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## Commodity risk assessment of *Malus domestica* plants from Ukraine

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### 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 1- to 3-year-old dormant grafted plants and rootstocks of *Malus domestica* imported from Ukraine, taking into account the available scientific information, including the technical information provided by Ukraine. All pests associated with the commodity were evaluated against specific criteria for their relevance for this opinion. Two quarantine pests (*Lopholeucaspis japonica* and Tobacco ringspot virus), one protected zone quarantine pest (*Erwinia amylovora*) and one non-regulated pest (*Eotetranychus prunicola*) that fulfilled all relevant criteria were selected for further evaluation. For *Erwinia amylovora*, for which special requirements are specified in Commission Implementing Regulation (EU) 2019/2072, Annex X, item 9, the fulfilment of these requirements was evaluated. Based on the information provided in the dossier, the specific requirements for *Erwinia amylovora* were not met. For the three remaining selected pests, the risk mitigation measures proposed in the technical dossier from Ukraine were evaluated taking into account the possible limiting factors. 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. The degree of pest freedom varies among the pests evaluated, with *Eotetranychus prunicola* being the pest most frequently expected on the imported plants. The Expert Knowledge Elicitation indicated with 95% certainty that between 9,912 and 10,000 bundles (consisting of 50 plants each) per 10,000 would be free from *Eotetranychus prunicola*.

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**Keywords:** Apple, European Union, pathway risk assessment, plant health, plant pest, quarantine, rootstock

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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<sup>1</sup>, 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<sup>2</sup>. 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<sup>3</sup>, 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 *M. domestica* from Ukraine taking into account the available scientific information, including the technical dossier provided by the State Service of Ukraine on Food Safety and Consumer Protection (SSUFSCP).

### 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 *Malus domestica* from Ukraine following the Guidance on commodity risk assessment for the evaluation of high-risk plant dossiers (EFSA PLH Panel, 2019a).

The EU quarantine pests that are regulated as a group in the Commission Implementing Regulation (EU) 2019/2072 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,

<sup>1</sup> Regulation (EU) 2016/2031 of the European Parliament and 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.

<sup>2</sup> 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.

<sup>3</sup> 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.

Moldova, Monaco, Montenegro, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (SeveroZapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug), San Marino, Serbia, Switzerland, Turkey, Ukraine and United Kingdom (except Northern Ireland<sup>1</sup>). Those countries are historically linked to the reference to 'non-European countries' existing in the previous legal framework, Directive 2000/29/EC.

Consequently, for those countries, 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.

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 an 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 provided by the applicant (State Service of Ukraine on Food Safety and Consumer Protection - SSUFSCP) in the technical dossier (hereafter referred to as 'the Dossier') was sufficient to conduct a commodity risk assessment. When necessary, additional information was requested to the applicant.
- Selected the relevant union EU-regulated quarantine pests and protected zone quarantine pests (as specified in Commission Implementing Regulation (EU)<sup>4</sup>, hereafter referred to as 'EU quarantine pests') and other relevant pests present in Ukraine and associated with the commodity.
- Assessed whether or not the applicant country implements specific measures for Union quarantine pests for which specific measures are in place for the import of the commodity from the specific country in the relevant legislative texts for emergency measures ([https://ec.europa.eu/food/plant/plant\\_health\\_biosecurity/legislation/emergency\\_measures\\_en](https://ec.europa.eu/food/plant/plant_health_biosecurity/legislation/emergency_measures_en)); the assessment was restricted to whether or not the applicant country applies those measures. The effectiveness of those measures was not assessed.
- Assessed whether the applicant country implements the special requirements specified in Annex VII (points 1–101) of the Commission Implementing Regulation (EU) 2019/2072 targeting Union quarantine pests for the commodity in question from the specific country.
- 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 import of the commodity from the specific applicant country and other relevant pests present in applicant country 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 the SSUFSCP.

## 2. Data and methodologies

### 2.1. Data provided by the SSUFSCP

The Panel considered all the data and information (hereafter called 'the Dossier') provided by SSUFSCP in February 2020, including the additional information provided by the SSUFSCP in January 2021 and in August 2021, 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.

<sup>4</sup> 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.

**Table 1:** Structure and overview of the Dossier

| Dossier section | Overview of contents   | Filename            |
|-----------------|--|---------------------|
| 1.0             | Technical dossier  | Malus d.docx        |
| 1.1             | Pest list on <i>Malus domestica</i>                            | Appendix Malus.docx |
| 2.0             | Additional information provided by the SSUFSCP on January 2021 | UKR Malus.docx      |
| 3.0             | Additional information provided by the SSUFSCP on August 2021  | Annex 1.docx        |

The data and supporting information provided by the SSUFSCP formed the basis of the commodity risk assessment.

Table 2 shows the main data sources used by the SSUFSCP to compile the Dossier (details on literature searches can be found in the Dossier Section 1.1).

**Table 2:** Database sources used in the literature searches by the SSUFSCP

| Acronym/ short title | Database name and service provider  | URL of database   | Justification for choosing database   |
|----------------------|---|---|---|
| EPPO                 | Name: EPPO Global Database Provider: European and Mediterranean Plant Protection Organization | <a href="https://gd.eppo.int/">https://gd.eppo.int/</a>   | This database provides all pest-specific information that has been produced or collected by EPPO.   |
|                      | Wikipedia   | <a href="https://en.wikipedia.org/wiki/Adoxophyes_orana">https://en.wikipedia.org/wiki/Adoxophyes_orana</a><br><a href="https://en.wikipedia.org/wiki/Anarsia_lineatella">https://en.wikipedia.org/wiki/Anarsia_lineatella</a><br><a href="https://en.wikipedia.org/wiki/Codling_moth">https://en.wikipedia.org/wiki/Codling_moth</a> | General information on specific pests.  |
|                      | Website of the Ministry of Agricultural Policy of Ukraine                                     | <a href="https://zakon.rada.gov.ua/go/z1300-06">https://zakon.rada.gov.ua/go/z1300-06</a>   | List of regulated and quarantine pests (in Ukrainian).  |
|                      | Website of the Government of Ukraine  | <a href="https://data.gov.ua/dataset/389ddb5a-ac73-44bb-9252-f899e4a97588">https://data.gov.ua/dataset/389ddb5a-ac73-44bb-9252-f899e4a97588</a>   | List of pesticides and agrochemicals approved for use State Register of Pesticides and Agrochemicals Permitted for Use in Ukraine in accordance with the requirements of the Resolution of the Cabinet of Ministers of Ukraine of November 21, 2007 No 1328 (in Ukrainian). |

## 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 *M. domestica*. The following searches were combined: (i) a general search to identify pests of *M. domestica* in different databases and (ii) a tailored search to identify whether these pests are present or not in *Ukraine* and the EU. The searches were run between 24 January 2021 and 22 April 2021. No language, date or document type restrictions were applied in the search strategy.

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.

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 *M. domestica*

| Database  | Platform/Link   |
|---|---|
| Aphids on World Plants  | <a href="http://www.aphidsonworldsplants.info/C_HOSTS_AAIntro.htm">http://www.aphidsonworldsplants.info/C_HOSTS_AAIntro.htm</a>   |
| CABI Crop Protection Compendium   | <a href="https://www.cabi.org/cpc/">https://www.cabi.org/cpc/</a>   |
| Database of Insects and their Food Plants   | <a href="http://www.brc.ac.uk/dbif/hosts.aspx">http://www.brc.ac.uk/dbif/hosts.aspx</a>   |
| Database of the World's Lepidopteran Hostplants   | <a href="https://www.nhm.ac.uk/our-science/data/hostplants/search/index.dsml">https://www.nhm.ac.uk/our-science/data/hostplants/search/index.dsml</a>   |
| EPPO Global Database  | <a href="https://gd.eppo.int/">https://gd.eppo.int/</a>   |
| EUROPHYT  | <a href="https://webgate.ec.europa.eu/europhyt/">https://webgate.ec.europa.eu/europhyt/</a>   |
| Leaf-miners   | <a href="http://www.leafmines.co.uk/html/plants.htm">http://www.leafmines.co.uk/html/plants.htm</a>   |
| Nemaplex  | <a href="http://nemaplex.ucdavis.edu/Nemabase2010/PlantNematodeHostStatusDDQuery.aspx">http://nemaplex.ucdavis.edu/Nemabase2010/PlantNematodeHostStatusDDQuery.aspx</a>   |
| Plant Pest Information Network  | <a href="https://www.mpi.govt.nz/news-and-resources/resources/registers-and-lists/plant-pest-information-network/">https://www.mpi.govt.nz/news-and-resources/resources/registers-and-lists/plant-pest-information-network/</a> |
| Plant Viruses Online  | <a href="http://bio-mirror.im.ac.cn/mirrors/pvo/vide/famindex.htm">http://bio-mirror.im.ac.cn/mirrors/pvo/vide/famindex.htm</a>   |
| Scalenet  | <a href="http://scalenet.info/associates/">http://scalenet.info/associates/</a>   |
| Spider Mites Web  | <a href="https://www1.montpellier.inra.fr/CBGP/spmweb/advanced.php">https://www1.montpellier.inra.fr/CBGP/spmweb/advanced.php</a>   |
| USDA ARS Fungal Database  | <a href="https://nt.ars-grin.gov/fungaldatabases/fungushost/fungushost.cfm">https://nt.ars-grin.gov/fungaldatabases/fungushost/fungushost.cfm</a>   |
| 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 IndexFSTA, KCI-Korean Journal Database, Russian Science Citation Index, MEDLINE SciELO Citation Index, Zoological Record) | Web of Science<br><a href="https://www.webofknowledge.com">https://www.webofknowledge.com</a>   |
| World Agroforestry  | <a href="http://www.worldagroforestry.org/treedb2/speciesprofile.php?Spid=1749">http://www.worldagroforestry.org/treedb2/speciesprofile.php?Spid=1749</a>   |
| GBIF  | <a href="https://www.gbif.org/">https://www.gbif.org/</a>   |
| Fauna Europaea  | <a href="https://fauna-eu.org/">https://fauna-eu.org/</a>   |
| EFSA Pest Categorization of Non EU virus and viroids of Prunus L.   | <a href="https://www.efsa.europa.eu/it/efsajournal/pub/5735">https://www.efsa.europa.eu/it/efsajournal/pub/5735</a>   |
| EFSA List of Non-EU viruses and viroids of Cydonia Mill., Fragaria L., Malus Mill., Prunus L., Pyrus L., Ribes L., Rubus L. and Vitis L..   | <a href="https://www.efsa.europa.eu/it/efsajournal/pub/5501">https://www.efsa.europa.eu/it/efsajournal/pub/5501</a>   |

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 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, 2019a).

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 were 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 proposed risk mitigation measures for each relevant pest were evaluated in terms of efficacy or compliance with EU requirements as explained in Section 1.2.



A conclusion on the likelihood of the commodity being free from each of the relevant pest was determined and uncertainties identified using expert judgements.

Pest freedom was assessed by estimating the number of infested/infected *bundles* out of 10,000 exported *bundles*. Each bundle contains 50 pieces of *M. domestica* rootstocks.

### 2.3.1. Commodity data

Based on the information provided by the Ukraine, 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 *M. domestica* from Ukraine, a pest list was compiled. The pest list is a compilation of all identified plant pests associated with *M. domestica* based on information provided in the Dossier Section 1.2 and on searches performed by the Panel. The search strategy and search syntax were adapted to each of the databases listed in Table 3, according to the options and functionalities of the different databases and CABI keyword thesaurus.

The scientific names of the host plants (i.e. *Malus domestica*) 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 consulted by searching for the interceptions associated with commodities imported from Ukraine, at species level, from 1995 to May 2020 and TRACES for interceptions from May 2020 to present. For the pests selected for further evaluation, a search in the EUROPHYT and/or TRACES was performed for the interceptions from the whole world, at species level.

The search strategy used for Web of Science Databases was designed combining common names for pests and diseases, terms describing symptoms of plant diseases and the scientific and common names of the commodity. All the pests already retrieved using the other databases were removed from the search terms in order to be able to reduce the number of records to be screened.

The established search string is detailed in Appendix B and was run on 12 April 2021.

The titles and abstracts of the scientific papers retrieved were screened and the pests associated with *M. domestica* 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<sup>®</sup> file in Appendix C) includes all identified pests that use *M. domestica* as host.

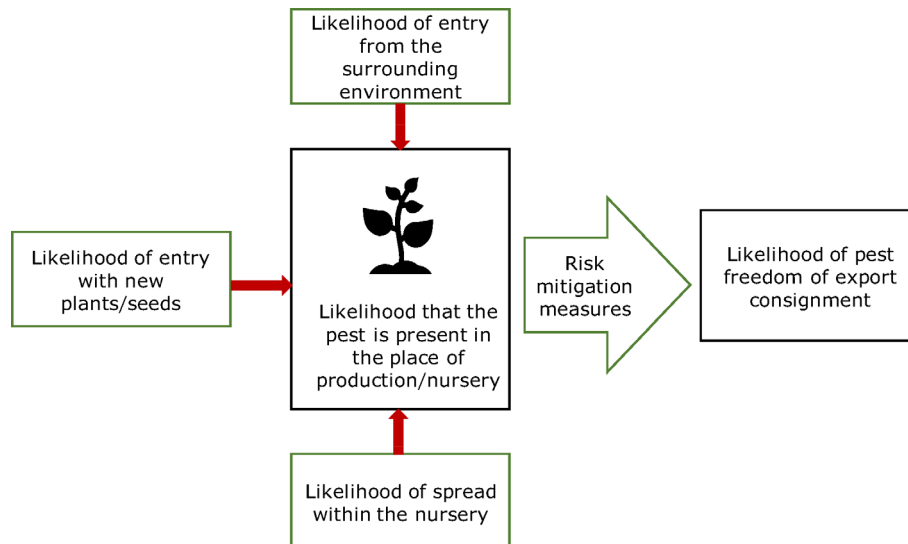
The evaluation of the compiled pest list was done in two steps: first, the relevance of the EU-quarantine pests was evaluated (Section 4.1); second, the relevance of any other plant pest was evaluated (Section 4.2).

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

All proposed risk mitigation measures were listed and evaluated. When evaluating the likelihood of pest freedom at origin, the following types of potential infection sources for *M. domestica* 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 Ukraine) 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 PLH Panel (2019b)

Information on the biology, estimates of likelihood of entry of the pest to the nursery and spread within 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).

#### 2.3.4. Expert Knowledge Elicitation

To estimate the pest freedom of the commodity, 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 bundles of *M. domestica* rootstocks or grafted plants will be infested with the relevant pest when arriving in the EU?'. Bundle was used as unit for the EKE because of the possibility of pest movement/spread within the bundle. 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

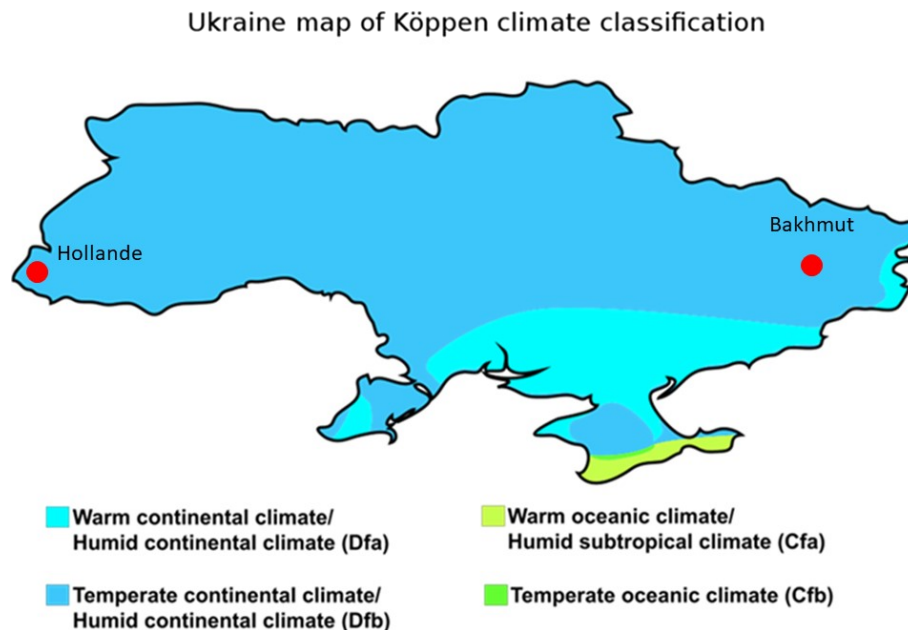
#### 3.1. Description of the commodity

The commodities to be imported are rootstocks and grafted plants of *Malus domestica* L. (common name: apple; family: Rosaceae). There are two rootstocks i.e. M9 and MM106 and these rootstocks are grafted with different cultivars i.e. Luna, Sirius, Rosella, Red Topaz, Allegro. Apple plants for export are produced by two growers i.e. Bakhmut Nursery, in the Bakhmut district, Donetsk region; and SE 'Holland Plant Ukraine', located in the Zakarpattia region (western Ukraine). Bakhmut nursery produces ungrafted rootstocks, while SE 'Holland Plant Ukraine' produces rootstocks and grafted plants with the aforementioned cultivars.

The commodities for export (both rootstocks and grafted plants) are bare-rooted plants in a dormant stage, hereafter referred as 'plants'. Depending on the exporting nursery, the stem diameter can vary, from 2 to 12 mm in Bakhmut, and not less than 14 mm in Holland Plant Ukraine. Also, different plant heights are produced i.e. 40–120 cm. Based on the description of the commodities in the dossier, plant development (starting from appearance on the mother plant) of exporting material varies from less than a year for rootstocks to three growing seasons for a knip-boom trees.

