseries** *Euwallacea fornicatus* (polyphagous shot hole borer – PSHB) and *Fusarium euwallaceae* are widespread in Israel and occur in the area where the export nurseries are located. The insect (vector) and the fungus can be present in several plant species. *R. pseudoacacia* plants for exports are grown in open fields; therefore, they can be infested by incoming infected beetles **Measures taken against the pest and their efficacy** The relevant applied measures are: (i) regular application of insecticides and fungicides; (ii) official inspections at 3-week intervals; (iii) isolation from other production fields within the nursery; (iv) only dormant leafless plants are exported. This combination of measures will greatly reduce the probability that *E. fornicatus* and *F. euwallaceae* are present in consignments destined for export **Interception records** There are no records of interceptions **Shortcomings of present methods** Plants for export and mother plants for bud collection are grown in open- fields. Residual efficacy of the applied insecticides may not protect the plants for the full rotation period of insecticide applications, therefore some plants may be infested by beetles. Newly infested trees may be difficult to detect **Main uncertainties** Pest pressure and the proximity of population sources in the surrounding environment is unknown Trees may be too young for beetle attack No information on the composition of the surrounding vegetation of export nurseries and other species present in the nursery				

Table 6 and Figure 4 show the outcome of expert elicitation regarding pest freedom after the evaluation of the currently proposed risk mitigation measures for all the evaluated pests.

Table 6: Assessment of the likelihood of pest freedom following evaluation of current risk mitigation measures against *E. fornicatus* and *F. euwallacea* on *R. pseudoacacia* 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	Pest Freedom Category							
			Sometimes pest free	More often than not pest free	Frequently pest freee	Very frequently pest free	Extremly frequently pest free	Pest free with some exceptional cases	Pest free with few exceptional cases	Almost always pest free
1	INS	*Euwallacea fornicatus*					L	M	U	
2	FUN	*Fusarium euwallacea*					L	M	U	

* FUN: fungi; INS: insect.

Panel A

Pest freedom category		Percent plants pest free (as percentage)
1	Almost always pest free	99.95% < x ≤ 100%
2	Pest free with few exceptional cases	99.90% < x ≤ 99.95%
3	Pest free with some exceptional cases	99.5% < x ≤ 99.9%
4	Extreme frequently pest free	99.0% < x ≤ 99.5%
5	Very frequently pest free	95% < x ≤ 99%
6	Frequently pest free	90% < x ≤ 95%
7	More often than not pest free	50% < x ≤ 90%
8	Sometimes pest free	0% ≤ x ≤ 50%