### 3.2. Description of the production areas

The plants designated for export are grown in different fields from plants designated for the local market (Dossier Section 2.0). There are two nurseries (Figure 2) producing plant material for export i.e. Bakhmut Nursery, Bakhmut district, Donetsk region; and SE 'Holland Plant Ukraine', located in the Zakarpattia region. The production sites for the 'Bakhmut Nursery' are surrounded by a forest belt mainly composed by *Acer platanoides*, *Quercus* spp., *Tilia platyphyllos*. While in the case of SE 'Holland Plant Ukraine', some species of fruit trees, other forest species and a mixture of vegetable and cereal crops occur in the vicinity of the production sites e.g. *Malus domestica*, *Prunus cerasus*, wheat, *Salix viminalis* 'Linea'. There are also some forest patches within a 3-km radius with: *Quercus* spp., *Fagus* spp., *Acer campestre*, *Cornus* spp., *Carpinus* spp., *Populus alba*, *Populus canescens*, *Salix alba*, *Prunus spinosa*, *Sambucus nigra*, *Rosa canina*.



**Figure 2:** Location of the production areas of *Malus domestica* in Ukraine and climate regions according to Köppen–Geiger classification. (Modified from Wikimedia Commons, Ali Zifan)

Based on the global Köppen–Geiger climate zone classification (Kottek et al., 2006), the climate of the production areas of *M. domestica* in Ukraine (West and East Ukraine, Zakarpattia and Donetsk region) is classified as Dfb, main climate (D): snow; precipitation (f): fully humid; temperature (b): warm summer.

### 3.3. Production and handling processes

#### 3.3.1. Growing conditions

In the nurseries, rootstocks and grafted plants are grown in open fields. Rootstock production fields are composed of mother stoolbeds of clonal apple (Figure 3), based on virus-free propagation material planted in well-drained soil, equipped with irrigation system. Planting distances are 1.5 m among rows and 0.25 m along the rows, while planting depth is 30 cm. Stoolbeds are maintained for 10–12 years. The rootstocks to be grafted are planted a year before the summer grafting (budding) on the preselected areas which have not been previously used in the nursery, formerly cultivated with cereals. Cultivation sites occur near steppes, forest-steppes and woodland. Inspection for cyst-forming nematodes also occurs before planting.



**Figure 3:** Formation of mother stoolbed of *Malus domestica* (above); adding substrate around the rootstocks (below). Source: State Service of Ukraine on Food Safety and Consumer Protection (SSUFSCP)

### 3.3.2. Source of planting material

Certified plant material for both nurseries comes from EU laboratories producing in vitro virus-free M9 T337 apple rootstocks. Each consignment of goods is accompanied with a Certificate of Origin and a Phytosanitary Certificate (Dossier, Section 2.0). Certified plant material may also come from inspected mother plantations within the two nurseries.

### 3.3.3. Production cycle

For both nurseries, stoolbeds are used to produce the rootstocks from certified propagation material. All the propagation material originates either from inspected mother plantations within the two nurseries or from tested and certified nurseries within the EU. At Holland Plant Nursery, field budding towards the end of summer or bench grafting, the following winter is used to produce plants with the desired apple variety, taking buds or scions from certified propagation material. These are grown in the field for a subsequent year, prior to marketing. Some of these plants may also be grown for a second year to produce a 'knip boom' or spindle-bush tree. For harvest, trees are defoliated, removed from the soil in the fall, the roots cleaned from soil, sorted and packaged. The Bakhmut nursery produces only rootstocks, but harvest only takes place starting in the fall of the second year, starting with defoliation, followed by removal of soil and washing the roots with high-pressure water, sorting and packaging.

### 3.3.4. Pest monitoring during production

Regulations in the Ukraine (No 1177 from 15 November 2019) specify how phytosanitary inspection should take place.

This includes inspecting or monitoring of agricultural lands, perennial and forest plantations, trees, shrubs, indoor vegetation, plant quarantine points and adjacent territory (within a 3-km zone), and other objects to detect regulated pests.

In relation to this dossier, inspection and monitoring on *Pseudococcus comstocki* and *Quadraspidiotus perniciosus* (= *Comstockaspis perniciosus*) are carried out visually and using pheromone traps. Visual inspection for *Erwinia amylovora* followed by laboratory confirmation is conducted three times a year. The surveys for potato cyst nematodes and viruses are also described. Places of production or production sites where the status of regulated pests, including regulated pests for the importing country, is officially established and maintained is inspected at intervals determined by the state phytosanitary inspector depending on the phenological phase of the growing season and biology of the development of a regulated pest, but not more than once every 6 months.

Examination and monitoring can be carried out simultaneously to detect several species of harmful organisms in case of correspondence of phenological phases of the vegetation period of plants and the biology of development of such organisms. At the request of importing countries in international trade, inspections of vegetative plants and places of storage of regulated objects may be carried out at different intervals.

Monitoring is carried out by the state phytosanitary inspectors in accordance with the monitoring plan of the relevant territory, which is approved by the decision of the State Service of Ukraine on Food Safety and Consumer Protection.

The State Phytosanitary Inspector determines an area and method of inspection and monitoring. The state phytosanitary inspector or laboratory specialist takes samples of regulated objects during the inspection and monitoring of a certain area. Throughout the growing process, all production fields are inspected by nursery staff every week. All production fields are controlled by the phytosanitary inspector during growing season and preparation before delivery (Dossier, Section 1.0).

### 3.3.5. Post-harvest processes and export procedure

Rootstocks and grafted plants are washed with high-pressured water (2 atm) to wash away soil in order to reduce phytosanitary risks. Plants are graded by diameter and height. After that, bundled plants with open roots are soaked in Merpan 0.5% and packed in pallet in nylon bags and moved to the refrigerator for further storage at 0–2°C and relative humidity up to 80–90% (Section 1.0).

Before export, each pallet of plants goes directly to the refrigerator truck, without breaking refrigerated conditions throughout the shipment. After washing the plants, the commodities are placed on the pallets and immersed in a container with a solution of Topsin (Section 2.0).

## 4. Identification of pests potentially associated with the commodity

The search for potential pests associated with *M. domestica* rendered 1,132 species (see Microsoft Excel® file in Appendix C).

### 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.

41 EU-quarantine species that are reported to use *M. domestica* 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 *Ukraine*;
- (b) *M. domestica* 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 4 presents an overview of the evaluation of the 41 EU-quarantine pest species that are reported to use *M. domestica* as a host in regard of their relevance for this Opinion.

Of these 41 EU-quarantine pest species evaluated, three species are present in Ukraine (*Lopholeucaspis japonica*, Tobacco ringspot virus and *Erwinia amylovora*) known to use *M. domestica* as host and be associated with the commodity were selected for further evaluation. Since special requirements are specified for *Malus domestica* with regard to *Erwinia amylovora*, in Appendix X, item 9 of Commission Implementing Regulation (EU) 2019/2072, the evaluation consisted of checking whether or not the exporting country applies these measures.

**Table 4:** Overview of the evaluation of the 41 EU-quarantine pest species known to use *M. domestica* as a host plant for their relevance for this opinion

| No. | Pest name according to EU legislation <sup>(a)</sup>                               | EPPO code | Group <sup>(b)</sup> | Pest present in Ukraine | <i>M. domestica</i> confirmed as a host (reference)   | Pest can be associated with the commodity | Pest relevant for the opinion |
|-----|--|-----------|----------------------|-------------------------|---|---|-------------------------------|
| 1   | <i>Candidatus Phytoplasma aurantifolia</i>   | PHYPAF    | BAC                  | No                      | Yes (CABI, online)  | Not evaluated                             | No                            |
| 2   | <i>Botryosphaeria kuwatsukai</i>   | PHYOPI    | FUN                  | No                      | Yes (EPPO, online)  | Not evaluated                             | No                            |
| 3   | <i>Gymnosporangium juniperi</i>  | GYMNJU    | FUN                  | No                      | Yes (USDA ARS Fungi Database)   | Not evaluated                             | No                            |
| 4   | <i>Phyllosticta solitaria</i>  | PHYSSL    | FUN                  | No                      | Yes (PC <a href="https://doi.org/10.2903/j.efsa.2018.5510">https://doi.org/10.2903/j.efsa.2018.5510</a> ) | Not evaluated                             | No                            |
| 5   | <i>Spodoptera litura</i>   | PRODLI    | INS                  | No                      | Yes (CABI, online)  | Not evaluated                             | No                            |
| 6   | <i>Acleris minuta</i>  | ACLRFI    | INSs                 | No                      | Yes (CABI, online)  | Not evaluated                             | No                            |
| 7   | <i>Anastrepha fraterculus</i>  | ANSTFR    | INS                  | No                      | Yes (CABI, online)  | Not evaluated                             | No                            |
| 8   | <i>Anastrepha ludens</i>   | ANSTLU    | INS                  | No                      | Yes (CABI, online)  | Not evaluated                             | No                            |
| 9   | <i>Anastrepha suspensa</i>   | ANSTSU    | INS                  | No                      | Yes (CABI, online)  | Not evaluated                             | No                            |
| 10  | <i>Anoplophora chinensis</i>   | ANOLCN    | INS                  | No                      | Yes (CABI, online)  | Not evaluated                             | No                            |
| 11  | <i>Anoplophora glabripennis</i>  | ANOLGL    | INS                  | No                      | Yes (EPPO, online)  | Not evaluated                             | No                            |
| 12  | <i>Anthonomus quadrigibbus</i>   | TACYQU    | INS                  | No                      | Yes (EPPO, online)  | Not evaluated                             | No                            |
| 13  | <i>Bactrocera dorsalis</i>   | DACUDO    | INS                  | No                      | Yes (CABI, online)  | Not evaluated                             | No                            |
| 14  | <i>Bactrocera tryoni</i>   | DACUTR    | INS                  | No                      | Yes (CABI, online)  | Not evaluated                             | No                            |
| 15  | <i>Bactrocera zonata</i>   | DACUZO    | INS                  | No                      | Yes (EPPO, online)  | Not evaluated                             | No                            |
| 16  | <i>Carposina sasakii</i>   | CARSSA    | INS                  | No                      | Yes (CABI, online)  | Not evaluated                             | No                            |
| 17  | <i>Ceratitis rosa</i> (it should be replaced with <i>Pterandrus rosa</i> (Karsch)) | CERTRO    | INS                  | No                      | Yes (CABI, online)  | Not evaluated                             | No                            |
| 18  | <i>Choristoneura rosaceana</i>   | CHONRO    | INS                  | No                      | Yes (EPPO, online)  | Not evaluated                             | No                            |
| 19  | <i>Conotrachelus nenuphar</i>  | CONHNE    | INS                  | No                      | Yes (EPPO, online)  | Not evaluated                             | No                            |
| 20  | <i>Erwinia amylovora</i>   | ERWIAM    | BAC                  | Yes                     | Yes (EPPO, online)  | Specific measures evaluated               | Yes                           |
| 21  | <i>Gonipterus scutellatus</i>  | GONPSC    | INS                  | No                      | No (EPPO online); Apple fruit Pest categorization   | Not evaluated                             | No                            |
| 22  | <i>Grapholita inopinata</i>  | CYDIIN    | INS                  | No                      | Yes (EPPO, online)  | Not evaluated                             | No                            |
| 23  | <i>Grapholita packardi</i>   | LASPPA    | INS                  | No                      | Yes (EPPO, online)  | Not evaluated                             | No                            |
| 24  | <i>Grapholita prunivora</i>  | LASPPR    | INS                  | No                      | Yes (EPPO, online)  | Not evaluated                             | No                            |
| 25  | <i>Lopholeucaspis japonica</i>   | LOPLJA    | INS                  | Yes                     | Yes (EPPO, online)  | Yes                                       | Yes                           |
| 26  | <i>Margarodes vitis</i>  | MARGVI    | INS                  | No                      | Yes (EPPO, online)  | Not evaluated                             | No                            |

| No. | Pest name according to EU legislation <sup>(a)</sup> | EPPO code | Group <sup>(b)</sup> | Pest present in Ukraine | <i>M. domestica</i> confirmed as a host (reference) | Pest can be associated with the commodity | Pest relevant for the opinion |
|-----|--|-----------|----------------------|-------------------------|---|---|-------------------------------|
| 27  | <i>Oeona hirta</i>                                   | OEMOHI    | INS                  | No                      | Yes (EPPO, online)                                  | Not evaluated                             | No                            |
| 28  | <i>Popillia japonica</i>                             | POPIJA    | INS                  | No                      | Yes (EPPO, online)                                  | Not evaluated                             | No                            |
| 29  | <i>Rhagoletis pomonella</i>                          | RHAGPO    | INS                  | No                      | Yes (EPPO, online)                                  | Not evaluated                             | No                            |
| 30  | <i>Saperda candida</i>                               | SAPECN    | INS                  | No                      | Yes (EPPO, online)                                  | Not evaluated                             | No                            |
| 31  | <i>Spodoptera eridania</i>                           | PRODER    | INS                  | No                      | Yes (CABI, online)                                  | Not evaluated                             | No                            |
| 32  | <i>Spodoptera frugiperda</i>                         | LAPHFR    | INS                  | No                      | Yes (CABI, online)                                  | Not evaluated                             | No                            |
| 33  | <i>Zeugodacus cucurbitae</i>                         | DACUCU    | INS                  | No                      | Yes (WoS Follett et al., 2019)                      | Not evaluated                             | No                            |
| 34  | <i>Globodera pallida</i>                             | HETDPA    | NEM                  | No                      | Yes (EPPO, online)                                  | Not evaluated                             | No                            |
| 35  | <i>Xiphinema americanum sensu stricto</i>            | XIPHAA    | NEM                  | No                      | Yes (CABI, online)                                  | Not evaluated                             | No                            |
| 36  | <i>Xiphinema bricolense</i>                          | XIPHBC    | NEM                  | No Data                 | Yes (Xu and Zhao, 2019)                             | Not evaluated                             | No                            |
| 37  | <i>Xiphinema californicum</i>                        | XIPHCA    | NEM                  | No                      | Yes (Xu and Zhao, 2019)                             | Not evaluated                             | No                            |
| 38  | <i>Xiphinema rivesi</i>                              | XIPHRI    | NEM                  | No                      | Yes (CABI, online)                                  | Not evaluated                             | No                            |
| 39  | <i>Cherry rasp leaf virus</i>                        | CRLV00    | VIR                  | No                      | Yes (EPPO, online)                                  | Not evaluated                             | No                            |
| 40  | <i>Tobacco ringspot virus</i>                        | TRSV00    | VIR                  | Yes                     | Yes (EPPO, online)                                  | Yes                                       | Yes                           |
| 41  | <i>Tomato ringspot virus</i>                         | TORSV0    | VIR                  | No                      | Yes (EPPO, online)                                  | Not evaluated                             | No                            |

(a): Commission Implementing Regulation (EU) 2019/2072.

(b): BAC: Bacteria and phytoplasmas; FUN: Fungi and oomycetes; INS: Insects and mites; NEM: Nematodes; VIR: Viruses and viroids.

## 4.2. Selection of other relevant pests (non-regulated in the EU) associated with the commodity

The information provided by Ukraine, integrated with the search EFSA performed, was evaluated in order to assess whether there are other potentially relevant pests of *M. domestica* 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 Ukraine;
- (b) the pest is (i) absent or (ii) has a limited distribution in the EU;
- (c) *M. domestica* 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 the above listed criteria were selected for further evaluation.

Based on the information collected, 1,132 potential pests known to be associated with *M. domestica* 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 Appendix C (Microsoft Excel<sup>®</sup> file). Of the evaluated pests not regulated in the EU, one pest *Eotetranychus prunicola* was selected for further evaluation because it met all the selection criteria. More information on *E. prunicola* can be found in the pest data sheet (Appendix A).

## 4.3. Overview of interceptions

Data on the interception of harmful organisms on plants of *Malus domestica* can provide information on some of the organisms that can be present on *M. domestica* despite the current measures taken. According to EUROPHYT online (accessed on 13 September 2021) and TRACES online (accessed on 13 September 2021), there were no interceptions of plants for planting of *Malus domestica* from Ukraine destined to the EU Member States due to presence of harmful organisms between 1994 and 13 September 2021.

## 4.4. Summary of pests selected for further evaluation

The four pests identified to be present in Ukraine while having potential for association with *M. domestica* plants destined for export are listed in Table 5. The effectiveness of the risk mitigation measures applied to the commodity was evaluated for three of these selected pests (*Lopholeucaspis japonica*, *Eotetranychus prunicola* and Tobacco ringspot virus).

**Table 5:** List of relevant pests selected for further evaluation

| Number | Current scientific name        | EPP0 code | Name used in the EU legislation | Taxonomic information                | Group             | Regulatory status  |
|--------|--------------------------------|-----------|---------------------------------|--------------------------------------|-------------------|--|
| 1      | <i>Lopholeucaspis japonica</i> | LOPLJA    | <i>Lopholeucaspis japonica</i>  | Hemiptera, Diaspididae               | Insects           | EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072                |
| 2      | <i>Eotetranychus prunicola</i> | –         | –                               | Acarida, Tetranychidae               | Mites             | Not regulated in the EU  |
| 3      | Tobacco ringspot virus         | TRSV00    | Tobacco ringspot virus          | Virus                                | Virus and viroids | EU Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072                |
| 4      | <i>Erwinia amylovora</i>       | ERWIAM    | <i>Erwinia amylovora</i>        | Gammaproteobacteria Enterobacterales | Bacteria          | EU Protected Zone Quarantine Pest according to Commission Implementing Regulation (EU) 2019/2072 |



## 5. Risk mitigation measures

For three of the selected pests (Table 5), the Panel assessed the possibility that it could be present in a *Malus domestica* 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 in 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 export nurseries

For these three pests (Table 5), the Panel evaluated the likelihood that the pest could be present in a *Malus domestica* nursery by evaluating the possibility that *Malus domestica* in the export nursery are 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.

### 5.2. Risk mitigation measures applied in Ukraine

- With the information provided by Ukraine (Dossier sections 1.0, 3.0 and 4.0), the Panel summarised the risk mitigation measures (see Table 6) that are proposed in the production nurseries.

**Table 6:** Overview of proposed risk mitigation measures for *Malus domestica* plants designated for export to the EU from Ukraine

| No. | Risk mitigation measure (name)   | Implementation in Ukraine   |
|-----|--|---|
| 1   | Certified material   | Establishment of mother plants is done using certified propagation material from either Hungary, Italy, Greece or the Netherlands. Once established, Ukraine phytosanitary authorities inspect yearly mother stocks. The Ukrainian State has a register of certified material and nurseries.<br>Protocols for diagnosis and inspections are applied taking into account ISPM 23 (Guidelines for inspection), 27 (diagnostic protocols for regulated pests), 31 (methodologies for sampling of consignments) and EPPO PM/3, PM/7 (diagnostic protocol for regulated pests) guidelines. |
| 2   | Registration, inspection, certification and surveillance of nurseries for export | Plants designated for export are grown in different fields than plants designated for the local market. Registration is needed for export, and therefore, export nurseries require having a specific certification and are accordingly inspected yearly.<br>For <i>E. amylovora</i> , <i>Quadraspidiotus perniciosus</i> , <i>Pseudococcus comstocki</i> specific surveillance and monitoring is conducted regularly and in different seasons within a growing cycle.<br>Surveillance and monitoring activities are carried out by an official state inspector                        |
| 3   | Root washing   | Stems and roots are washed with high pressure water to remove attached soil.  |
| 4   | Soil management  | Fields for production of apple trees are either steamed or biofumigated (by growing mustard) before the establishment of the nursery  |
| 5   | Application of chemical treatments   | During the growing season (April–August), several chemical treatments are applied (insecticides, acaricides, fungicides and bactericides).<br>Several fungicides and bactericides are applied during field production. Moreover, prior to packaging and export, plant roots are treated with merpan and bathed in topsin.   |
| 6   | Application of vegetable oil   | Spraying 1.5% solution of vegetable oil to treat <i>Operophtera brumata</i>   |

| No. | Risk mitigation measure (name)           | Implementation in Ukraine   |
|-----|--|---|
| 7   | Crop rotation                            | Cultivation of apple rootstocks is integrated into a crop rotation and/or fallow scheme. Wheat, mustard, sunflower are the main crops cultivated in the areas of production.  |
| 8   | Defoliation                              | Plants for planting for export are mechanically defoliated.   |
| 9   | Sorting and selection of export material | There is an inspection prior to export i.e. visual examination and phytosanitary screening to issue phytosanitary certificates (which remain valid for 14 days).<br>Protocols for diagnosis and inspections are applied taking into account ISPM 23 (Guidelines for inspection), 27 (diagnostic protocols for regulated pests), 31 (methodologies for sampling of consignments) and EPPO PM/3, PM/7 (diagnostic protocol for regulated pests) guidelines. |
| 10  | Storage temperature                      | Plants for export are stored in cold temperatures below 5°C.  |

### 5.3. 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.

Therefore, the Panel assumes that applications are effective in removing the pest to an acceptable level. If there are serious uncertainties or evidence of pest presence despite application of the pesticide (e.g. reports of interception at import), this will be considered in the EKE on the effectiveness of the measures.

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 5.3.1–5.3.3). The outcome of the EKE regarding pest freedom after the evaluation of the proposed risk mitigation measures is summarised in Section 5.3.4.

#### 5.3.1. Overview of the evaluation of *Lopholeucaspis japonica*

| 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                            | <b>9,960</b><br>out of 10,000 bundles  | <b>9,975</b><br>out of 10,000 bundles | <b>9,985</b><br>out of 10,000 bundles | <b>9,992</b><br>out of 10,000 bundles | <b>9,998</b><br>out of 10,000 bundles |
| Percentile of the distribution                     | 5%   | 25%                                   | Median                                | 75%                                   | 95%                                   |
| Proportion of infested bundles                     | <b>2</b><br>out of 10000 bundles   | <b>8</b><br>out of 10000 bundles      | <b>15</b><br>out of 10000 bundles     | <b>25</b><br>out of 10000 bundles     | <b>40</b><br>out of 10000 bundles     |
| Summary of the information used for the evaluation | <p><b>Possibility that the pest could become associate with the commodity</b><br/> <i>Lopholeucaspis japonica</i> is present in Ukraine, with restricted distribution. It is a polyphagous armoured scale that feeds on plants belonging to 38 families, with <i>Malus domestica</i> being reported as a host.<br/> Crawlers can be dispersed by wind or insects (ants, flies and ladybirds), occasionally also by human transport.<br/> Plants for planting and cut branches are reported as possible pathways.</p> |                                       |                                       |                                       |                                       |

|  |  |
|--|--|
|  | <p><b>Measures taken against the pest and their efficacy</b><br/>The relevant proposed measures are: (i) official surveillance and monitoring, (ii) high water pressure, (iii) pesticide treatment (including vegetable oil), (iv) defoliation, (v) storage temperature.</p> <p><b>Interception records</b><br/>There are no records of interceptions from Ukraine.</p> <p><b>Shortcomings of current measures/procedures</b><br/>High pressure water on stems could be partially effective on mobile juveniles while not on adults. Besides, if the pest is hidden in trunk cracks water can be ineffective. Conflicting information regarding the use of pesticides was encountered while evaluating the dossier and the additional information provided by the NPPO. The active ingredients mentioned in the dossier (and the reply) would be effective against the pest. However, it is unclear whether these products are applied on a calendar basis or following ad hoc application as function of pest presence, or both. Vegetable oils are also applied which could have limited effect on juveniles. Defoliation can help to reduce pest pressure, but the main pathway for introduction remains stems/trunks. Low storage temperature can prevent or slow down the development of the pest but will not eliminate it.</p> <p><b>Main uncertainties</b></p> <ul style="list-style-type: none"> <li>• No data is available on the distribution of the pest in Ukraine or on the presence and population densities in the two main areas of production.</li> <li>• It is unclear whether the pesticides are applied on a calendar basis or following ad hoc application as function of pest presence, or both.</li> <li>• Screening of certified material for this pest could not ensure pest absence because young stages can be difficult to detect.</li> </ul> |
|--|--|

### 5.3.2. Overview of the evaluation of *Eotetranychus prunicola*

|   |  |                                       |                                       |                                       |                                       |
|---|--|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| <b>Rating of the likelihood of pest freedom</b>           | <b>Pest free with some exceptional cases</b> (based on the Median)   |                                       |                                       |                                       |                                       |
| <b>Percentile of the distribution</b>                     | 5%   | 25%                                   | Median                                | 75%                                   | 95%                                   |
| <b>Proportion of pest-free bundles</b>                    | <b>9,912</b><br>out of 10,000 bundles  | <b>9,939</b><br>out of 10,000 bundles | <b>9,961</b><br>out of 10,000 bundles | <b>9,979</b><br>out of 10,000 bundles | <b>9,995</b><br>out of 10,000 bundles |
| <b>Percentile of the distribution</b>                     | 5%   | 25%                                   | Median                                | 75%                                   | 95%                                   |
| <b>Proportion of infested bundles</b>                     | <b>5</b><br>out of 10,000 bundles  | <b>21</b><br>out of 10,000 bundles    | <b>39</b><br>out of 10,000 bundles    | <b>61</b><br>out of 10,000 bundles    | <b>88</b><br>out of 10,000 bundles    |
| <b>Summary of the information used for the evaluation</b> | <p><b>Possibility that the pest could become associate with the commodity</b><br/><i>Malus domestica</i> is reported as a host of <i>E. prunicola</i> which is present in Ukraine. Since the mite overwinters in small groups in cracks, under dead bark and in branches forks it is possible that the mite is associated with the commodity, although plants are defoliated.</p> <p><b>Measures taken against the pest and their efficacy</b><br/>The relevant proposed measures are: (i) official surveillance and monitoring, (ii) high water pressure, (iii) pesticide treatment (including vegetable oil), (iv) defoliation, (v) storage temperature.</p> <p><b>Interception records</b><br/>There are no records of interceptions from Ukraine</p> <p><b>Shortcomings of current measures/procedures</b><br/>Surveillance could not ensure pest absence because young stages can be difficult to detect. High pressure water on stems could be partially effective on mobile instars; however, if hidden in cracks in the trunk, they may be difficult to remove with water. Although no acaricides are mentioned in the dossier, the active ingredients used for insects would be somehow effective against the pest. Besides, it is unclear whether these products are applied on a calendar basis or following ad hoc application as function of pest presence, or both. Vegetable oils are also applied which could have a deterrent effect on oviposition, though limited effect on mite development. Defoliation can help to</p> |                                       |                                       |                                       |                                       |

reduce the density of the pest on the plant and decrease pest pressure; however, the mite could survive in stems/trunks where it overwinters. Low storage temperature can prevent or slow down the development of the mite but will not eliminate it.

#### Main uncertainties

- No information is available on the distribution of the pest in Ukraine and specifically in the two main areas of production.
- It is unclear whether the pesticides are applied on a calendar basis or following ad hoc application as function of pest presence, or both.
- In the absence of leaves and related symptoms, the pest might be easily overlooked.

### 5.3.3. Overview of the evaluation of Tobacco ringspot virus

|   |   |                                       |                                       |                                       |  |
|---|---|---------------------------------------|---------------------------------------|---------------------------------------|--|
| <b>Rating of the likelihood of pest freedom</b>           | <b>Almost always pest free</b> (based on the Median)  |                                       |                                       |                                       |  |
| <b>Percentile of the distribution</b>                     | 5%  | 25%                                   | Median                                | 75%                                   | 95%                                    |
| <b>Proportion of pest-free bundles</b>                    | <b>9,980</b><br>out of 10,000 bundles   | <b>9,991</b><br>out of 10,000 bundles | <b>9,997</b><br>out of 10,000 bundles | <b>9,999</b><br>out of 10,000 bundles | <b>10,000</b><br>out of 10,000 bundles |
| <b>Percentile of the distribution</b>                     | 5%  | 25%                                   | Median                                | 75%                                   | 95%                                    |
| <b>Proportion of infested bundles</b>                     | <b>0</b><br>out of 10,000 bundles   | <b>1</b><br>out of 10,000 bundles     | <b>3</b><br>out of 10,000 bundles     | <b>9</b><br>out of 10,000 bundles     | <b>20</b><br>out of 10,000 bundles     |
| <b>Summary of the information used for the evaluation</b> | <p><b>Possibility that the pest could become associate with the commodity</b><br/>In addition to <i>Malus domestica</i>, TRSV has a wide host range, including herbaceous and woody plant species. Although the current pest status in Ukraine according to EPPO is transient (under eradication), it has been recently detected in two regions.</p> <p><b>Measures taken against the pest and their efficacy</b><br/>Mother plants are coming from certified material, and plant material for export is certified under the Ukrainian phytosanitary regulations.</p> <p><b>Interception records</b><br/>There are no records of interceptions of <i>M. domestica</i> plants for planting from Ukraine due to the presence of TRSV.</p> <p><b>Shortcomings of current measures/procedures</b><br/>Details on the inspections and surveillance to detect TRSV.</p> <p><b>Main uncertainties</b><br/>Beyond the nematode transmission, TRSV spread and transmission efficiency by other vectors are unclear and poorly studied in woody plants.<br/>The sampling strategies and their extent to detect either symptomatic or asymptomatic infections.</p> |                                       |                                       |                                       |  |

### 5.3.4. Outcome of Expert Knowledge Elicitation

Table 7 and Figure 4 show the outcome of the EKE regarding pest freedom after the evaluation of the proposed risk mitigation measures for all the evaluated pests.

Figure 5 provides an explanation of the descending distribution function describing the likelihood of pest freedom after the evaluation of the proposed risk mitigation measures for *Malus domestica* trees designated for export to the EU for *Lopholeucaspis japonica*, *Eotetranychus prunicola* and Tobacco ringspot virus.

**Table 7:** Assessment of the likelihood of pest freedom following evaluation of current risk mitigation measures against *Lopholeucaspis japonica*, *Eotetranychus prunicola* and Tobacco ringspot virus on *Malus domestica* 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      | INS    | Lopholeucaspis japonica       |                     |                               |                      |                           |                                | LM                                    |                                      | U                       |
| 2      | INS    | Eotetranychus prunicola       |                     |                               |                      |                           | L                              | M                                     | U                                    |                         |
| 3      | VIR    | Tobacco Ringspot Virus (TRSV) |                     |                               |                      |                           |                                | L                                     |                                      | MU                      |

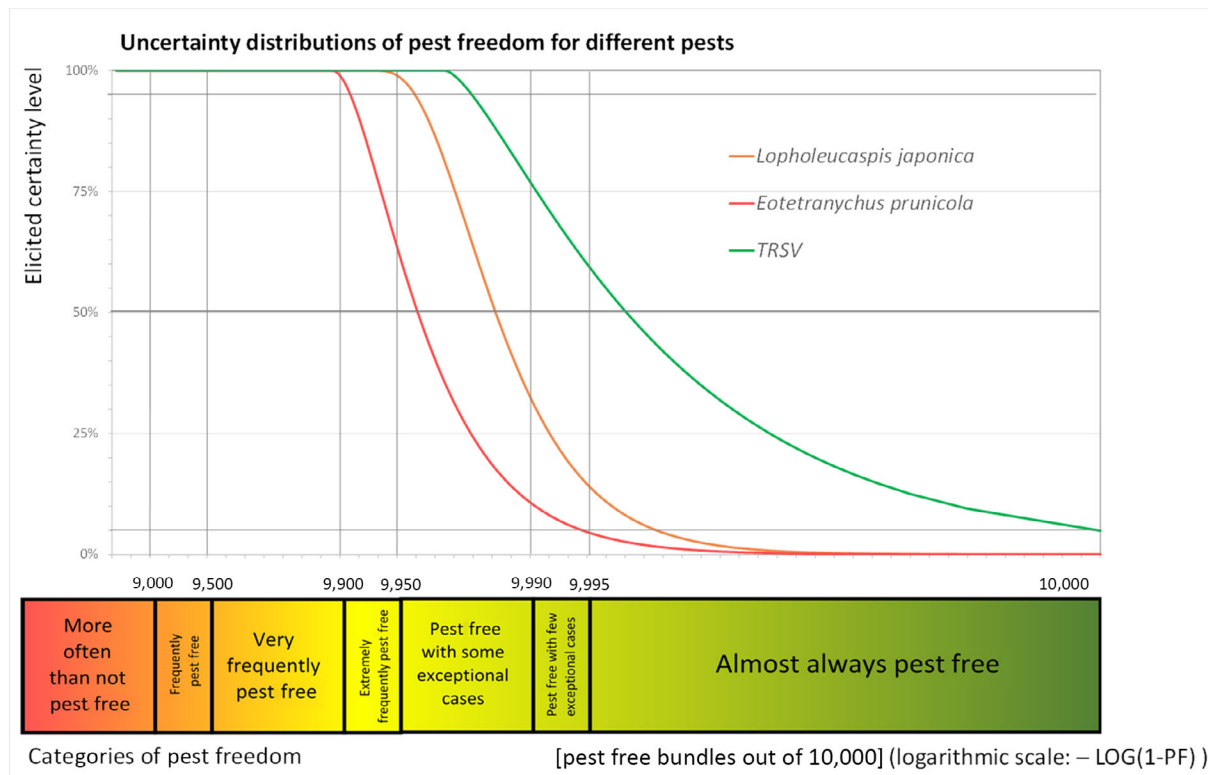
PANEL A

|  | Pest freedom category                 | Pest-free plants out of 10,000 |
|--|---------------------------------------|--------------------------------|
|  | Sometimes pest free                   | ≤ 5,000                        |
|  | More often than not pest free         | 5,000–≤ 9,000                  |
|  | Frequently pest free                  | 9,000–≤ 9,500                  |
|  | Very frequently pest free             | 9,500–≤ 9,900                  |
|  | Extremely frequently pest free        | 9,900–≤ 9,950                  |
|  | Pest free with some exceptional cases | 9,950–≤ 9,990                  |
|  | Pest free with few exceptional cases  | 9990–≤ 9995                    |
|  | Almost always pest free               | 9,995–≤ 10,000                 |

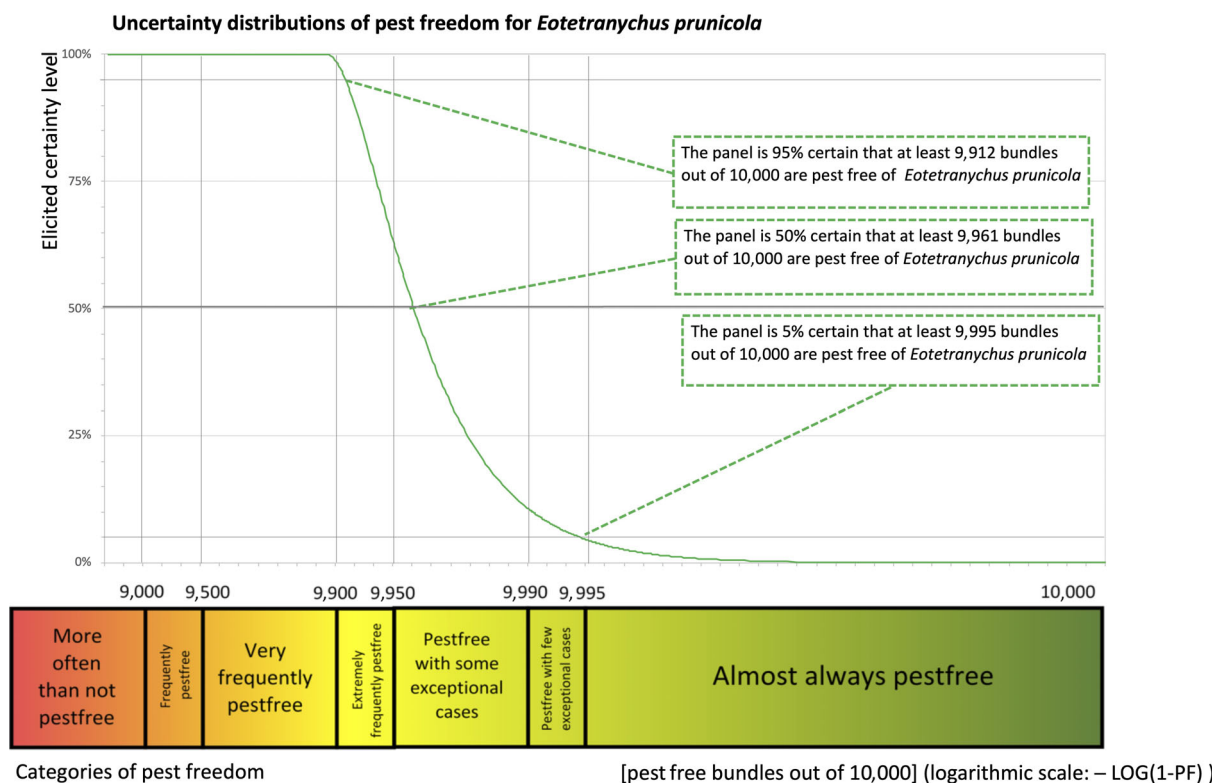
**Legend of pest freedom categories**

|          |  |
|----------|--|
| <b>L</b> | Pest freedom category includes the elicited lower bound of the 90% uncertainty range |
| <b>M</b> | Pest freedom category includes the elicited median                                   |
| <b>U</b> | Pest freedom category includes the elicited upper bound of the 90% uncertainty range |

PANEL B



**Figure 4:** Elicited certainty (y-axis) of the number of pest-free *Malus domestica* bundles (x-axis; log-scaled) out of 10,000 plants designated for export to the EU from Ukraine for all evaluated pests visualised as descending distribution function. Horizontal lines indicate the percentiles (starting from the bottom 5%, 25%, 50%, 75%, 95%). The Panel is 95% confident that 9,960, 9,912 and 9,980 or more bundles per 10,000 will be free from *Lopholeucaspis japonica*, *Eotetranychus prunicola* and Tobacco ringspot virus, respectively



**Figure 5:** Explanation of the descending distribution function describing the likelihood of pest freedom after the evaluation of the proposed risk mitigation measures for plants designated for export to the EU based on the example of *Eotetranychus prunicola*

### 5.4. Evaluation of the application of specific measures in the Ukraine

Annex X of the Commission Implementing Regulation (EU) 2019/2072 specifies a list of plants, plant products and other objects, originating from third countries and the corresponding special requirements for their introduction into the Union territory or Protected Zones. According to the above-mentioned annexes, special measures are required for the import of the commodity from the Ukraine related to *Erwinia amylovora*. The evaluation of the specific measures is specified in Table 8.