Panel B

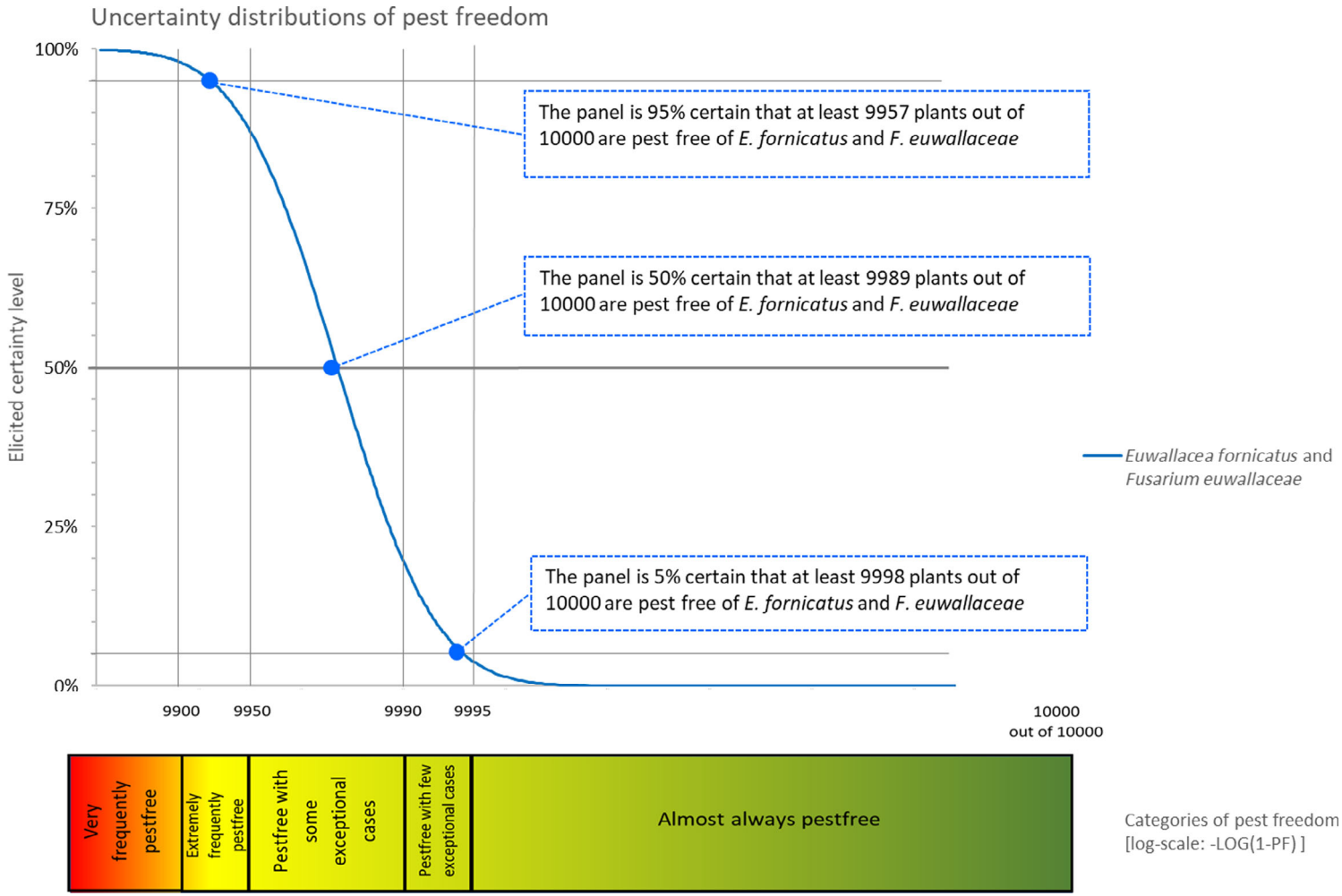

Figure 4: Elicited certainty (y-axis) of the number of pest-free R. pseudoacacia plants (x-axis; log-scaled) out of 10,000 plants designated for export to the EU introduced from Israel for all evaluated pests visualised as descending distribution function. Horizontal lines indicate the percentiles (starting from the bottom 5%, 25%, 50%, 75%, 95%)

6. Conclusions

There are two pests identified to be present in Israel and considered to be potentially associated with bare rooted plants for planting of *Robinia pseudoacacia* (1 year-old with a stem diameter of less than 2.5 cm) imported from Israel and relevant for the EU. For these pests (*Euwallacea fornicatus* and *Fusarium euwallaceae*), the likelihood of the pest freedom after the evaluation of the currently proposed risk mitigation measures for *R. pseudoacacia* designated for export to the EU was estimated.

The Panel is 95% sure that 9,950 or more units per 10,000 will be pest free.

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Glossary

Containment (of a pest)	Application of phytosanitary measures in and around an infested area to prevent spread of a pest (FAO, 1995, 2017)
Control (of a pest)	Suppression, containment or eradication of a pest population (FAO, 1995, 2017)
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, 2017)
Eradication (of a pest)	Application of phytosanitary measures to eliminate a pest from an area (FAO, 2017)
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2017)
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, 2017)

Measures	Control (of a pest) is defined in ISPM 5 (FAO, 2017) as 'Suppression, containment or eradication of a pest population' (FAO, 1995). 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 Reduction Options that do not directly affect pest abundance
Pathway	Any means that allows the entry or spread of a pest (FAO, 2017)
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, 2017)
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 EU
Quarantine pest	A pest of potential economic importance to the area endangered from and not yet present there, or present but not widely distributed and being officially controlled (FAO, 2017)
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, 2017)
Risk mitigation measure = Risk reduction option (RRO)	A measure acting on pest introduction and/or pest spread and/or the magnitude of the biological impact of the pest should the pest be present. An RRO may become a phytosanitary measure, action or procedure according to the decision of the risk manager
Spread (of a pest)	Expansion of the geographical distribution of a pest within an area (FAO, 2017)

Abbreviations

CABI	Centre for Agriculture and Bioscience International
EKE	Expert knowledge elicitation
EPPO	European and Mediterranean Plant Protection Organization
FAO	Food and Agriculture Organization
FUN	Fungi
INS	Insect
ISPM	International Standards for Phytosanitary Measures
PLH	Plant Health
PPIS	Plant Protection & Inspection Services of Israel
PRA	Pest risk analysis
PSHB	Polyphagous shot hole borer
RRO	Risk Reduction Option = Risk mitigation measures

Appendix A – Data sheets of pests selected for further evaluation

A.1. *Euwallacea fornicatus* and *Fusarium euwallaceae*

A.1.1. Organism information

Taxonomic information	**Insect** *Euwallacea fornicatus* (Eichhoff, 1868) In the EPPO Global Database, *Euwallacea fornicatus* (polyphagus shot hole borer – PSHB) is considered as a species complex which includes: *E. fornicatus* sensu stricto, *E. fornicatior*, *E. whitforiodendrus* and *E. Kuroshio*. However, a recent taxonomic review of the species complex by Smith et al. (2019) proposed the following classification: *Euwallacea fornicatus* (=*E. tapatapaoensis* (Schedl, 1951); = *E. whitfordiodendrus* (Schedl, 1942)) syn. res.); *E. fornicatior* (Eggers, 1923) (=*E. schultzei* (Schedl, 1951) syn. nov.); *E. kuroshio* (Gomez and Hulcr, 2018) and *E. perbrevis* (Schedl, 1951) stat. res. EPPO code: XYLBFO Order: Coleoptera Family: Curculionidae Common name: Polyphagous Shot Hole Borer (PSHB) Name used in the Dossier: *Euwallacea fornicatus* **Fungus** *Fusarium euwallaceae* S. Freeman, Z. Mendel, T. Aoki & O'Donnell Current valid name: *Neocosmospora euwallaceae (Sandoval-Denis* et al*., 2019)* Name used in this Opinion: *Fusarium euwallaceae* EPPPO code: FUSAEW Order: Hypocreales Family: Nectriaceae Name used in the Dossier: *Fusarium euwallaceae*
Regulated status	The insect E*. fornicatus* is regulated as a Union Quarantine Pest according to Implementing Regulation 2019/2072. The fungus *F. euwallaceae* is currently not regulated in the EU Both, *E. fornicatus* and *F. euwallaceae* are listed as A2 quarantine pest by EPPO (i.e. recommended for regulation)
Pest status in Israel	*E. fornicatus* and *F. euwallaceae* are present in Israel (Gomez et al., 2018, EPPO online). First record of *E. fornicatus* was in 2009 (EPPO online). *F. euwallaceae* was first described as new species in 2013 (Freeman et al., 2013)
Pest status in the EU	*E. fornicatus* is reported as 'Absent, pest eradicated' in Poland. *F. euwallaceae* is not present in the EU (EPPO, online)
Host status on *Robinia pseudoacacia*	*Robinia pseudoacacia* has been reported as host of *E. fornicatus* (Rabaglia et al., 2006; EPPO, online) but no fungal damage was recorded Reproductive hosts of *E. fornicatus* are plant species that are capable of supporting beetle reproduction and growth of the fungus *F. euwallacea* that cause Fusarium dieback. (Eskalen et al., 2013). There are no host records of *F. euwallacea* on *R. pseudoacacia* *R. pseudoacacia* is reported to be a suitable reproductive host of the closely related Kuroshio Shot Hole Borer *E. kuroshio* (Greer et al., 2018). The beetle *E. fornicatus* has been reported on *R. pseudoacacia* in Israel, but there are no reports of *F. euwallacea on R. pseudoacacia* in Israel
Pest Risk Analysis information	Rapid Pest Risk Analysis (PRA) for polyphagous shot hole borer (*Euwallacea* sp.) and Fusarium dieback (*F. euwallaceae*) (FERA, 2015) Express PRA for the Ambrosia beetle *Euwallacea* sp. including all the species within the genus *Euwallacea* that are morphologically similar to E*. fornicatus* (Ministerio de Agricultura, Alimentacion y Medio Ambiente, 2015) Report of a Pest Risk Analysis for *Euwallacea fornicatus* sensu *lato* and *Fusarium euwallaceae* (EPPO, 2017)