**Table 8:** Specific measures regarding *Erwinia amylovora* which are in place for the import of the commodity from the Ukraine according to Annex X of the Commission Implementing Regulation (EU) 2019/2072

| Pest name                | Point            | Evaluation of Specific measure to be implemented  |
|--------------------------|------------------|---|
| <i>Erwinia amylovora</i> | Annex X, item 9. | Based on the information provided in the dossier, including the supplementary information, the exporting country does not fully meet the specific requirements for a certificate regarding <i>Erwinia amylovora</i> . Three inspections are mentioned including the nursery and surrounding area, and the timing could be interpreted as the 'most appropriate time', though not in full agreement with the time periods mentioned in the legislation. Details of the buffer zone were uncertain, and it was not clear if it was officially designated, nor if it met the minimum size requirement (50 km <sup>2</sup> ). Details of testing for latent infections were not provided. |

## 6. Conclusions

There are four pests identified to be present in Ukraine and considered to be potentially associated with bare-rooted rootstocks and grafted plants of *Malus domestica* imported from Ukraine and relevant for the EU.

For *Erwinia amylovora*, the exporting country does not fully meet the specific requirements for a certificate regarding this pest.

For the remaining three pests (*Lopholeucapsis japonica*, *Eotetranychus prunicola* and Tobacco ringspot virus), the likelihood of pest freedom after the evaluation of the proposed risk mitigation measures for bare-rooted rootstocks and grafted plants of *Malus domestica* designated for export to the EU was estimated.

For *Lopholeucapsis japonica*, the likelihood of pest freedom following evaluation of current risk mitigation measures was estimated as 'Pest free with some exceptional cases' with the 90% uncertainty range reaching from 'Pest free with some exceptional' to 'Almost always pest free'. The Expert Knowledge Elicitation indicated, with 95% certainty, that between 9,995 and 10,000 units per 10,000 will be free from *Lopholeucapsis japonica*.

For *Eotetranychus prunicola*, the likelihood of pest freedom 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 'Pest free with few exceptional cases'. The Expert Knowledge Elicitation indicated, with 95% certainty, that between 9,995 and 10,000 units per 10,000 will be free from *Eotetranychus prunicola*.

For Tobacco ringspot virus (TRSV), the likelihood of pest freedom following evaluation of current risk mitigation measures was estimated as 'Almost always pest free' with the 90% uncertainty range reaching from 'Pest free with some exceptional cases' to 'Almost always pest free'. The Expert Knowledge Elicitation indicated, with 95% certainty, that between 9,995 and 10,000 units per 10,000 will be free from Tobacco ringspot virus.

## References

- CABI (Centre for Agriculture and Bioscience International), online. CABI Crop Protection Compendium. Available online: <https://www.cabi.org/cpc/>
- CABI Abstracts (CABI Direct), online. CAB International. Available online: <https://www.cabi.org/cpc/>
- EFSA PLH Panel (EFSA Panel on Plant Health), 2019b. Commodity risk assessment of black pine (*Pinus thunbergii* Parl.) bonsai from Japan. EFSA Journal 2019;17(5):5667, 184 pp. <https://doi.org/10.2903/j.efsa.2019.5668>
- EFSA PLH Panel (EFSA Panel on Plant Health), 2018. Guidance on quantitative pest risk assessment. EFSA Journal 2018;16(8):5350, 86 pp. <https://doi.org/10.2903/j.efsa.2018.5350>
- EFSA PLH Panel (EFSA Panel on Plant Health), 2019a. Guidance on commodity risk assessment for the evaluation of high risk plants dossiers. EFSA Journal 2019;17(4):5668, 20 pp. <https://doi.org/10.2903/j.efsa.2019.5668>
- EFSA Scientific Committee, 2018. Scientific Opinion on the principles and methods behind EFSA's Guidance on Uncertainty Analysis in Scientific Assessment. EFSA Journal 2018;16(1):5122, 235 pp. <https://doi.org/10.2903/j.efsa.2018.5122>. ISSN:1831-4732
- EPPO (European and Mediterranean Plant Protection Organization), online. EPPO Global Database. Available online: <https://www.eppo.int/> [Accessed: 4 February 2021].
- EUROPHYT, online. European Union Notification System for Plant Health Interceptions - EUROPHYT. Available online: [http://ec.europa.eu/food/plant/plant\\_health\\_biosecurity/europhyt/index\\_en.htm](http://ec.europa.eu/food/plant/plant_health_biosecurity/europhyt/index_en.htm) [Accessed: 13 September 2021].
- FAO (Food and Agriculture Organization of the United Nations), 1995. ISPM (International standards for phytosanitary measures) No 4. Requirements for the establishment of pest free areas. Available online: <https://www.ippc.int/en/publications/614/>
- FAO (Food and Agriculture Organization of the United Nations), 2016. ISPM (International standards for phytosanitary measures) No. 36. Integrated measures for plants for planting. FAO, Rome, 22 pp. Available online: <https://www.ippc.int/en/publications/636/>
- FAO (Food and Agriculture Organization of the United Nations), 2017. ISPM (International standards for phytosanitary measures) No. 5. Glossary of phytosanitary terms. FAO, Rome. Available online: <https://www.ippc.int/en/publications/622/>
- Kottek M, Grieser J, Beck C, Rudolf B and Rubel F, 2006. World map of Köppen- Geiger climate classification updated. Meteorologische Zeitschrift, 15, 259–263.
- MacLeod A and Korycinska A, 2019. Detailing Köppen-Geiger climate zones at a country and regional level: a resource for pest risk analysis. EPPO Bulletin, 49, 73–82.
- TRACES-NT, online. TRAdE Control and Expert System. Available online: <https://webgate.ec.europa.eu/tracesnt> [Accessed: 13 September 2021].
- Xu YM and Zhao ZQ, 2019. Longidoridae and Trichodoridae (Nematoda: Dorylaimida and Triplonchida). Fauna of New Zealand, 79.

## 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 |
| NEM   | Nematode   |
| PLH   | Plant Health                                       |
| PRA   | Pest Risk Assessment                               |
| RNQPs | Regulated Non-Quarantine Pests                     |

## Glossary

|                               |  |
|-------------------------------|--|
| 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).  |
| 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 mitigation measures 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 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, 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       | 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, 2017).   |

## Appendix A – Data sheets of pests selected for further evaluation via Expert Knowledge Elicitation

### A.1. *Lopholeucaspis japonica*

#### A.1.1. Organism information

|  |   |
|--|---|
| <b>Taxonomic information</b>                         | <p>Current valid scientific name: <i>Lopholeucaspis japonica</i> Cockerell</p> <p>Synonyms: <i>Leucaspis japonica</i> (Fernald, 1903), <i>Leucaspis japonica</i> var. <i>darwinensis</i> (Green, 1916), <i>Leucodiaspis hydrangeae</i> (Takahashi, 1934), <i>Leucodiaspis japonica</i> (Takahashi, 1934), <i>Leucodiaspis japonica darwiniensis</i> (Takahashi, 1934), <i>Leucaspis hydrangeae</i> (Takahashi, 1934), <i>Lopholeucaspis japonica</i> (Balachowsky, 1953), <i>Lopholeucaspis japonica darwiniensis</i> (Balachowsky, 1953), <i>Lopholeucaspis menoni</i> (Borchsenius, 1964); <i>Lopholeucaspis darwiniensis</i> (Borchsenius, 1966), <i>Leucaspis menoni</i> (Takagi, 1969)</p> <p>Name used in the EU legislation: <i>Lopholeucaspis japonica</i> Cockerell [LOPLJA]</p> <p>Order: Hemiptera</p> <p>Family: Diaspididae</p> <p>Common name: Japanese long scale, Japanese maple scale, Japanese pear white scale</p> <p>Name used in the Dossier: <i>Lopholeucaspis japonica</i></p> |
| <b>Group</b>   | Insects   |
| <b>EPPO code</b>                                     | LOPLJA  |
| <b>Regulated status</b>                              | <p>The pest is listed in Annex II of Commission Implementing Regulation (EU) 2019/2072 as <i>Lopholeucaspis japonica</i> Cockerell [LOPLJA]</p> <p>The pest is included in the EPPO A2 list (EPPO, online_a).<br/><i>Lopholeucaspis japonica</i> is quarantine in Belarus, Israel, Mexico, Morocco and Tunisia (EPPO, online_b).</p>  |
| <b>Pest status in Ukraine</b>                        | <i>Lopholeucaspis japonica</i> is present in Ukraine, with restricted distribution (EFSA PLH Panel, 2018; EPPO, online_c).  |
| <b>Pest status in the EU</b>                         | <i>Lopholeucaspis japonica</i> is absent in the EU. It was intercepted in Croatia, Greece, Italy and Slovak Republic, but never found again (EFSA PLH Panel, 2018; EPPO, online_c).   |
| <b>Host status on <i>Malus domestica</i></b>         | <i>M. domestica</i> is reported as a host of <i>Lopholeucaspis japonica</i> (EPPO, online_d).   |
| <b>PRA information</b>                               | <p>Pest Risk Assessments available:</p> <ul style="list-style-type: none"> <li>– Scientific Opinion on the pest categorisation of <i>Lopholeucaspis japonica</i> (EFSA PLH Panel, 2018).</li> <li>– Final import risk analysis report for fresh apple fruit from the People's Republic of China (Biosecurity Australia, 2010),</li> <li>– Final import risk analysis report for fresh unshu mandarin fruit from Shizuoka prefecture in Japan (Biosecurity Australia, 2009),</li> <li>– Import Risk Analysis: Pears (<i>Pyrus bretschneideri</i>, <i>Pyrus pyrifolia</i> and <i>Pyrus</i> sp. nr. <i>communis</i>) fresh fruit from China (Biosecurity New Zealand, 2009).</li> </ul>  |
| <b>Other relevant information for the assessment</b> |   |
| <b>Biology</b>                                       | <p><i>Lopholeucaspis japonica</i> is an oyster shell-shaped armoured scale, originating from Far East and spread to tropical and semitropical areas (CABI, online).</p> <p>Females and males have different life cycles. The life stages of females are egg, two larval instars and adult, while males have two additional stages called pre-pupa and pupa (CABI, online). Males are small and have wings (Bienkowski, 1993), while females are sessile enclosed in chitinous 'puparium' (Tabatadze and Yasnosh, 1999). The colour of females, eggs and crawlers is lavender. The wax which is covering the body of scales is white (Fulcher et al., 2011). Each female lays on average 25 eggs, which are laid underneath the female bodies (Addesso et al., 2016; Fulcher et al., 2011).</p> <p>Crawlers can be dispersed by wind or insects (ants, flies and ladybirds), and occasionally also by human transport (Magsig-Castillo et al., 2010).</p>  |

|  |  |   |
|--|--|---|
|  | <p><i>Lopholeucaspis japonica</i> has one or two overlapping generations per year (Adesso et al., 2016). It was reported that occasionally there can be a third generation, in Georgia (Tabatadze and Yasnosh, 1999). In India, first-generation crawlers were observed from late March until the end of April. Female and male pupae were present from June till the end of August. Second-generation crawlers occurred in September and matured females in October (Harsur et al., 2018).</p> <p><i>Lopholeucaspis japonica</i> overwinters as an immature stage on trunks and branches in Tennessee (Fulcher et al., 2011) and second instar males and females in Maryland (Gill et al., 2012). In addition, it has been reported to overwinter as fertilised females in Japan (Murakami, 1970) and in Pennsylvania (Stimmel, 1995). They can endure temperatures of –20 to –25°C (EPPO, 1997).</p>   |   |
| <b>Symptoms</b>  | <b>Main type of symptoms</b>   | <p><i>Lopholeucaspis japonica</i> is usually on bark of branches and trunks but can be found also on leaves (Gill et al., 2012) and sometimes on fruits (EPPO, 1997).</p> <p>The scale feeds on plant storage cells, which causes them to collapse (Fulcher et al., 2011). When the population is high, the main symptoms on plants are premature leaf drop, dieback of branches and death of plants (Fulcher et al., 2011; Gill et al., 2012).</p> <p>Symptoms observed on pomegranate in India were yellowing of leaves, poor fruit set and stunted plant growth (Harsur et al., 2018).</p> |
|  | <b>Presence of asymptomatic plants</b>   | No information.   |
|  | <b>Confusion with other pests</b>  | <p><i>Lopholeucaspis japonica</i> can be confused with other armoured scales.</p> <p><i>Lopholeucaspis japonica</i> is similar to <i>L. cockerelli</i> but can be differentiated by the number of macroducts (García Morales et al., online). Another very similar scale is <i>Pseudaulacaspis pentagona</i> (Fulcher et al., 2011).</p>  |
| <b>Host plant range</b>                                      | <p><i>Lopholeucaspis japonica</i> is polyphagous armoured scale and feeds on plants belonging to 38 families (García Morales et al., online).</p> <p>Some of the many hosts of <i>Lopholeucaspis japonica</i> are <i>Acer palmatum</i>, <i>Acer pictum</i>, <i>Acer ukurunduense</i>, <i>Citrus junos</i>, <i>Citrus unshiu</i>, <i>Diospyros kaki</i>, <i>Distylium racemosum</i>, <i>Elaeagnus umbellata</i>, <i>Euonymus alatus</i>, <i>Euonymus japonicus</i>, <i>Gleditsia japonica</i>, <i>Ilex crenata</i>, <i>Magnolia denudata</i>, <i>Magnolia kobus</i>, <i>Malus pumila</i>, <i>Paeonia lactiflora</i>, <i>Poncirus trifoliata</i>, <i>Prunus × yedoensis</i>, <i>Pyrus pyrifolia</i>, <i>Robinia pseudoacacia</i>, <i>Rosa chinensis</i>, <i>Rosa multiflora</i>, <i>Salix</i> sp., <i>Staphylea bumalda</i>, <i>Syringa oblata</i> and <i>Ziziphus jujuba</i> (Suh, 2020).</p> <p><i>Lopholeucaspis japonica</i> is a pest of tea in China (Li et al., 1997). It is a serious pest of many crops (citrus, fruit trees, tea, tung) and ornamental plants in the area around the Black Sea (Tabbatadze and Yasnosh, 1999). In the US, it is known to damage <i>Acer</i> and <i>Pyracantha</i> (Davidson and Miller, 1990).</p> |   |
| <b>Reported evidence of impact</b>                           | Listed as EU Quarantine pest (Annex II, part B).   |   |
| <b>Pathways and evidence that the commodity is a pathway</b> | Possible pathways of entry for <i>Lopholeucaspis japonica</i> are plants for planting (excluding seeds), bonsai, cut flowers and cut branches (EFSA PLH Panel, 2018).  |   |
| <b>Surveillance information</b>                              | No surveillance information is currently available from the Ukraine NPPO.  |   |

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

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

If present in the surroundings, the pest can enter the nursery (as Ukraine is producing these plants for planting outdoors). The pest could enter the nursery either by passive dispersal (e.g. wind)

especially young instars than can be easily uplifted by wind, infested plant material by nursery workers and machinery. Given that the pest is very polyphagous, the pest could be associated with several crops and wild hosts in the surroundings.

#### Uncertainties:

- No data available on the distribution of the pest in Ukraine and on the population densities in the two main areas of production.

Taking into consideration the above evidence and uncertainties, the Panel considers that it is possible for the pest to enter the nursery.

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

The pest can be found on the trunk, stem, branches, leaves of plants for planting (scions, grafted rootstocks). Although adults can be relatively easily spotted during visual inspections, young stages can be difficult to detect. The pest can be hidden inside bark cracks. In case of low populations, the species can be overlooked regarded as trunk spots. Introduction of the pest with certified material is very unlikely.

#### Uncertainties:

- Uncertain if certified material is screened for this pest

Taking into consideration the above evidence and uncertainties, the Panel considers it possible that the pest could enter the nursery although very unlikely.

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

If the scale enters the nursery from the surroundings, the pest could spread within the nursery either by passive dispersal (e.g. wind), especially young instars than can be easily uplifted by wind, infested plant material or by nursery workers and machinery. Active dispersal is possible and movement from plant to plant by mobile young instars is possible. Given that the pest is very polyphagous, it could be associated with other crops in the nursery (e.g. *Prunus* spp.).

Taking into consideration the above evidence, the Panel considers that the transfer of the pest within the nursery is possible.

#### **A.1.3. Information from interceptions**

There are no records of interceptions of *M. domestica* plants for planting from Ukraine due to the presence of *L. japonica* between 1995 and March 2021 (EUROPHYT, online, online).

#### **A.1.4. Evaluation of the risk mitigation options**

In the table below, all risk mitigation measures currently applied in Ukraine are listed and an indication of their effectiveness on *L. japonica* is provided. The description of the risk mitigation measures currently applied in Ukraine is provided in Table 6.

| No. | Risk mitigation measure (name) | Description  | Effect on the pest | Evaluation and uncertainties  |
|-----|--------------------------------|--|--------------------|---|
| 1   | Certified material             | Establishment of mother plants is done using certified propagation material from either Hungary, Italy or the Netherlands. Once established, Ukraine phytosanitary authorities inspect yearly mother stocks. The Ukrainian State has a register of certified material and nurseries. | Yes                | Protocols for diagnosis and inspections are applied taking into account ISPM 23 (Guidelines for inspection), 27 (diagnostic protocols for regulated pests), 31 (methodologies for sampling of consignments) and EPPO PM/3, PM/7 (diagnostic protocol for regulated pests) guidelines.<br><br>They follow article. 29 of Ukrainian phytosanitary law (answer 35 to EFSA) |

| No. | Risk mitigation measure (name)   | Description  | Effect on the pest | Evaluation and uncertainties  |
|-----|--|--|--------------------|---|
|     |  |  |                    | Uncertainties: <ul style="list-style-type: none"> <li>The details of the certification process are not given (e.g. number of plants, intensity of surveys and inspections, etc.).</li> <li>Specific figures on the intensity of survey (sampling effort) are not provided.</li> </ul>   |
| 2   | Registration, inspection, certification and surveillance of nurseries for export | Registration is needed for export and therefore, export nurseries require having a specific certification and are accordingly inspected yearly.  | Yes                | Details of the surveillance and monitoring during production cycle were only described for three pests, and details were not provided for other pests.<br><br>Details on inspection are provided mainly for the pre-export stage.<br><br>Uncertainties: <ul style="list-style-type: none"> <li>The details of the surveillance and monitoring were not described (e.g. number of plants, intensity of surveys and inspections, etc.).</li> </ul>  |
| 3   | High water pressure  | Stems and root system of the rootstock are washed with high pressure water to remove attached soil.  | Yes                | Partially effective on mobile juveniles while not on adults.<br><br>Uncertainties: <ul style="list-style-type: none"> <li>If the pest is hidden in trunk cracks, it may be difficult to remove with water.</li> </ul>   |
| 4   | Soil management  | Fields for production of apple trees are either steamed or biofumigated (by growing mustard) before the establishment of the nursery   | No                 |   |
| 5   | Application of chemical treatment (Insecticides and acaricides)                  | In the dossier and reply several phytosanitary products are listed, such as: Actara, Actellic, Bi 58, Calypso, Confidor, Envidor, Karate Zeon, Mospilan, Movento, Ortus, Sanmit, Vertimec. | Yes                | Conflicting information regarding the use of pesticides was encountered while evaluating the dossier and the additional information provided by the NPPO.<br><br>The active ingredients mentioned in the dossier (and the reply) would be effective against the pest.<br><br>Uncertainties: <ul style="list-style-type: none"> <li>It is unclear whether these products are applied on a calendar basis or following ad hoc application as function of pest presence, or both.</li> </ul> |
| 6   | Application of vegetable oil   | Spraying 1.5% solution of vegetable oil.   | Yes                | It could have limited effect only on young instars.   |
| 7   | Crop rotation  | Cultivation of apple rootstocks is integrated into a crop rotation and/or fallow scheme. Wheat, mustard, sunflower are the main crops cultivated in the areas of production.               | No                 |   |

| No. | Risk mitigation measure (name)           | Description   | Effect on the pest | Evaluation and uncertainties  |
|-----|--|---|--------------------|---|
| 8   | Defoliation                              | Plants for planting for export are defoliated. First, there is a machine that opens the ridges in the field and this followed by mechanical removal of leaves.  | Yes                | It can help to decrease pest pressure.<br>Uncertainties:<br>• The main pathway for introduction remains stems/trunks.       |
| 9   | Sorting and selection of export material | Inspection prior to export visual examination and taking samples for phytosanitary procedures (screening), certificates issued after this screening remain valid for a period of 14 days.<br>Select material for export based on stem diameter.<br>At the Bakhmut nursery, there are five commodity categories with trunk diameter from 2 to 12 mm.<br>At Holland Plant Ukraine nursery, the stems are $\geq 14$ mm | Yes                | Visual inspection can have a limited efficacy.<br>Uncertainties:<br>• It may fail to detect low infestations and juveniles. |
| 10  | Storage temperature                      | Plants for export are stored in cold temperatures below 5°C.  | Yes                | It can prevent or slow down the development of the pest, but cold temperatures will not eliminate it.                       |

### A.1.5. Overall likelihood of pest freedom

#### A.1.5.1. Reasoning for a scenario which would lead to a reasonably low number of infested consignments

- Nurseries are located in pest-free areas.
- No pest entry by other propagation material/plants/humans.
- Certification prohibits entry.
- No pest entry by natural movement.
- No spread by machinery.
- Natural enemies are present in the nurseries.
- Regular visual inspection will detect larger populations of the pest.
- Regular pesticide application will be effective to control the pest.
- Defoliation will reduce the pest population.
- Sorting, grading will detect infestations.
- Visual inspection (200 pcs per pallet) is effective to detect the pest.

#### A.1.5.2. Reasoning for a scenario which would lead to a reasonably high number of infested consignments

- Nurseries are located in areas where the pest is present.
- Pest can enter by other propagation material/plants/humans.
- Unclear certification criteria for this pest.
- Pest can enter by wind or insects (ants, flies and ladybirds).
- Machinery can spread the pest within the nursery.
- Natural enemies are not present in the nurseries.
- Short production cycle will not allow to establish larger population, which are detectable by visual detection.
- Limited (ad hoc) pesticide applications will not effectively control the pest.
- Overlapping generations and infestations on the trunk will survive defoliation.
- Low infestation level will stay undetected on the rootstocks, also after cleaning.

- Visual inspection (200 pcs per pallet) may not be effective to detect the pest in case of low infestation.

#### A.1.5.3. Reasoning for a central scenario equally likely to over- or underestimate the number of infested consignments (Median)

- The exported plants are without leaves and this reduces pest pressure.
- Pesticides listed by the applicant are effective in the control of the pest.
- Alternative hosts are not common in the areas surrounding the nurseries.

#### A.1.5.4. Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/interquartile range)

- Pest pressure in the production area is uncertain.
- Data on efficacy of inspection are not provided.
- Data on the pesticide application scheme are unclear.

#### A.1.5.5. Elicitation outcomes of the assessment of the pest freedom for *Lopholeucaspis japonica*

The elicited and fitted values for *Lopholeucaspis japonica* agreed by the Panel are shown in Tables A.1 and A.2 and in Figure A.1.

**Table A.1:** Elicited and fitted values of the uncertainty distribution of pest infestation by *Lopholeucaspis japonica* 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     |      |      |      |     | 8   |      | 15   |      | 25   |      |      |      |       | 50   |
| EKE             | 0.644 | 1.28 | 2.17 | 3.71 | 5.6 | 7.9 | 10.2 | 15.2 | 21.1 | 24.8 | 29.4 | 34.5 | 40.3 | 45.1  | 50.2 |

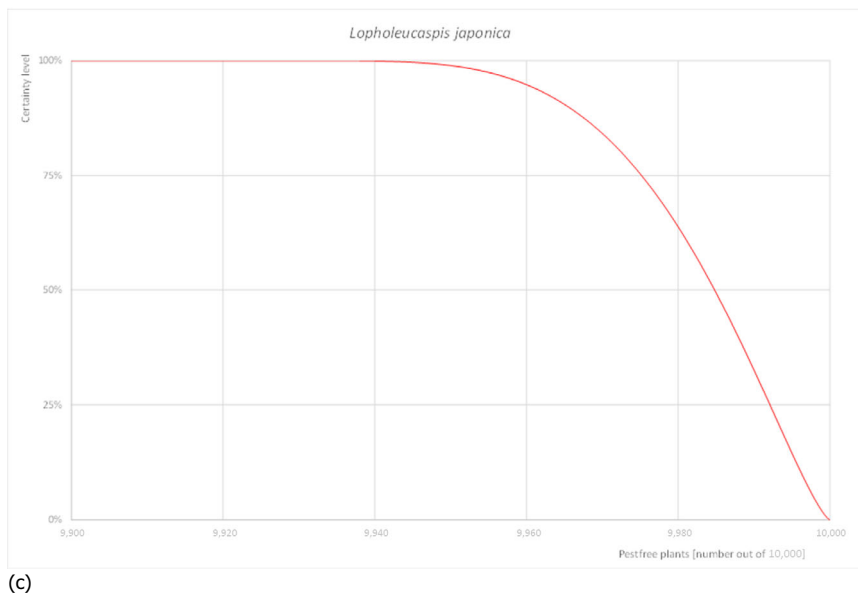
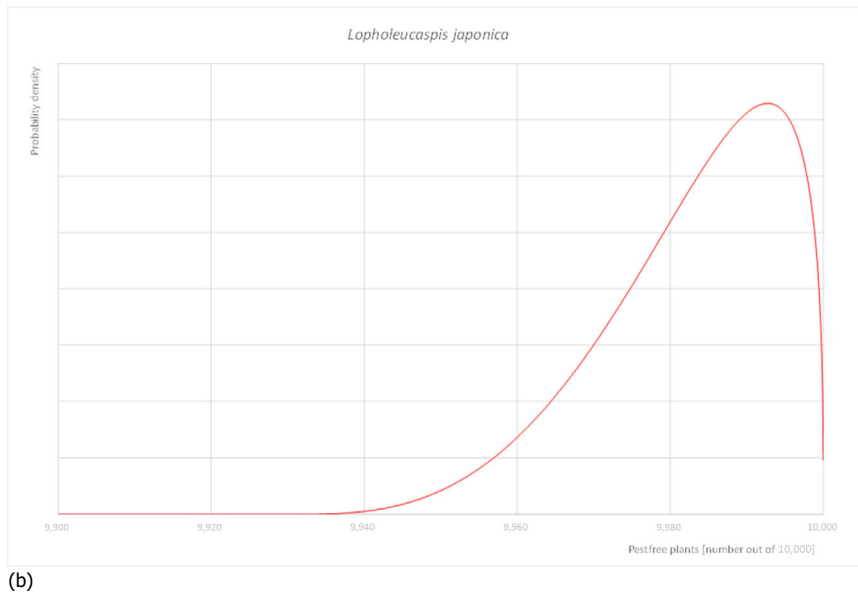
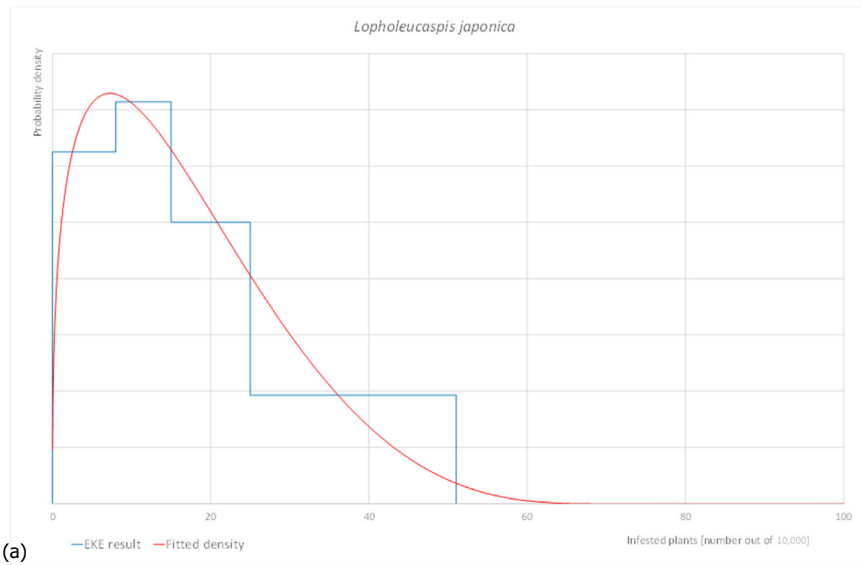
The EKE results is BetaGeneral (1.3591, 4.1033, 0, 70) distribution fitted with @Risk version 7.5.

Based on the numbers of estimated infested plants, the pest freedom was calculated (i.e. = 10,000 – the number of infested 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 *Lopholeucaspis japonica* per 10,000 plants calculated by Table A.1

| Percentile  | 1%    | 2.5%  | 5%    | 10%   | 17%   | 25%   | 33%   | 50%   | 67%   | 75%   | 83%   | 90%   | 95%   | 97.5%   | 99%     |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|---------|
| Values      | 9,950 |       |       |       |       | 9,975 |       | 9,985 |       | 9,992 |       |       |       |         | 10,000  |
| EKE results | 9,950 | 9,955 | 9,960 | 9,965 | 9,971 | 9,975 | 9,979 | 9,985 | 9,990 | 9,992 | 9,994 | 9,996 | 9,998 | 9,998.7 | 9,999.4 |

The EKE results are the fitted values.





**Figure A.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

### A.1.6. Reference List

- Addesso KM, Blalock A and O’Neal PA, 2016. Japanese Maple Scale Activity and Management in Field Nursery Production. *Journal of Environmental Horticulture*, 34, 41–46. <https://doi.org/10.24266/0738-2898-34.2.41>
- Bienkowski AO, 1993. Morphology and systematics of the adult male of *Lopholeucaspis japonica* (Cockerell) (Coccinea Diaspididae). *Russian Entomological Journal*, 2, 25–29.
- Biosecurity Australia, 2010. Final import risk analysis report for fresh apple fruit from the People’s Republic of China. Biosecurity Australia, Canberra.
- CABI (Centre for Agriculture and Bioscience International), online. *Lopholeucaspis japonica* (Japanese baton shaped scale). Available online: <https://www.cabi.org/cpc/datasheet/31328> [Accessed: 4 February 2021].
- EFSA PLH Panel (EFSA Panel on Plant Health), Jeger M, Bragard C, Caffier D, Candresse T, Chatzivassiliou E, Dehnen-Schmutz K, Gilioli G, Gregoire J-C, Jaques Miret JA, Navajas Navarro M, Niere B, Parnell S, Potting R, Rafoss T, Rossi V, Urek G, Van Bruggen A, Van der Werf W, West J, Winter S, Kertesz V and MacLeod A, 2018. Scientific Opinion on the pest categorisation of *Lopholeucaspis japonica*. *EFSA Journal* 2018;16(7):5353, 23 pp. <https://doi.org/10.2903/j.efsa.2018.5353>
- EPPO (European and Mediterranean Plant Protection Organization), 1997. *Lopholeucaspis japonica*. In: Quarantine pests for Europe: data sheets on quarantine pests for the European Union and for the European and Mediterranean Plant Protection Organization. Pp. 384–387. CAB International, Wallingford, UK.
- EPPO (European and Mediterranean Plant Protection Organization), online\_a. EPPO A2 List of pests recommended for regulation as quarantine pests, version 2019-09. Available online: [https://www.eppo.int/ACTIVITIES/plant\\_quarantine/A2\\_list](https://www.eppo.int/ACTIVITIES/plant_quarantine/A2_list) [Accessed: 4 February 2021].
- EPPO (European and Mediterranean Plant Protection Organization), online\_b. *Lopholeucaspis japonica* (LOPLJA), Categorization. Available online: <https://gd.eppo.int/taxon/LOPLJA/categorization> [Accessed: 4 February 2021].
- EPPO (European and Mediterranean Plant Protection Organization), online\_c. *Lopholeucaspis japonica* (LOPLJA), Distribution. Available online: <https://gd.eppo.int/taxon/LOPLJA/distribution> [Accessed: 4 February 2021].
- EPPO (European and Mediterranean Plant Protection Organization), online\_d. *Lopholeucaspis japonica* (LOPLJA), Host plants. Available online: <https://gd.eppo.int/taxon/LOPLJA/hosts> [Accessed: 31 March 2021].
- EUROPHYT, online. European Union Notification System for Plant Health Interceptions - EUROPHYT Available online: [http://ec.europa.eu/food/plant/plant\\_health\\_biosecurity/europhyt/index\\_en.htm](http://ec.europa.eu/food/plant/plant_health_biosecurity/europhyt/index_en.htm) [Accessed: 4 February 2021].
- Fulcher A, Hale F and Halcomb M, 2011. Japanese maple scale: An important new insect pest in the nursery and landscape. University of Tennessee, Extension Publications.
- García Morales M, Denno BD, Miller DR, Miller GL, Ben-Dov Y and Hardy NB, online. ScaleNet: A literature-based model of scale insect biology and systematics, *Lopholeucaspis japonica*. Available online: <http://scalenet.info/catalogue/Lopholeucaspis%20japonica/> [Accessed: 4 February 2021].
- Gill S, Shrewsbury P and Davidson J, 2012. Japanese maple scale (*Lopholeucaspis japonica*): a pest of nursery and landscape trees and shrubs. University of Maryland Extension fact sheet.
- Harsur MM, Joshi S and Pal RN, 2018. Pomegranate: a new host for the invasive scale insect *Lopholeucaspis japonica* (Cockerell, 1897) (Hemiptera: Diaspididae) from Gujarat, India. *Oriental Insects*. <https://doi.org/1080/00305316.2018.1451783>
- Li L, Wang R and Waterhouse DF, 1997. The distribution and importance of arthropod pests and weeds of agriculture and forestry plantations in southern China. Australian Centre for International Agricultural Research (ACIAR). <https://doi.org/10.22004/ag.econ.117177>
- Magsig-Castillo J, Morse JG, Walker GP, Bi JL, Rugman-Jones PF and Stouthamer R, 2010. Phoretic dispersal of armored scale crawlers (Hemiptera: Diaspididae). *Journal of Economic Entomology*, 103, 1172–1179. <https://doi.org/10.1603/ec10030>
- Miller DR and Davidson JA. 1990. A list of armoured scale pests. In: Rosen D, editor. Armoured scale insects. Vol. 4B. Amsterdam: Elsevier; p. 299–306.
- Murakami Y, 1970. A review of biology and ecology of *Diaspine* scales in Japan (Homoptera, Coccoidea). *Mushi* 43, 65–114.