Other relevant information for the assessment		
Biology		The polyphagous shot hole borer (PSHB) has a complex association with symbiotic fungi, particularly with *F. euwallaceae*. As reviewed by Paap et al. (2018), adults female beetles create galleries in the trees where they introduce the symbiotic fungus (being transported through the mandibular mycangia), which colonises gallery walls, becoming a food source for developing larvae and adult beetles Successful reproduction occurs mainly in thin branches which usually desiccate after about two beetle generations. If larger branches are colonised, the beetle could survive for longer periods, and may produce more generations before moving to a new breeding site (branch, tree or plantation) (Ministerio de Agricultura, Alimentacion y Medio Ambiente, 2015)
Symptoms	**Main type of symptoms**	The symptoms caused by the beetle on a tree depend on the response to the fungus infection and vary among hosts species. The beetles infest stems and branches of various diameters (from 2 to > 30 cm, corresponding to 1- to 30-year-old growth) (Mendel et al., 2012) and commonly attack the main stem and larger branches of trees and shrubs (EPPO, 2017; CABI, online) After the attack of the beetle, the fungus invades the vascular tissue of the tree. It may interfere with water and mineral transport, cause brownish staining of the xylem, cambial necrosis, branch dieback and in the worst-case scenario, the death of the tree (Ministerio de Agricultura, Alimentacion y Medio Ambiente, 2015). In general, there is a correlation between severity of the beetle attack (which therefore increases severity of infection by *Fusarium* sp.) and the observed dieback (Eskalen et al., 2013) *F. euwallacea* infections can be associated with an abundant production of blue to brownish macroconidia (Freeman et al., 2013). The symptoms include also leaf yellowing and wilting of the branches, which, when there is heavy yield, break down at the section where the beetle galleries are located. Those symptoms, together with the ones caused by the fungus associated to the beetle, could lead to the death of young and mature trees (Ministerio de Agricultura, Alimentacion y Medio Ambiente, 2015; EPPO, 2016, 2017) A good description of symptoms on several host plant species is given by the California Department of Fish and Wildlife (online)
	Presence of asymptomatic plants	Newly infested trees exhibit few external symptoms. While there is no visible injury to the cortex at an early stage of colonisation, examination of the wood under the infested spot bored by the beetle reveals the brownish staining of the xylem and necrosis caused by the fungus (Mendel et al., 2012)
	Confusion with other pathogens/pests	In the EPPO Global Database, *Euwallacea fornicatus* is considered as a complex species which includes: *E. fornicatus sensu stricto*, *E. fornicatior*, *E. whitforiodendrus* and *E. Kuroshio*. However, a recent taxonomic review of the species complex by Smith et al. (2019) proposed the following classification: *Euwallacea fornicatus* (=*E. tapatapaoensis* (Schedl, 1951); = E. *whitfordiodendrus* (Schedl, 1942) syn. res.); *E. fornicatior* (Eggers, 1923) (=*E. schultzei* (Schedl, 1951) syn. nov.); *E. kuroshio* (Gomez and Hulcr, 2018) and *E. perbrevis* (Schedl, 1951) stat. res.

Host plant range	*E. fornicatus* is one of the few ambrosia beetles that can infest healthy plants (EPPO, 2017). In the USA to Eskalen et al. (2013) reported that more than 200 tree species were used as a host plant by *E. fornicatus* and of these 200 species, 113 tree species were reported as a host for the fungus *F. euwallaceae* and classified as reproductive hosts. Fungal infection is most likely due to susceptibility of the tree to the fungus if the beetle is able to penetrate into or through this critical layer of tissue (Eskalen et al., 2013) According to EPPO, a non-complete list of host plants include: *Acer buergerianum, Acer macrophyllum, Acer negundo, Acer palmatum, Acer paxii, Albizia julibrissin, Alectryon excelsus, Ailanthus altissima, Alnus rhombifolia, Castanospermum australe, Cercidium floridum, Erythrina corallodendrum, Eucalyptus ficifolia, Ilex cornuta, Liquidambar styraciflua, Parkinsonia aculeata, Persea americana, Platanus racemosa, Platanus x acerifolia, Populus fremontii, Populus trichocarpa, Prosopis articulata, Quercus suber, Quercus agrifolia, Quercus engelmannii, Quercus lobata, Quercus robur, Ricinus communis, Robinia pseudoacacia, Salix babylonica, Salix gooddingii, Salix laevigata, Wisteria floribunda* (EPPO, 2016, 2017) In Israel, avocado (*Persea Americana)* is the host reporting the most significant economic damage, but several ornamental species are also affected, such *as Ricinus communis, Acer negundo, Quercus pedunculiflora, Quercus robur, Platanus occidentalis, Platanus orientalis* and *Acer buergerianum* (Mendel et al., 2017)
Pathways	According to the PRA of EPPO (2017), the main pathways of entry are: plants for planting (except seeds) and wood of reproductive host species *F. euwallaceae* causes serious damage to more than 20 tree species, and, according to Eskalen et al. (2013) it was isolated from 113 different plant species. An attempted beetle attack may serve as an infection site for the fungus in both reproductive and non-reproductive hosts of PSHB; however, in some cases, *Fusarium* sp. was not able to infect the tissue (Eskalen et al., 2013)
Surveillance information	Every 21 days the PPIS is carrying out an official inspection in the nursery and an additional regular comprehensive self-inspection is performed weekly. There is no information available on surveillance of the natural environment of the production sites