Stimmel JF, 1995. "Japanese maple scale", *Lopholeucaspis japonica* (Cockerell). Regulatory horticulture, entomology circular No. 176, Pennsylvania Department of Agriculture, Bureau of Plant Industry, 21, 33–34.

Suh SJ, 2020. Host plant list of the scale insects (Hemiptera: Coccoomorpha) in South Korea. *Insecta Mundi*.

Tabatadze ES and Yasnosh VA, 2016. Population dynamics and biocontrol of the Japanese scale, *Lopholeucaspis japonica* (Cockerell) in Georgia. *Entomologica*, 33, 429–434.

TRACES-NT, online. TRAdE Control and Expert System. Available online: <https://webgate.ec.europa.eu/tracesnt> [Accessed 13 September 2021].

## A.2. *Eotetranychus prunicola*

### A.2.1. Organism information

|  |   |   |
|--|---|---|
| <b>Taxonomic information</b>                         | Current valid scientific name: <i>Eotetranychus prunicola</i><br>Synonyms: <i>Schizotetranychus prunicola</i> (Livsic, 1960), <i>Tetranychus prunicola</i> (Livshitz, 1960)<br>Name used in the EU legislation: –<br>Order: Acarida<br>Family: Tetranychidae<br>Common name: yellow plum mite<br>Name used in the Dossier: –  |   |
| <b>Group</b>   | Mites   |   |
| <b>EPPO code</b>                                     | –   |   |
| <b>Regulated status</b>                              | –   |   |
| <b>Pest status in Ukraine</b>                        | <i>E. prunicola</i> is present in Ukraine (Spider Mites Web, online).   |   |
| <b>Pest status in the EU</b>                         | <i>E. prunicola</i> is restricted in the EU. It is reported as present in Hungary and in Bulgaria (Spider Mites Web, online).   |   |
| <b>Host status on <i>Malus domestica</i></b>         | <i>M. domestica</i> is reported as a host of <i>E. prunicola</i> (Spider mites web, online).  |   |
| <b>PRA information</b>                               | No PRA is available for <i>E. prunicola</i> .   |   |
| <b>Other relevant information for the assessment</b> |   |   |
| <b>Biology</b>                                       | Females of <i>E. prunicola</i> are light yellow or pale orange with oblong oval shape. They overwinter in small groups in cracks, under dead bark, in branches forks. Overwintering takes place from mid-September to late October, at least in Azerbaijan. Overwintering females leave their wintering places in April (during bud opening), at an average daily air temperature of + 10°C. They start feeding, settling on the underside of young leaves and 5–7 days after flowering they begin to lay eggs mainly along the veins at the base of leaf. Eggs are slightly yellowish, almost colourless. They cover them with a very thin and rare web. The life longevity of the female is up to 30 days and it lays up to 25 eggs. Hatching larvae are transparent. Mites develop on the lower side of the leaf lamina, pierce the epidermis of the leaf and suck out juices from the spongy parenchyma. Damaged leaves change their natural colour, becoming marble and brittle. The yellow plum mite almost does not form a web. It might develop 5–7 generations. Damage has been reported on alycha ( <i>Prunus vachuschtii</i> ) and plum ( <i>Prunus domestica</i> ) (Musayeva et al., 2019). |   |
| <b>Symptoms</b>                                      | <b>Main type of symptoms</b>  | <i>E. prunicola</i> starts feeding on the underside of young leaves and they lay eggs mainly along the veins at the base of leaf. Eggs are slightly yellowish, almost colourless.<br>It is difficult to detect spider mites at low densities, since they are invisible to the naked eye. To confirm the presence or not of spider mites, an examination with stereomicroscope of the undersides of leaves is necessary. The presence of spider mites is usually associated with the presence of white exuviae and webbing. High densities of spider mites are easier to detect, with the same symptoms on a large scale and webbing on the underside of the leaves (EPPO, online) |

|  |   |  |
|--|---|--|
|  | <b>Presence of asymptomatic plants</b>  | <p>the absence of leaves does not allow to detect symptoms. Resting stages of mites on the bark are not associated with symptoms.</p> <p>The absence of leaves does not allow to detect symptoms. Resting stages of mites on the bark are not associated with symptoms.</p> <p>In the case of the congeneric <i>E. sexmaculatus</i>, the absence of leaves does not allow to detect symptoms (EFSA PLH Panel, 2020).</p> |
|  | <b>Confusion with other pests</b>   | No information available.  |
| <b>Host plant range</b>                                      | The hosts of <i>E. prunicola</i> are: <i>Prunus domestica</i> , <i>Malus pumila</i> , <i>Prunus avium</i> , <i>Prunus cerasus</i> , <i>Prunus domestica</i> , <i>Pyrus communis</i> , <i>Cerasus avium</i> , <i>Cerasus vulgaris</i> and <i>Cerasus avium</i> (Kontschán, and Ripka, 2017, Spider mites web, online)  |  |
| <b>Reported evidence of impact</b>                           | Damage has been reported on alycha ( <i>Prunus vachuschtii</i> ) and plum ( <i>Prunus domestica</i> ) (Musayeva et al., 2019).  |  |
| <b>Pathways and evidence that the commodity is a pathway</b> | Possible pathways of entry for <i>E. prunicola</i> are plants for planting since the mite overwinters under dead bark. Although presumably young plants have few cracks, there could be a possibility of moving overwintering instars (Musayeva et al., 2019). Spider mites can spread by wind currents and longer distance dispersion can occur by transportation of planting material (EPPO, online). |  |
| <b>Surveillance information</b>                              | No surveillance information is currently available from the Ukraine NPPO.   |  |

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

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

If present in the surroundings, the pest can enter the nursery (as Ukraine is producing these plants for planting outdoors). The pest could enter the nursery either by passive dispersal (e.g. wind), infested plant material by nursery workers and machinery. The pest could be associated with *Prunus* spp. and *Malus* spp. occurring in the surrounding.

#### Uncertainties:

- No data available on the distribution of the pest Ukraine or population densities in the two main areas of production.
- The main uncertainty is whether the pest is present in the production areas in Ukraine

Taking into consideration the above evidence and uncertainties, the Panel considers that it is possible for the pest to enter the nursery.

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

The pest can be found on the trunk, stem, branches, leaves of plants for planting (scions, grafted rootstocks). The pest is difficult to be spotted during visual inspections especially on the trunk of plants. The pest can be hidden inside bark cracks.

#### Uncertainties:

- Uncertain if certified material is screened for this pest
- The pest is present in Hungary and part of the certified mother material comes from Hungary; it is unclear if the material is inspected for the presence of this pest
- Unclear from the dossier if other type of plant material (for other plant species) is being introduced from Hungary or from other nurseries in Ukraine.

Taking into consideration the above evidence and uncertainties, the Panel considers it possible that the pest could enter the nursery.

### A.2.2.3. Possibility of spread within the nursery

If the pest enters the nursery from the surroundings, it could spread within the nursery either by passive dispersal (e.g. wind), infested plant material or by nursery workers and machinery. Active

dispersal is possible although very short range or transferred from plant to plant if plants are touching each other (as in stoolbeds). Given that the pest is polyphagous, the pest could be associated with other fruit crops in the nursery (e.g. *Prunus* spp.).

Taking into consideration the above evidence, the Panel considers that the transfer of the pest within the nursery is possible.

### A.2.3. Information from interceptions

There are no records of interceptions of *M. domestica* plants for planting from Ukraine due to the presence of *E. prunicola* between 1995 and March 2021 (EUROPHYT and TRACES-NT, online).

### A.2.4. Evaluation of the risk mitigation options

In the table below, all risk mitigation measures currently applied in Ukraine are listed and an indication of their effectiveness on *E. prunicola* is provided. The description of the risk mitigation measures currently applied in Ukraine is provided in Table 6.

| No. | Risk mitigation measure (name)   | Description  | Effect on pests | Evaluation and uncertainties  |
|-----|--|--|-----------------|---|
| 1   | Certified material   | Establishment of mother plants is done using certified propagation material from either Hungary, Italy or the Netherlands. Once established, Ukraine phytosanitary authorities inspect yearly mother stocks. The Ukrainian State has a register of certified material and nurseries. | Yes             | <p>Protocols for diagnosis and inspections are applied taking into account ISPM 23 (Guidelines for inspection), 27 (diagnostic protocols for regulated pests), 31 (methodologies for sampling of consignments) and EPPO PM/3, PM/7 (diagnostic protocol for regulated pests) guidelines.</p> <p>They follow article. 29 of Ukrainian phytosanitary law (answer 35 to EFSA)</p> <p>Uncertainties:</p> <ul style="list-style-type: none"> <li>The details of the certification process are not given (e.g. number of plants, intensity of surveys and inspections, etc.).</li> </ul> <p>Specific figures on the intensity of survey (sampling effort) are not provided.</p> |
| 2   | Registration, inspection, certification and surveillance of nurseries for export | Registration is needed for export, and therefore, export nurseries require having a specific certification and are accordingly inspected yearly.   | Yes             | <p>Details of the surveillance and monitoring during production cycle were only described for three pests, and details were not provided for other pests.</p> <p>Details on inspection are provided mainly for the pre-export stage.</p> <p>Uncertainties:</p> <ul style="list-style-type: none"> <li>The details of the surveillance and monitoring were not described (e.g. number of plants, intensity of surveys and inspections, etc.).</li> </ul>   |
| 3   | High water pressure  | Stems and root system of the rootstock are washed with high pressure water to remove attached soil.  | Yes             | <p>Very limited efficacy on removing mites if present in trunk cracks.</p> <p>Uncertainties:</p> <ul style="list-style-type: none"> <li>The efficacy on mites based on the roughness of the stem.</li> </ul>  |

| No. | Risk mitigation measure (name)                                  | Description   | Effect on pests | Evaluation and uncertainties   |
|-----|---|---|-----------------|--|
| 4   | Soil management   | Fields for the production of apple trees are either steamed or biofumigated (by growing mustard) before the establishment of the nursery  | No              |  |
| 5   | Application of chemical treatment (Insecticides and acaricides) | In the dossier and reply several phytosanitary products are listed, such as: Actara, Actellic, Bi 58, Calypso, Confidor, Envidor, Karate Zeon, Mospilan, Movento, Ortus, Sanmit, Vertimec.  | Yes             | Although no acaricides are mentioned in the dossier, the active ingredients used for insects would be somehow effective against the pest.<br>Vertimec is used as acaricide<br>Uncertainties: <ul style="list-style-type: none"> <li>• It is unclear whether the pesticides are applied on a calendar basis or following ad hoc application as function of pest presence, or both.</li> </ul> |
| 6   | Application of vegetable oil                                    | Spraying 1.5% solution of vegetable oil.  | Yes             | This can have a deterrent effect on oviposition. It could have limited effect on mite development.   |
| 7   | Crop rotation   | Cultivation of apple rootstocks is integrated into a crop rotation and/or fallow scheme. Wheat, mustard, sunflower are the main crops cultivated in the areas of production.  | No              |  |
| 8   | Defoliation   | Plants for planting for export are defoliated. First, there is a machine that opens the ridges in the field and this followed by mechanical removal of leaves.  | Yes             | It can help to decrease pest pressure.<br>Uncertainties:<br>The main pathway for introduction remains stems/trunks.  |
| 9   | Sorting and selection of export material                        | Inspection prior to export visual examination and taking samples for phytosanitary procedures (screening), certificates issued after this screening remain valid for a period of 14 days.<br>Select material for export based on stem diameter. At the Bakhmut nursery, there are five commodity categories with trunk diameter from 12 to 2 mm. At Holland Plant Ukraine nursery, the stems are $\geq$ 14 mm | Yes             | Visual inspection can have a limited efficacy.<br>Uncertainties: <ul style="list-style-type: none"> <li>• It may fail to detect low infestations and juveniles.</li> </ul>   |
| 10  | Storage temperature   | Plants for export are stored in cold temperatures below 5°C.  | Yes             | It can prevent or slow down the development of the pest, but cold temperatures will not eliminate it.  |

## A.2.5. Overall likelihood of pest freedom

### A.2.5.1. Reasoning for a scenario which would lead to a reasonably low number of infested consignments

- Nurseries are located in pest-free areas.
- Few alternative hosts in the environment.
- Small part of other fruit tree production in the nurseries, maybe only in one nursery.
- Mites are recognised as pest.
- No pest entry by other propagation material/plants/humans.
- Mother plants are pest-free.
- Certification prohibits entry.
- Reduced pest entry by natural move, only short distance.
- No spread by machinery.
- Regular visual inspection will detect larger populations of the pest by decolouration of leaves.
- At least one regular pesticide application will be effective to control the pest.
- Movement from leaves to trunk for overwintering starts after defoliation.
- Defoliation will reduce pest infestations when done early.

### A.2.5.2. Reasoning for a scenario which would lead to a reasonably high number of infested consignments

- Nurseries are located in areas where the pest is present.
- Fruit orchards in the environment with alternative hosts.
- Alternative hosts are present inside or close to the nurseries.
- Mites can be undetected due to the absence of symptoms.
- Pest entry by other propagation material/plants/humans.
- Parts of the mother plants come from Hungary, where the pest is present.
- Unclear certification criteria for this pest.
- Pest entry by natural dispersal by wind.
- Machinery can spread the pest within the nursery.
- Most of the plants for export are older with larger trunks and more cracks.
- Regular visual inspection may misinterpret or disregard discoloured leaves.
- Limited applications of pesticides, and no specific acaricides.
- Reduced population of natural enemies.
- Movement from leaves to trunk for overwintering starts before defoliation.
- Defoliation will not reduce pest infestations when done late just before export.

### A.2.5.3. Reasoning for a central scenario equally likely to over- or underestimate the number of infested consignments (Median)

- The exported plants are without leaves and this reduces pest pressure.
- Only one pesticide listed is an acaricide.
- Alternative hosts are present in the areas surrounding or within the nurseries.

### A.2.5.4. Reasoning for the precision of the judgement describing the remaining uncertainties (1st and 3rd quartile/interquartile range)

- Pest pressure in the production area is uncertain.
- Data on efficacy of inspection are not provided.
- Data on the pesticide application scheme are unclear.

### A.2.5.5. Elicitation outcomes of the assessment of the pest freedom for *Eotetranychus prunicola*

The elicited and fitted values for *Eotetranychus prunicola* agreed by the Panel are shown in Tables A.3 and A.4 and in Figure A.2.

**Table A.3:** Elicited and fitted values of the uncertainty distribution of pest infestation by *Eotetranychus prunicola* per 10,000 bundles

| Percentile      | 1%   | 2.5% | 5%   | 10%  | 17%  | 25%  | 33%  | 50%  | 67%  | 75%  | 83%  | 90%  | 95%  | 97.5% | 99% |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|-----|
| Elicited values | 1    |      |      |      |      | 20   |      | 40   |      | 60   |      |      |      |       | 100 |
| EKE             | 1.46 | 3.04 | 5.32 | 9.41 | 14.5 | 20.5 | 26.5 | 39.0 | 52.9 | 60.9 | 70.1 | 79.2 | 88.3 | 94.6  | 100 |

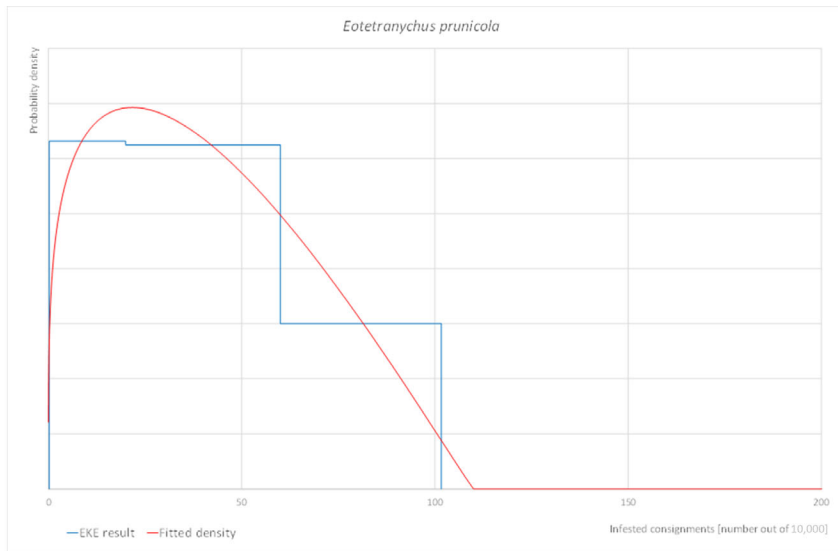
The EKE results are BetaGeneral (1.2569,2.0427,0,110) distribution fitted with @Risk version 7.5.

Based on the numbers of estimated infested bundles, the pest freedom was calculated (i.e. = 10,000 – the number of infested bundles per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.4.

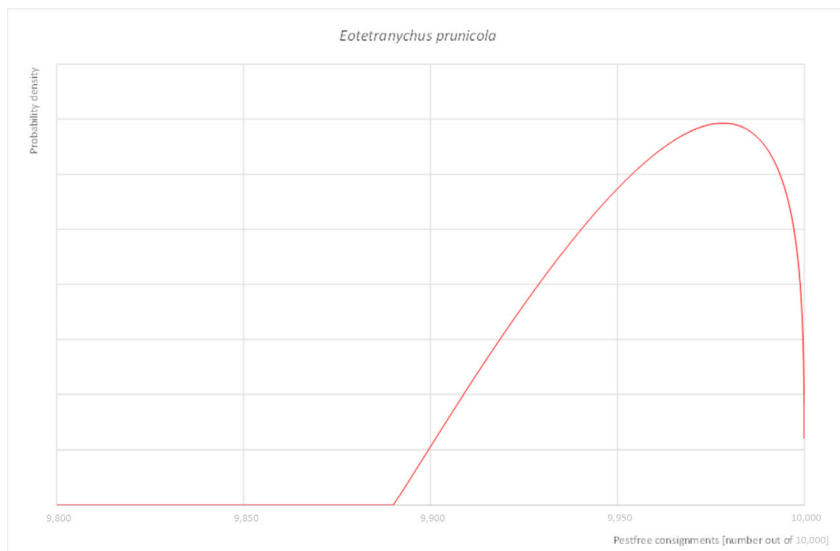
**Table A.4:** : The uncertainty distribution of plants free of *Eotetranychus prunicola* per 10,000 plants calculated by Table A.1

| Percentile  | 1%    | 2.5%  | 5%    | 10%   | 17%   | 25%   | 33%   | 50%   | 67%   | 75%   | 83%   | 90%   | 95%   | 97.5% | 99%     |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| Values      | 9,900 |       |       |       |       | 9,940 |       | 9,960 |       | 9,980 |       |       |       |       | 9,999   |
| EKE results | 9,900 | 9,905 | 9,912 | 9,921 | 9,930 | 9,939 | 9,947 | 9,961 | 9,973 | 9,979 | 9,986 | 9,991 | 9,995 | 9,997 | 9,998.5 |

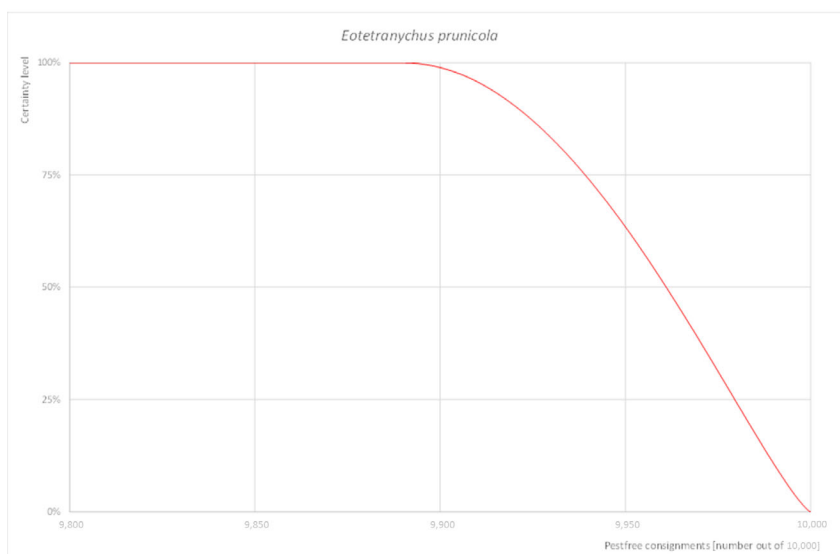
The EKE results are the fitted values.



(a)



(b)



(c)



**Figure A.2:** (a) Elicited uncertainty of pest infestation 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 plants per 10,000 (i.e. = 1 – pest infestation proportion expressed as percentage); (c) descending uncertainty distribution function of pest infestation per 10,000 bundles

### A.2.6. Reference list

- EUROPHYT, online. European Union Notification System for Plant Health Interceptions – EUROPHYT. Available online: [http://ec.europa.eu/food/plant/plant\\_health\\_biosecurity/europhyt/index\\_en.htm](http://ec.europa.eu/food/plant/plant_health_biosecurity/europhyt/index_en.htm) [Accessed: 13 September 2021].
- TRACES-NT, online. TRAdE Control and Expert System. Available online: <https://webgate.ec.europa.eu/tracesnt> [Accessed: 13 September 2021].
- Kontschán J and Ripka G, 2017. Checklist of the Hungarian spider mites and flat mites (Acari: Tetranychidae and Tenuipalpidae). *Systematic and Applied Acarology*, 22, 1199–1225.
- Musayeva ZY, Muradova EA and Gadirzade FI, 2019. SECTION: BIOLOGY SCIENCE. *POLISH SCIENCE JOURNAL*, 12.
- EFSA PLH Panel (EFSA Panel on Plant Health, Bragard C, Dehnen-Schmutz K, Di Serio F, Jacques MA, Jaques Miret JA and Gonthier P, 2020. Commodity risk assessment of *Acer* spp. plants from New Zealand. *EFSA Journal* 2020;18(5):e06105.
- EPPO, 2021. *Eotetranychus lewisi*. EPPO datasheets on pests recommended for regulation. Available online. <https://gd.eppo.int>

## A.3. Tobacco ringspot virus (TRSV00)

### A.3.1. Organism information

|  |  |
|--|--|
| <b>Taxonomic information</b>                 | Current valid scientific name: Tobacco ringspot virus<br>Synonyms: TRSV, Tobacco ringspot, <i>Tobacco ringspot nepovirus</i> .<br>Name used in the EU legislation: Tobacco ringspot virus [TRSV00]<br>Category: Virus<br>Order: <i>Picornavirales</i><br>Family: <i>Secoviridae</i><br>Common name: ringspot of tobacco<br>Name used in the Dossier: <i>Tobacco ringspot virus (TRSV)</i>  |
| <b>Group</b>                                 | Virus and Viroids  |
| <b>EPPO code</b>                             | TRSV00   |
| <b>Regulated status</b>                      | Annex II A: List of Union quarantine pests, Part A: Pests not known to occur in the EU Union territory (2019).<br>Quarantine pest: Morocco (2018), Tunisia (2012), Canada (2019), Mexico (2018), Israel (2009), Norway (2012).<br>A1 list: East Africa (2001), Argentina (2019), Brazil (2018), Paraguay (1995), Jordan (2013), Kazakhstan (2017), Turkey (2016), Ukraine (2019).<br>A2 list: Egypt (2018), China (1993), Jordan (2013), Russia (2014), APPPC (1993), EAEU (2016), EPPO (1995) |
| <b>Pest status in Ukraine</b>                | Transient, under eradication (EPPO, Online)<br>Although according to the NPPO (2021) it has been detected in Zhytomyr and Khmelnytsky regions, which are under quarantine regimes, covering 293.49 ha.   |
| <b>Pest status in the EU</b>                 | Present, no details (Georgia, Lithuania, Poland, Turkey). Few occurrences (Hungary, Italy).<br>Transient under eradication (Netherlands) (EPPO, Online).   |
| <b>Host status on <i>Malus domestica</i></b> | <i>Malus domestica</i> is reported as a host for TRSV in the EPPO Global Database (EPPO, Online).  |
| <b>PRA information</b>                       | Besides the Scientific Opinion on the pest categorisation of non-EU viruses and viroids of <i>Cydonia</i> Mill., <i>Malus</i> Mill. and <i>Pyrus</i> L. (EFSA PLH Panel, 2019), there is a report of Rapid Pest Risk Analysis for TRSV in UK (EPPO, 2017)  |

| <b>Other relevant information for the assessment</b> |  |
|--|--|
| <b>Biology</b>                                       | TRSV is a bipartite positive-sense RNA virus with isometric particles about 28 nm in diameter. It is transmitted in several ways, e.g. by certain nematode species of <i>Xiphinema americanum sensu lato</i> group, which are known to be important vectors of TRSV, and by species of thrips, spider mites, grasshoppers, flea beetles, honeybees and, possibly, aphids (Bergeson et al., 1974; Bristow and Martin 1999; Stace-Smith, 1985). It is also commonly transmitted by seeds and sap inoculation (Yang and Hamilton, 1974). TRSV occurs in a wide range of herbaceous and woody hosts (Stace-Smith, 1985). And several variants of TRSV have been reported from different hosts.   |
| <b>Symptoms</b>                                      | <p><b>Main type of symptoms</b></p> <p>TRSV mostly does not cause striking symptoms, and symptom expression varies according to the plant species.</p> <p>In apple plants, TRSV cause stem pitting, necrosis and breaking or separation of scion/rootstock at the graft union. Foliage is sparse and leaves are chlorotic and diffusely mottled (Lana et al. 1983).</p> <p>In grapevine, it shows symptoms of decline, whereas new growth is weak and sparse, internodes are shortened, leaves are small and distorted (Gonsalves, 1988).</p> <p>In soybean, it shows curved, brown-coloured and necrotic buds. Brown streaks can be seen in the pith of stems and branches, and occasionally on petioles and leaf veins. Leaflets are dwarfed and rolled (Demski &amp; Kuhn, 1989).</p> <p>In tobacco, it causes ring and line patterns on the foliage and stunting (Gooding, 1991).</p> <p>In cucurbits, leaves are mottled and stunted, and fruits are deformed (Sinclair &amp; Walker, 1956).</p> <p>In cherry, in which the disease has only ever been seen in few individual trees, young leaves show irregular chlorotic blotching over the whole leaf blade, and the leaf margins are deformed and lobed. These symptoms are seen in scattered leaves throughout the crown. Fruits mature late on infected trees (Stace-Smith &amp; Hansen, 1974).</p> |
|  | <p><b>Presence of asymptomatic plants</b></p> <p>TRSV disease could be asymptomatic.</p>   |
|  | <p><b>Confusion with other pathogens/pests</b></p> <p>No definite symptoms have been associated with TRSV in woody plants. It might be confused with Tomato ringspot virus (ToRSV), which has a similar host range (EPPO/CABI, 1996b)</p>  |
| <b>Host plant range</b>                              | <p>TRSV occurs in a wide range of herbaceous and woody hosts. It causes significant disease in soybeans (<i>Glycine max</i>), tobacco (<i>Nicotiana tabacum</i>), <i>Vaccinium</i> spp. and Cucurbitaceae (Stace-Smith, 1985).</p> <p>Many other hosts have been found naturally infected, including: Anemone, apples (<i>Malus domestica</i>), aubergines (<i>Solanum melongena</i>), blackberries (<i>Rubus fruticosus</i>), Capsicum, cherries (<i>Prunus avium</i>), Cornus, Fraxinus, Gladiolus, grapes (<i>Vitis vinifera</i>), Iris, Lupinus, Mentha, Narcissus Pseudonarcissus, pawpaws (<i>Carica papaya</i>), Pelargonium, Petunia, Sambucus and various weeds (Gonsalves, 1988).</p>  |
| <b>Reported evidence of impact</b>                   | TRSV may induce severe disease in economically relevant crops, and is listed as EU Quarantine pest (Annex II, part A).   |

|  |   |
|--|---|
| <b>Pathways and evidence that the commodity is a pathway</b> | <p>Plants for planting can be a potential pathway of entry (EFSA PLH Panel, 2013). TRSV can be spread:</p> <ul style="list-style-type: none"> <li>– By vectors: it can be transmitted by nematodes; <i>Xiphinema americanum sensu lato</i> (<i>X. americanum sensu stricto</i>, <i>X. californicum</i>, <i>X. intermedium</i>, <i>X. rivesi</i>, <i>X. tarjanense</i>) (EFSA Journal 2018; 16(7):5298) in a non-persistent manner (Douthit and McGuire 1978). In soybean, by nymphs but not by adults of <i>Thrips tabaci</i> (Bergeson et al., 1964). It may have been associated with other vectors, such as spider mites of the genus <i>Tetranychus</i>, grasshoppers of the genus <i>Melanoplus</i>, the tobacco flea beetle, <i>Epitrix hirtipennis</i> (Bergeson et al., 1964; Dunleavy 1957). There are also reports of transmission by the aphids <i>Myzus persicae</i> and <i>Aphis gossypii</i>, as well as honeybees (Bristow and Martin 1999).</li> <li>– Through seeds: common in soybean, petunia, <i>Nicotiana glutinosa</i>, <i>Gomphrena globosa</i> and <i>Taraxacum officinale</i>; rare in tobacco, cantaloupe, cucumber, muskmelon and lettuce (Yang and Hamilton, 1974). Seed transmission has not been reported in woody plants.</li> <li>– Mechanically by sap-inoculation.</li> <li>– By pollen: it can be transmitted in some species (Card et al., 2007), but has been poorly studied and its efficiency is unclear.</li> <li>– Clonal propagation in ornamental plants.</li> </ul> |
| <b>Surveillance information</b>                              | <p>According to the EPPO, the TRSV occurrence is transient (under eradication), although following the information provided by the Ukraine NPPO, it has been recently detected in Zhytomyr and Khmelnytsky regions. These regions are under quarantine regimes, covering 293.49 ha. No surveillance information is available from the Ukraine NPPO. And based on the Dossier, all plants for planting exported from Ukraine originate from nurseries that are placed at Donetsk and Zakarpattia regions. The plants designated for export are certified under the Ukrainian phytosanitary regulations to ensure the quality of the material. This includes:</p> <ul style="list-style-type: none"> <li>• Visual field inspections.</li> <li>• Systematic surveys of agricultural lands and adjacent areas.</li> <li>• Soil and laboratory varietal control.</li> </ul> <p>The inspections are performed during the growing season by nursery staff every week, as well as by a state phytosanitary inspector during the vegetation and before the loading up on the vehicle. The phytosanitary certificate is issued for 14 days.</p> <p>The examination is carried out in accordance with the monitoring plan of each area. Laboratory analyses are performed in accordance with the international standards and instructions to detect pest species. In case of virus detection, the diagnostic methods are based on the visual symptomatology, ELISA and conventional RT-PCR.</p>                            |

### A.3.2. Possibility of pest presence in the nursery

#### A.3.2.1. Possibility of entry from the surrounding environment

The natural host range of TRSV is wide, including herbaceous and woody plant species (EPPO, 2019). From the identification of TRSV in Ukraine in 2015 in soybean, the current pest status was transient, under eradication. However, it has been recently detected in Zhytomyr and Khmelnytsky regions (NPPO, 2021). Both regions are placed relatively (at least 300 Km) far away from the Bakhmut (Zakarpattia region) and Holland (Donetsk region) apple production sites. The dispersal range of TRSV infection by natural processes is limited, as the nematode species of the *Xiphinema americanum* group known to transmit viruses are not established in Ukraine, and the extent of other potential vectors to woody plants, such as species of honeybees, thrips, spider mites, grasshoppers, flea beetles and aphids, is unclear.

Uncertainties:

- Apart from transmission by nematodes, the spread of TRSV and the efficiency of transmission by other vectors in woody plants are unclear and poorly studied.

Taking into consideration the above evidence and uncertainties, the Panel considers that the possibility of entry into the nursery infecting apple plants from surrounding orchards may be unlikely.

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

At the nurseries, plant material is supervised and certified as virus-free. TRSV host range is wide, and despite some hosts can be symptomless carriers, symptoms expression is often severe enough to

ensure its detection. TRSV is capable of establishing via seed/pollen transmission and clonal propagation in ornamental plants. However, TRSV seed/pollen transmission in woody hosts is unclear.

#### Uncertainties:

- It is uncertain to what extent the detection and sampling strategies are effective to detect asymptomatic infections.
- There is a lack of information related to the material certification and phytosanitary measures.

Taking into consideration the above evidence and uncertainties, the Panel considers that the possibility of entry with either seeds or ornamental material must be considered. I

#### **A.3.2.3. Possibility of spread within the nursery**

TRSV can be mechanically transmitted by sap-inoculation on herbaceous hosts (Stace-Smith, 1985), and spread by clonal propagation of infected mother ornamental plants. However, grafting transmission has not been investigated in apple trees, and TRSV is not transmissible by contact between plants (Brown and Trudgill 1998).

#### Uncertainties:

- It is unknown whether TRSV can be transmitted mechanically from infected apple trees, and whether can be transmitted by grafting and pruning processes.
- It is uncertain to what extent the clonal propagation may spread the virus in apple trees.

Taking into consideration the above evidence and uncertainties, the Panel considers that the spread of the pathogen within the nursery is very unlikely.

#### **A.3.3. Information from interceptions**

There are no records of interceptions of *M. domestica* plants for planting from Ukraine due to the presence of TRSV between 1995 and March 2021 (EUROPHYT and TRACES-NT, online).