A.1.2. Possibility of pest presence in the nurseries

A.1.2.1. Possibility of entry from the surrounding environment

In Israel, castor bean (*Ricinus communis*), box elder (*Acer negundo*), *Quercus pedunculiflora*, *Quercus robur*, *Persea americana*, *Platanus occidentalis*, *Platanus orientalis* and *Acer buergerianum* are reported as reproductive hosts for PSHB and hosts of its associated fungus (F. euwallaceae*)* (Mendel et al., 2017). These reproductive hosts are significant drivers for the population dynamics of the beetle and the fungal disease. Therefore, the presence of such species in the environment of the nurseries with *Robinia* plants is an important factor for the possible migration of infected beetles into the nursery.

F. euwallaceae can be introduced into the nursery only by the insect vector *E. fornicatus*. There are divergences in the literature about the flying capacity of *Euwallacea sp*. It is considered that the beetle (only females can fly) is able to fly up to about 457 m (EPPO, 2017). Calnaido (1965) reported an estimated flight distance of 864 m without external help (e.g. wind) while Owens et al. (2019) found a maximum dispersal distance of 400 m. In any case, only a few insects fly this distance. Wind speed and direction can have a great effect on the number of beetles that disperse as well as on the distance they can cover within a single flight (Owens et al., 2019).

EPPO (2017) define that in the Euro-Mediterranean region there are many agricultural, forests and urban species that could be attacked: e.g. *Acacia* spp*., Acer negundo, Citrus* spp*., Ficus carica, Persea americana, Platanus, Populus, Quercus* and *Salix*.

There is no evidence if the nurseries are located in a pest-free area for *F. euwallaceae,* so the Panel assumes that both *F. euwallaceae* and *E. fornicatus* can be present in the production areas of *Robinia* destined for export to the EU.

The Dossier states that the production fields of plants designated for export are isolated 10s to 100s of metres from fields of plants designated for local market. However, no information is provided on the presence of host plants such as *Albizia* spp., *Acacia* spp*., Acer negundo, Citrus* spp*., Ficus carica, Persea americana, Platanus* spp*., Populus* spp*., Quercus* spp*., Robinia* spp*., Salix* spp. in the surrounding neighbourhood of the nurseries.

Uncertainties:

- There is no surveillance information on the presence and beetle population pressure in the area where nurseries are located.
- The presence of the fungus in the area where nurseries are located.
- Proximity of the nurseries to sources of infected insect vectors. Presence of host plants of the pathogen and the vector in the surrounding environment (at a distance of about 500 m) of the production field.

Taking into consideration the above evidence and uncertainties, the Panel considers that it is possible for the insect and pathogen to enter the nursery from the surrounding area.

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

The source of the planting material to produce *Robinia* mother plants destined to be the source of scions for production for export is assumed to originate from the same nursery.

Rootstocks are plants of *R. pseudoacacia* grown from seeds imported from the Netherlands and therefore entry with new plants/seeds is highly unlikely.

Uncertainties:

— There is some uncertainty concerning the origin of mother plants

Taking into consideration the above evidence and uncertainties, the Panel considers it is very unlikely that the insect and the pathogen enter the nursery with new plants/seeds.

A.1.2.3. Possibility of spread within the nursery

Introduction by the use of infected soil or water is not relevant for this risk assessment. It is also highly unlikely that the pathogen and its vector are transported by means of growing practices.

Uncertainties

No information is available related to the plant species produced in the nurseries beside *R. pseudoacacia.*

No information is available for the isolation or proximity of the mother plant stock for scion collection to other species in the nursery.

Taking into consideration the above evidence and uncertainties, the Panel considers that the spread of the pest within the nurseries is possible.

A.1.3. Information from interceptions

Approximately 3,000 *R. pseudoacacia* plants are imported annually from Israel to the EU. In the Europhyt database (1995–2019), there are no records of notification of interceptions of harmful organism.

A.1.4. Evaluation of the risk reduction options

In the table below, all the risk mitigation measures (RROs) currently applied in Israel are summarised and an indication of their effectiveness on *E. fornicatus* and *F. euwallaceae* is provided.

Number of the RRO	Risk reduction options	Current measures in Israel	Relevant	Evaluation of RROs for *E. fornicatus* and *F. euwallaceae*
RRO1	Characteristics of the production field	The plants destined for export, are grown in different fields from the crops destined for the local market, with 10s to 100s of metres as a minimum distance between a field for the local market and a field for export	Yes	Beetles may immigrate the production fields from the surrounding environment. Dispersal distance is reported up to 400 m
RRO2	Soil Treatments	In summer, before a new crop, open field soil preparation and solarisation	No	
RRO3	Rotation of the growing fields	Rotation of the growing fields between different locations in a manner of a 'growing cycle.	No	

Number of the RRO	Risk reduction options	Current measures in Israel	Relevant	Evaluation of RROs for *E. fornicatus* and *F. euwallaceae*
RRO4	Insecticide treatment	During the growing season, production fields are treated in a 3-week cycle with preventative treatments, i.e. rotation of the following pesticides: Atlas® (Bifenthrin), Ipon® (Dinotefuran), Imidan® (Phosmet) and EOS® (Eco Oil Spray)	Yes	Residual efficacy of the applied insecticides may not protect the plants for the full rotation period
RRO5	Fungicide treatment	Post-harvest treatment: The bare rooted plants are rinsed and soaked in Merpan® 0.5%. The plants are packed after Merpan® has evaporated to dryness	Yes	Merpan® is a preventative treatment. Therefore, it has no effects on plants that are already infected Chilling storage is not expected to kill the fungus inside the plant
RRO6	Nematicide treatment	Against nematodes: treatment with Nemakor® (Fenamiphos)	No	
RRO7	Treatment against weeds	Weeds are treated with Faster® (glufosinate-ammonium)	No	
RRO8	Root treatment washing	December – lifting the plants from the field, washing the soil off the roots, selecting, grading and packing them in boxes. Storing them in cold storage 2°C	No	
RRO9	Sampling and testing	Root samples with attached soil are tested once during the active growth for nematodes	No	
RRO10	Official Supervision by PPIS	All plants for planting exported from Israel originate from nurseries that are approved by PPIS and are under PPIS inspection Whenever a harmful organism of interest is found at any production site, the grower is required to inform PPIS and to treat the site as appropriate. During consecutive inspections, if there is no further evidence to the presence of the pest, the PPIS considers the site of production to be free from this harmful organism (Dossier, FVO report)	Yes	Given the inspection frequency it is likely that the vector is detected. However, newly infested trees may be difficult to detect
RRO11	Inspections of nurseries that export plants	The production sites are regularly monitored on a weekly basis. Every 21 days the Plant Protection and Inspection Service of Israel is carrying out an official inspection in the nursery and an additional regular comprehensive self-inspection is performed weekly Before export the bare rooted plants are rinsed and checked individually for selecting and grading	Yes	Given the inspection frequency it is likely that the vector is detected. However, newly infested trees may be difficult to detect
RRO 12	Surveillance and monitoring	No information available on specific surveys in the natural environment/ surrounding environment of the production areas (i.e. inspections outside production fields)	Yes	Uncertain. No specific surveillance protocol has been described for *E. fornicatus* around and within production plots

A.1.5. Overall likelihood of pest freedom

Rating of the likelihood of pest freedom	**Pest free with some exceptional Cases (99.5%–99.9%) (Between 9,950 and 9,990 of 10,000 plants) (EFSA PLH Panel, 2019a)**
Summary of the information used for the evaluation	**Possibility that the pest/pathogen could enter exporting nurseries** The polyphagus shot hole borer (PSHB) and *F. euwallaceae* are widespread in Israel and also occur in the area where the export nurseries are located. The insect (vector) and the fungus can be present in several plant species such as avocado (*Persea americana*), castor bean (*Ricinus communis*), box elder (*Acer negundo*), *Quercus pedunculiflora*, *Quercus robur*, *Platanus occidentalis*, *Platanus orientalis* and *Acer buergerianum* in the surrounding environment. *R. pseudoacacia* plants for exports and the mother plants for the scion to be grafted are grown in open fields, therefore they can be invaded by incoming infected beetles. *R. pseudoacacia* is reported to be a suitable reproductive host of Kuroshio Shot Hole Borer (*Euwallacea kuroshio*) but there is no certain indication for the PSHB. The exported plants are 1-year-old and the diameter of the stem may not be large enough to host the PSHB **Measures taken against the pest/pathogen and their efficacy** The relevant applied measures are: (i) regular application of insecticides and fungicides treatments; (ii) inspections at 3-week interval; (iii) isolation from other production fields within the nursery; (iv) only dormant leafless plants are exported These measures will greatly reduce the probability that *E. fornicatus* and *F. euwallaceae* are present in consignments destined for export **Interception records** There are no records of interceptions **Shortcomings of current measures/procedures** Plants and mother plants for scion collection are grown in open fields. Residual efficacy of the applied insecticides may not protect the plants for the full rotation period. Newly infested trees may be difficult to detect. No surveillance trapping has been put in place to ensure the absence of *E. fornicatus* in the plots **Main uncertainties** Pest pressure and the proximity of population sources in the surrounding environment are unknown Trees may be too young for beetle attack (see references in the table below) No information on the composition of the surrounding vegetation of export nurseries and other species present in the nursery The status of *R. pseudoacacia* as reproductive host plants

A.1.6. Elicitation outcomes of the assessment of the pest freedom for *Euwallacea fornicatus* and *Fusarium euwallaceae*

Condition	Evidence	Uncertainties
Robinia plants in the nursery are suitable/ attractive for feeding by beetles	Export plants in nursery are 1-year-old (dossier) Mother plant stock for the scion collection are older and bigger and may be more prone for attack (dossier) Beetles are reported to attack branches of various diameters (from 2 to > 30 cm, corresponding to 1- to 30-year-old growth) (Mendel, 2012; 2017)	Exact diameter of the export trees is unknown Trees may be too young for beetle attack Exact age of the mother plant stock is unknown

Condition	Evidence	Uncertainties
The vector and fungus are present in the surrounding environment of the nursery	There is no evidence if the nurseries are located in a pest free area for the vector and fungus (Dossier Section 5.6) There is a proximity of the area where avocado is grown (i.e. major inoculum and vector sources) and the location of the export nurseries (Dossier Section 3.10) Vector and fungus have a large host range and for example the following plant species are attacked in Israel *Acacia* spp., *Acer negundo, Citrus* spp., *Ficus carica, Persea americana, Platanus, Populus, Quercus, Salix* (EPPO, 2017) The production fields of plants designated for export are isolated tens to hundreds of meters from fields of plants designated for local market (Dossier Section 3.11) The insect vector and fungus have not been reported in nurseries in Israel (Dossier Section 5.6)	No information on the composition of the surrounding vegetation of export nurseries and other species present in the nursery Information on population density is lacking
The dispersal capacity of the vector is appropriate to migrate from the surrounding environment into the nursery	Dispersal capacity is reported to be up to 400 m (Owens et al., 2019) Wind speed and direction can have a great effect on the number of beetles that disperse as well as on the distance they can cover with a single flight (Owens et al., 2019)	The proximity of population sources and export nurseries is unknown
The production method does not prevent immigrating vectors	Plants are grown in the open field (Dossier Section 3.2)	
Efficacy of applied measures	During the growing period of the plants, insecticide treatments are applied in a 3-week cycle with four products. Effective insecticide treatment of colonised trees is difficult because *E. fornicatus* feeds deep in the wood of infested branches (CABI, online) Plants for export are soaked in a fungicide (Merpan®). The Dossier (Appendix E – Dossier) states that 'preventive fungicide treatments are applied on mother plants of the grafted scions large enough in diameter to host *E. fornicatus*' but no details are given on product and frequency Nursery plants are frequently inspected (every week by nursery staff and at a 3-week interval by NPPO) (Dossier Section 3.8) Plants for export are dormant and have no leaves	The mode of action (non-systemic) of the preventive fungicide treatment is considered not to be effective

1. Reasoning for a scenario that would lead to a reasonably low number of infested consignments

- Production areas are isolated from the area where the beetle and the fungus are present.
- Plants in the surrounding environment are not hosts of the beetle and the fungus.
- Low pressure of the beetle.
- The inspection regime would be effective (detection of the beetle).
- Scions are collected only from mother plants that are free from *E. fornicatus*.
- The beetle and the fungus are not reported in the exporting nurseries in Israel.
- The age and size of the exported plants is unsuitable for colonisation.
- It is unlikely for *F. euwallaceae* to infect *R. pseudoacacia* plants (no evidence). Dieback caused by *Fusarium* sp. has never been reported on *R. pseudoacacia*.

2. Reasoning for a scenario which would lead to a reasonably high number of infested consignments

- Production areas are in places where the vector and the pathogen are present.
- Host plants of the beetle and the fungus are abundant in the surrounding environment (e.g. *Persea* sp.).
- High pressure of the beetle (e.g. abandoned infected field of highly preferable host).

- Asymptomatic plants remain undetected.
- Presence of the beetle in the environment is not detected.
- Risk mitigation measures in place are not fully effective, insecticide and fungicide treatment cannot prevent colonisation of mother plants.
- Even if there is no evidence of infection of *R. pseudoacacia* with *F. euwallaceae*, the fungus is always associated with its vector *E. fornicatus* and therefore *R. pseudoacacia* is a likely pathway for the introduction of both fungus and beetle.

3. Reasoning for a central scenario equally likely to over- or underestimate the number of infested consignments (median)

The value of the median is estimated based on:

- The age and size of the export plants are not optimal for beetle attack.
- The plants are regularly treated with insecticides and fungicides applications.
- Plants are regularly inspected at three-week interval.
- The dispersal capacity of PSHB is limited.
- There are no records of interceptions.

4. Reasoning for the detail of the judgement describing the remaining uncertainties (1st and 3rd quartile/interquartile range)

The clarification is given by the level of uncertainty which is higher for the values above the median.

The following Tables show the elicited and fitted values for pest infestation/infection (Tale A1.1) and freedom (Table A1.2 i.e. 1-infestation rate in plants per 10,000) agreed by the Panel: graphical representation is shown in Figure A1.1.

Table A1.1: Elicited and fitted values of the uncertainty distribution of pest infestation by *E. fornicatus* and *F. euwallaceae* per 10,000 plants

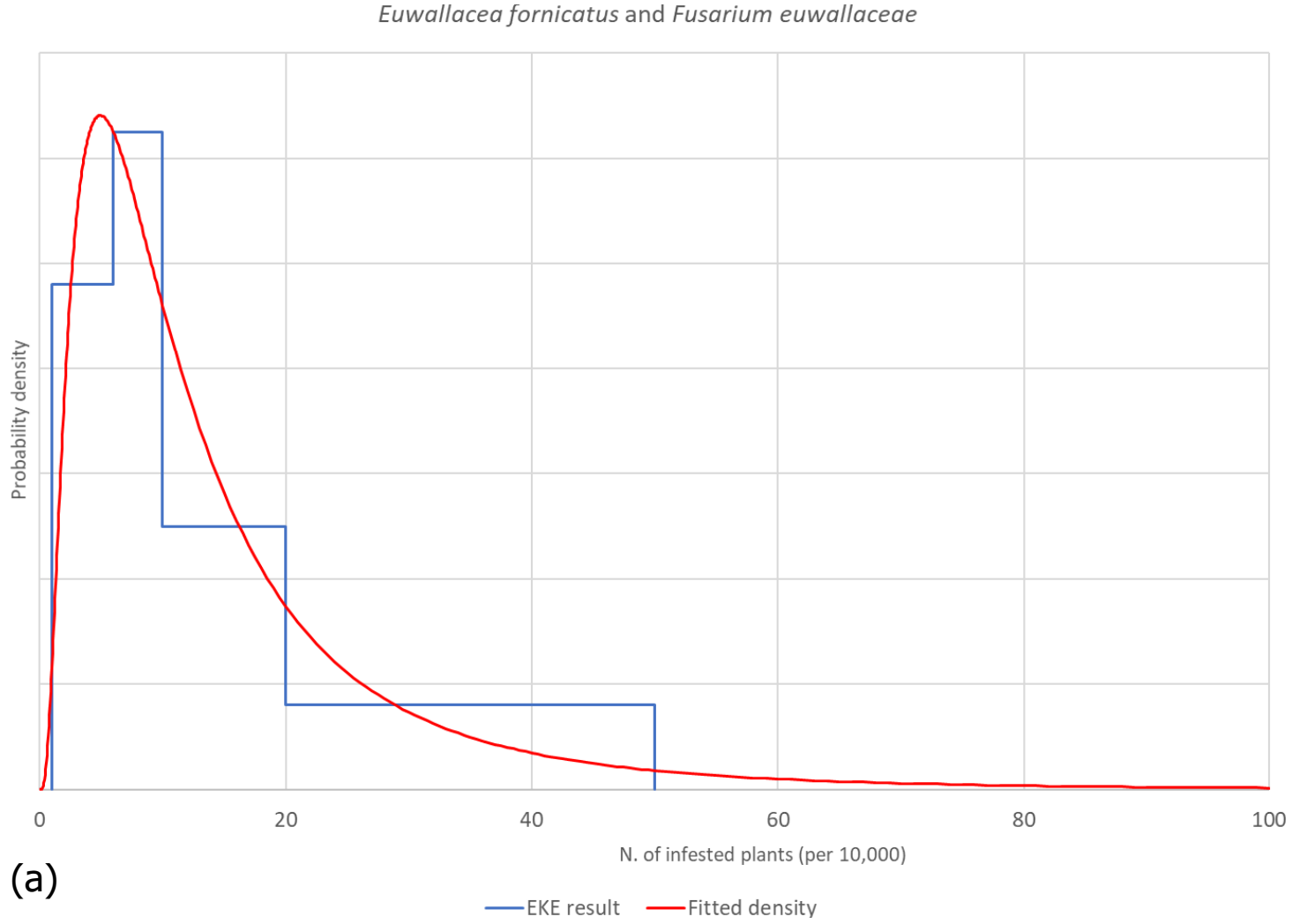
Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	1.0					6.0		10.0		20.0					50.0
EKE	1.4	1.9	2.5	3.4	4.5	5.8	7.2	10.5	15.2	18.8	24.2	31.7	43.5	57.1	78.5

The EKE results is the Lognormal distribution (15.222,16.09) fitted to the elicited values with @Risk version 7.5.

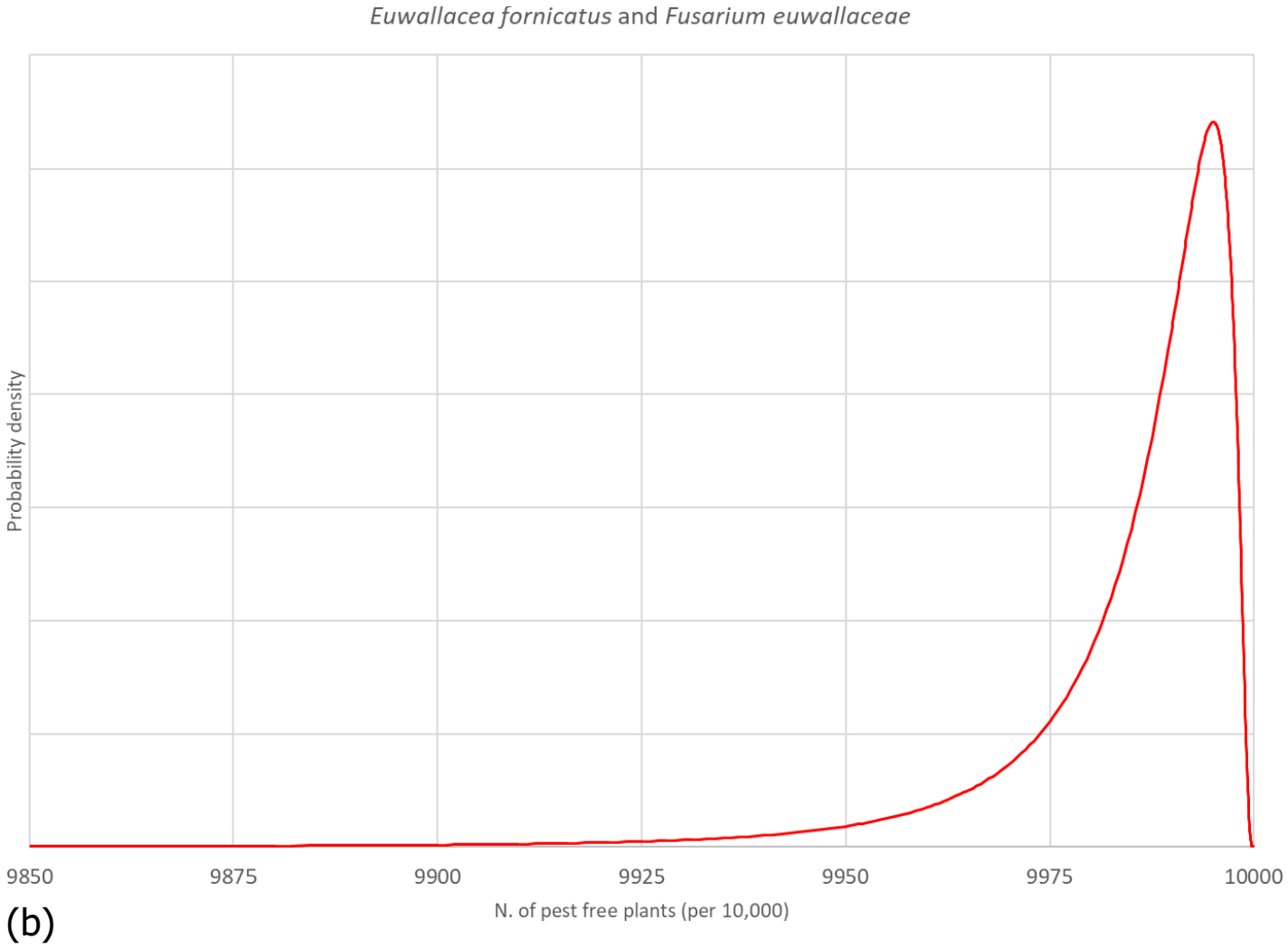
Table A1.2: The uncertainty distribution of plants free of pest for *F. euwallaceae* and *E. fornicatus* per 10,000 plants calculated by Table A1.1.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9,950					9,980		9,990		9,994					9,999
EKE results	9,922	9,943	9,957	9,968	9,976	9,981	9,985	9,990	9,993	9,994	9,995	9,997	9,997	9,998	9,999

The EKE results are the fitted values.


Euwallacea fornicatus and *Fusarium euwallaceae*
Probability density
0
20
40
60
80
100
N. of infested plants (per 10,000)
EKE result
Fitted density

(a)


Euwallacea fornicatus and *Fusarium euwallaceae*
Probability density
9850
9875
9900
9925
9950
9975
10000
N. of pest free plants (per 10,000)

(b)

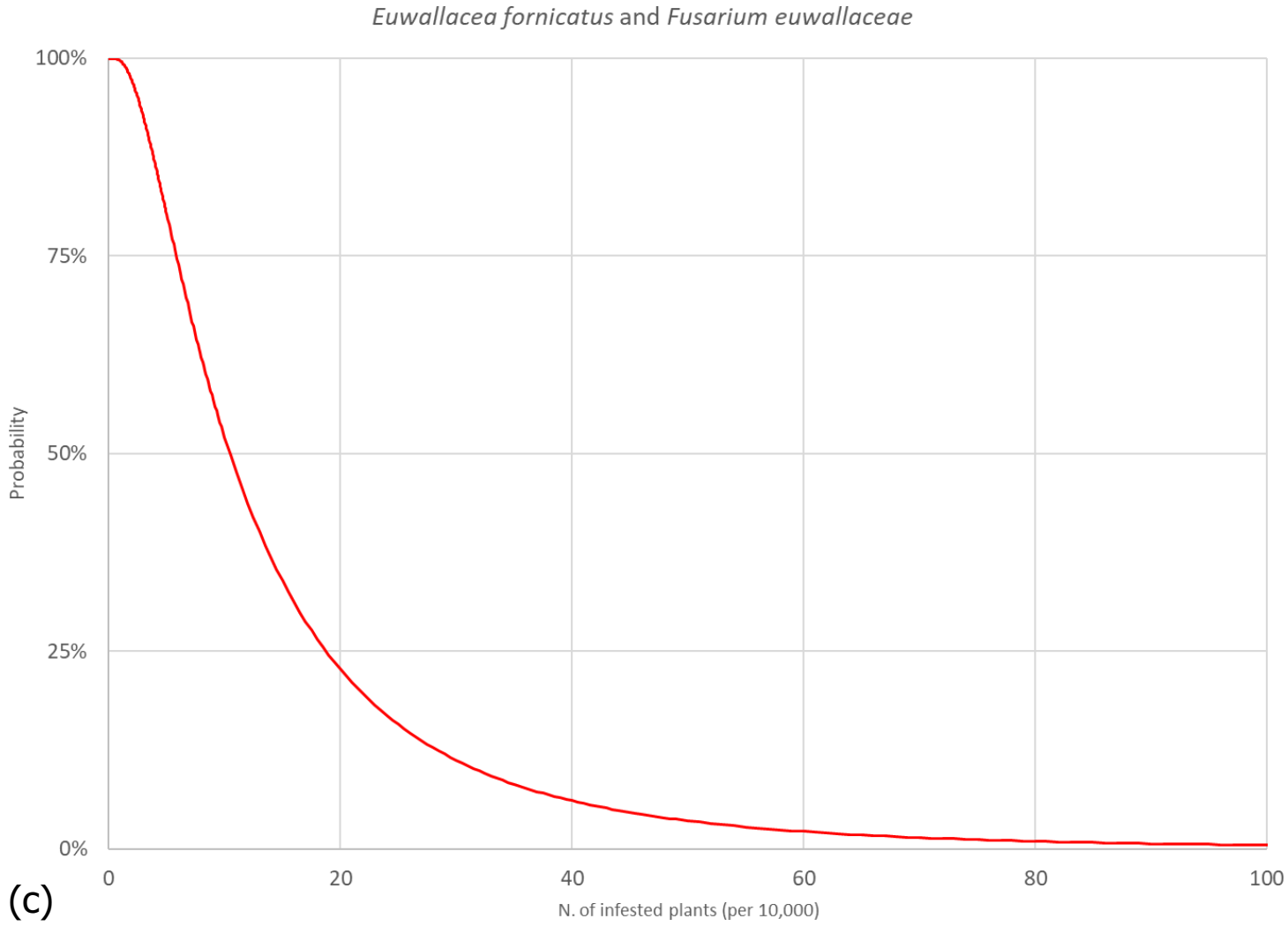


Figure A1.1: (a) Elicited uncertainty of pest infestation per 10,000 plants (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (b) uncertainty of the proportion of pest free plants per 10,000 (i.e. 1-pest infestation proportion expressed as percentage); (c) descending uncertainty distribution function of pest infestation per 10,000 plants

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

There are no pests fulfilling the criteria to be included in this list.

Appendix C – Excel file with the pest list

Excel file with all EU and non-EU regulated pests.