#### **A.3.4. Evaluation of the risk reduction options**

In the table below, all risk mitigation measures currently applied in Ukraine are listed and an indication of their effectiveness on TRSV is provided. The description of the risk mitigation measures currently applied in Ukraine is provided in Table 8.

| No. | Risk mitigation measure (name) | Implementation in Ukraine   | Effect on pests | Evaluation and uncertainties  |
|-----|--------------------------------|---|-----------------|---|
| 1   | Certified material             | Establishment of mother plants is done using certified propagation material from either Hungary, Italy, Greece and the Netherlands. Once established, Ukraine phytosanitary authorities inspect yearly mother stocks. The Ukrainian State has a register of certified material and nurseries. | Yes             | <p>Protocols for diagnosis and inspections are applied taking into account ISPM 23 (Guidelines for inspection), 27 (diagnostic protocols for regulated pests), 31 (methodologies for sampling of consignments) and EPPO PM/3, PM/7 (diagnostic protocol for regulated pests) guidelines.</p> <p>They follow article. 29 of Ukrainian phytosanitary law (answer 35 to EFSA)</p> <p>Uncertainties:</p> <ul style="list-style-type: none"> <li>• The details of the certification process are not given (e.g. number of plants, intensity of surveys and inspections, etc.).</li> </ul> <p>Specific figures on the intensity of survey (sampling effort) are not provided.</p> |

| No. | Risk mitigation measure (name)   | Implementation in Ukraine  | Effect on pests | Evaluation and uncertainties   |
|-----|--|--|-----------------|--|
| 2   | Registration, inspection, certification and surveillance of nurseries for export | Plants designated for export are grown in different fields than plants designated for the local market. Registration is needed for export and therefore, export nurseries require having a specific certification and are accordingly inspected yearly. Surveillance and monitoring activities are carried out by an official state inspector. | Yes             | <p>Details of the surveillance and monitoring during production cycle were only described for three pests, and details were not provided for other pests.</p> <p>Details on inspection are provided mainly for the pre-export stage.</p> <p>The certificates specifically relate to the compliance of the material with the State standard (DSTU) and virus-free material. However, the details of the certification process are not provided (e.g. number of plants, intensity of surveys and inspections, etc.).</p> <p>In apple trees, TRSV has been reported as the causal agent of union incompatibility in apple trees in Canada (Lana et al., 1983); however, it is uncertain whether the symptoms are easily recognised during inspections.</p> <p>Uncertainties:</p> <ul style="list-style-type: none"> <li>The details of the surveillance, monitoring and certification process were not described (e.g. number of plants, intensity of surveys and inspections, etc.)</li> </ul> |
| 3   | High water pressure  | Stems and root system of the rootstock are washed with high pressure water to remove attached soil.  | No              | <p>Very limited efficacy on removing mites if present in trunk cracks.</p> <p>Uncertainties:</p> <ul style="list-style-type: none"> <li>The efficacy on mites based on the roughness of the stem.</li> </ul>   |
| 4   | Soil management  | Fields for apple production are either steamed or biofumigated (by growing mustard) before the establishment of the nursery.   | No              | <p>Uncertainties:</p> <ul style="list-style-type: none"> <li>The details on the application procedures of these methods and a soil test to determine the presence of nematodes (which may harbour and spread the virus) are not provided.</li> </ul>   |
| 5   | Application of chemical treatments   | During the growing season (April to August), several chemical treatments are applied (insecticides, acaricides, fungicides and bactericides).  | Yes             | <p>Application of chemical treatments may control insect vectors of TRSV.</p> <p>Uncertainties:</p> <ul style="list-style-type: none"> <li>It is unclear whether the pesticides are applied on a calendar basis or following ad hoc application as function of insect presence, or both.</li> </ul>  |
| 6   | Application of vegetable oil   | Spraying 1.5% solution of vegetable oil.   | No              |  |
| 7   | Crop rotation  | Cultivation of apple rootstocks is integrated into a crop rotation and/or fallow scheme. Wheat, mustard, sunflower are the main crops cultivated in the areas of production.   | No              |  |

| No. | Risk mitigation measure (name)           | Implementation in Ukraine  | Effect on pests | Evaluation and uncertainties   |
|-----|--|--|-----------------|--|
| 8   | Crop rotation                            | Cultivation of apple rootstocks is integrated into a crop rotation and/or fallow scheme. Wheat, mustard, sunflower are the main crops cultivated in the areas of production. | No              | Uncertainties: <ul style="list-style-type: none"> <li>It is uncertain how the crop rotation scheme is applied specifically in the two export nurseries.</li> </ul> |
| 9   | Sorting and selection of export material | There is an inspection prior to export i.e. visual examination and phytosanitary screening to issue phytosanitary certificates (which remain valid for a period of 14 days). | Yes             | Visual inspection can have a limited efficacy. Uncertainties: <ul style="list-style-type: none"> <li>It may fail to detect latent infections.</li> </ul>           |
| 10  | Storage temperature                      | Plants for export are stored in cold temperatures below 5°C.   | Yes             | It can prevent or slow down the multiplication of the virus but cold temperatures will not eliminate it.   |

### A.3.5. Overall likelihood of pest freedom

#### A.3.5.1. Reasoning for a scenario which would lead to a reasonably low number of infested consignments (lower limit)

- Nurseries are located in areas where the virus is not reported (in Ukraine and in the neighbouring countries).
- No pest entry by vectors other than nematodes.
- No virus entry by human and plant material.
- No nematode vectors are present in the production areas.
- Adherence to certification of propagation material reduces the risk of entry.
- Regular visual inspection will detect plant infected.
- Regular pesticide application will be effective to eliminate the arthropod vectors.

#### A.3.5.2. Reasoning for a scenario which would lead to a reasonably high number of infested consignments (upper limit)

- Undetected virus outbreaks are present in the surrounding of *Malus* production areas or the nurseries are located in areas close to places where the TRSV is present.
- Pest can enter by arthropod vectors.
- Possibility of entry by human and plant material.
- Undetected nematode vectors are present in the production areas.
- Poor adherence to certification criteria of propagation material for this pest is not reducing the risk of entry.
- Visual inspection will not detect early stages of infections.
- Restricted applications of pesticides will not be effective to eliminate the arthropod vectors.

#### A.3.5.3. Reasoning for a central scenario equally likely to over- or underestimate the number of infested consignments (median)

- Primary vectors of TRSV are probably not present.
- The introduction of the virus from the surrounding areas or from propagation material within the nurseries is unlikely.

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

- Other vectors of the virus are not well documented.
- Status of the virus in the surrounding areas is unknown.

### A.3.5.5. Elicitation outcomes of the assessment of the pest freedom for Tobacco ringspot virus

The elicited and fitted values for Tobacco ringspot virus agreed by the Panel are shown in Tables A.5 and A.6 and in Figure A.3.

**Table A.5:** Elicited and fitted values of the uncertainty distribution of pest infestation by Tobacco ringspot virus per 10,000 bundles

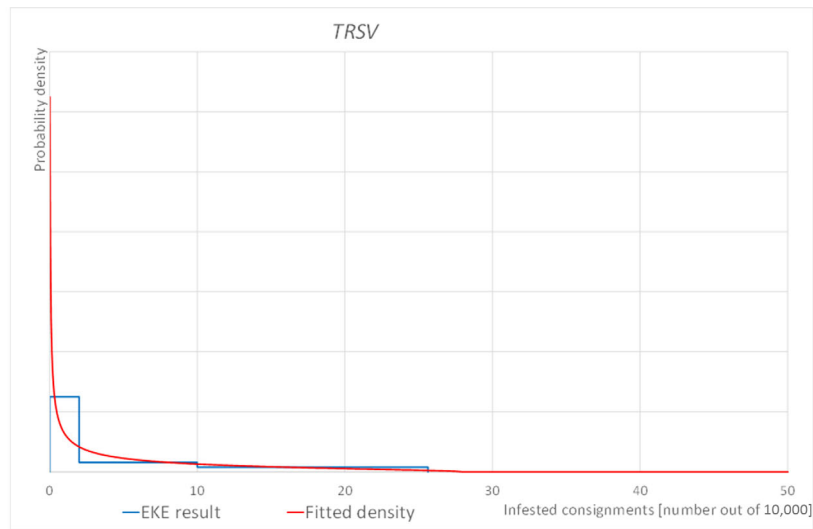
| Percentile | 1%    | 2.5%  | 5%    | 10%   | 17%   | 25%   | 33%  | 50%  | 67%  | 75%  | 83%  | 90%  | 95%  | 97.5% | 99%  |
|------------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|-------|------|
| EKE        | 0     |       |       |       |       | 1     |      | 2    |      | 10   |      |      |      |       | 25   |
| Fit-GB     | 0.000 | 0.002 | 0.010 | 0.058 | 0.203 | 0.548 | 1.12 | 3.11 | 6.66 | 9.25 | 12.7 | 16.4 | 20.3 | 22.9  | 25.1 |

The EKE results are BetaGeneral (0.40769,1.5498,0,28) distribution fitted with @Risk version 7.5.

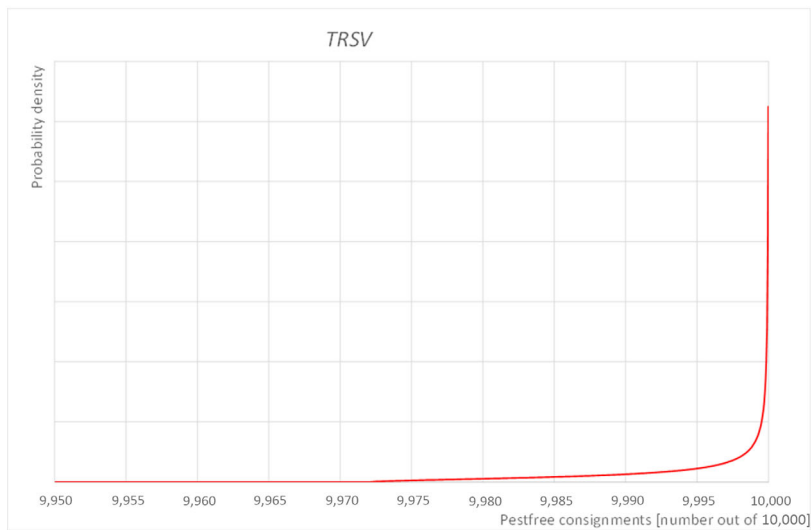
Based on the numbers of estimated infested bundles, the likelihood of estimated pest freedom was calculated. The fitted values of the uncertainty distribution of the likelihood of pest freedom are shown in Table A.6.

**Table A.6:** Elicited and fitted values of the uncertainty distribution of likelihood of pest freedom for Tobacco ringspot virus

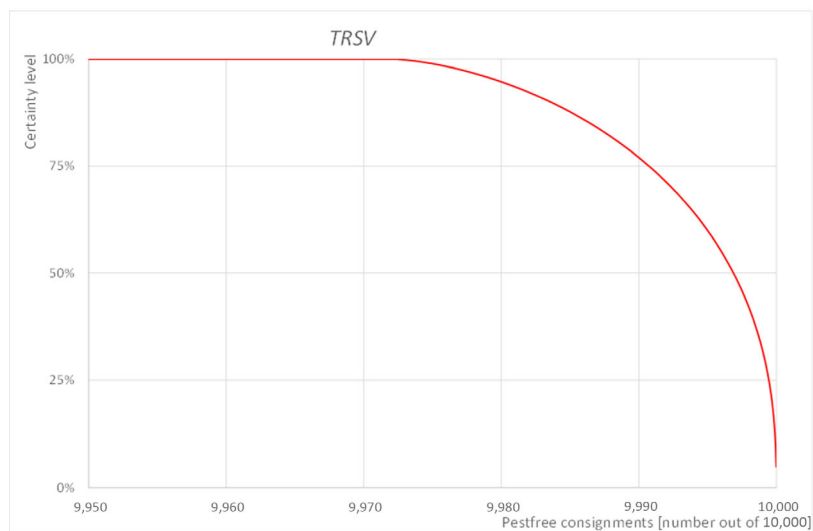
| Percentile | 1%    | 2.5%  | 5%    | 10%   | 17%   | 25%   | 33%   | 50%   | 67%     | 75%     | 83%     | 90%     | 95%     | 97.5%   | 99%    |
|------------|-------|-------|-------|-------|-------|-------|-------|-------|---------|---------|---------|---------|---------|---------|--------|
| EKE        | 9,975 |       |       |       |       | 9,990 |       | 9,998 |         | 9,999   |         |         |         |         | 10,000 |
| Fit-GB     | 9,975 | 9,977 | 9,980 | 9,984 | 9,987 | 9,991 | 9,993 | 9,997 | 9,998.9 | 9,999.5 | 9,999.8 | 9,999.9 | 9,999.9 | 9,999.9 | 10,000 |



(a)



(b)



(c)



**Figure A.3:** (a) Comparison of judged values for the uncertainty distribution of pest infestation per 10,000 bundles (histogram in blue) and fitted distribution (red line); (b) density function to describe the uncertainties of the likelihood of pest freedom; (c) descending distribution function of the likelihood of pest freedom

### A.3.6. Reference list

- Bergeson GB, Athow KL, Laviolette FA, and Thomasine M, 1964. Transmission, movement, and vector relationships of tobacco ringspot virus in soybean. *Phytopathology*, 54, 723–728.
- Bristow PR and Martin RR, 1999. Transmission and the role of honey bees in field spread of blueberry shock ilarvirus, a pollen-borne virus of highbush blueberry. *Phytopathology*, 89, 124–130.
- Brown DJF and Trudgill DL, 1998. Nematode transmission of plant viruses: a 30year perspective. Host pathogen interactions and crop protection. SCRI Annual Report, pp 121–125.
- Card SD, Pearson MN, and Clover GRG, 2007. Plant pathogens transmitted by pollen. *Austra. Plant Pathology*, 36, 455–461.
- Demski JW and Kuhn CW, 1989. Tobacco ringspot virus. In: Compendium of soybean diseases (3rd edition), pp. 57–59. American Phytopathological Society, St. Paul, USA.
- Douthit LB and McGuire JM, 1978. Transmission of tobacco ringspot virus by *Xiphinema americanum* to a wide range of hosts. *Plant Disease Reports*, 62, 164–166.
- Dunleavy JM, 1957. The grasshopper as a vector of tobacco ringspot virus in soybean. *Phytopathology*, 47, 681–682.
- EFSA PLH Panel (EFSA Panel on Plant Health), 2013. Scientific opinion on the risks posed by Prunus pollen, as well as pollen from seven additional plant genera, for the introduction of viruses and virus-like organisms into the EU. *EFSA Journal* 2013;11(10):3375, 50 pp. <https://doi.org/10.2903/j.efsa.2013.3375>
- EFSA PLH Panel (EFSA Plant Health Panel), 2019. Scientific Opinion on the pest categorisation of non-EU viruses and viroids of Cydonia Mill., Malus Mill. and Pyrus L. *EFSA Journal* 2019;17(9):5590, 81 pp. <https://doi.org/10.2903/j.efsa.2019.5590>
- EFSA PLH Panel (EFSA Panel on Plant Health), 2018. Scientific Opinion on the pest categorisation of *Xiphinema americanum* sensu lato. *EFSA Journal* 2018;16(7):5298, 43 pp. <https://doi.org/10.2903/j.efsa.2018.5298>
- EPPO, Online.
- Gonsalves D, 1988. Tomato ringspot virus decline; tobacco ringspot virus decline. In: Compendium of grape diseases, pp. 49–51. American Phytopathological Society, St. Paul, USA.
- Gooding GV, 1991. Diseases caused by viruses. In: Compendium of tobacco diseases, pp. 41–46. American Phytopathological Society, St. Paul, USA.
- Lana AF, Peterson JF, Rouselle GL, Vrain TC, 1983. Association of Tobacco ringspot virus with a union incompatibility of apple. *Phytopathol Z*, 106, 141–148.
- Ramsdell DC, 1987. Necrotic ringspot of blueberry. In: Virus diseases of small fruits, Agriculture Handbook No. 631, pp. 114–116. USDA/ARS, Washington, USA.
- Sinclair JB and Walker JC, 1956. A survey of ringspot on cucumber in Wisconsin. *Plant Disease Reporter*, 40, 19–20.
- Stace-Smith R, 1985. Tobacco ringspot virus. CMI/AAB Descriptions of Plant Viruses No. 309 (No. 17 revised). Association of Applied Biologists, Wellesbourne, UK.
- Stace-Smith R and Hansen AJ, 1974. Occurrence of tobacco ringspot virus in sweet cherry. *Canadian Journal of Botany*, 52, 1647–1651.
- Yang AF and Hamilton RI, 1974. The mechanism of seed transmission of tobacco ringspot virus in soybean, *Virology*, 62.

## Appendix B – Web of Science All Databases Search String

In the table below, the search string used in Web of Science is reported. In total, 184 papers were retrieved. Titles and abstracts were screened, and 13 pests were added to the list of pests (see Appendix C).

|                              |   |
|------------------------------|---|
| Web of Science All databases | <p>TOPIC:<br/>       ("Malus domestica" OR "M. Domestica" OR "apple tree\$")</p> <p>AND</p> <p>TOPIC:<br/>       ("pathogen* OR pathogenic bacteria OR fung* OR oomycet* OR myce* OR bacteri* OR virus* OR viroid* OR insect\$ OR mite\$ OR phytoplasm* OR arthropod* OR nematod* OR disease\$ OR infecti* OR damag* OR symptom* OR pest\$ OR vector OR hostplant\$ OR "host plant\$" OR host OR "root lesion\$" OR decline\$ OR infestation\$ OR damage\$ OR symptom\$ OR dieback* OR "die back*" OR malaise OR aphid\$ OR curculio OR thrip\$ OR cicad\$ OR miner\$ OR borer\$ OR weevil\$ OR "plant bug\$" OR spittlebug\$ OR moth\$ OR mealybug\$ OR cutworm\$ OR pillbug\$ OR "root feeder\$" OR caterpillar\$ OR "foliar feeder\$" OR virosis OR viruses OR blight\$ OR wilt\$ OR wilted OR canker OR scab\$ OR rot OR rots OR "rotten" OR "damping off" OR "damping-off" OR blister\$ OR smut OR "mould" OR "mold" OR "damping syndrome\$" OR mildew OR scald\$ OR "root knot" OR "root-knot" OR rootkit OR cyst\$ OR "dagger" OR "plant parasitic" OR "parasitic plant" OR "plant\$parasitic" OR "root feeding" OR "root \$feeding")</p> <p>NOT</p> <p>TOPIC:<br/>       ("heavy metal\$" OR "pollut*" OR "weather" OR "propert*" OR probes OR "spectr*" OR "antioxidant\$" OR "transformation" OR musca OR RNA OR "musca domestica" OR peel OR resistance OR gene OR DNA OR "Secondary plant metabolite\$" OR metabolite\$ OR Catechin OR "Epicatechin" OR "Rutin" OR "Phloridzin" OR "Chlorogenic acid" OR "Caffeic acid" OR "Phenolic compounds" OR "Quality" OR "Appearance" OR Postharvest OR Antibacterial OR Abiotic OR Storage OR Pollin* OR Ethylene OR Thinning OR fertil* OR Mulching OR Nutrient\$ OR Pruning 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\$")</p> <p>NOT</p> <p>TOPIC:<br/>       ("Abortiporus biennis" OR "Acetobacter aceti" OR "Acetobacter pasteurianus" OR "Acetobacter persici" OR "Acleris comariana" OR "Acleris fimbriana" OR "Acleris minuta" OR "Acleris rhombana" OR "Acleris sparsana" OR "Acremonium mali" OR "Acremonium sclerotigenum" OR "Acremonium sp." OR "Acronicta psi" OR "Acronicta rumicis" OR "Aculus malivagrans" OR "Aculus malus" OR "Aculus schlechtendali" OR "Adoretus versutus" OR "Adoxophyes orana" OR "Adoxophyes orana fasciata" OR "Aenetes virescens" OR "Aeolesthes holosericea" OR "Aeolesthes sarta" OR "Agapeta hamana" OR "Agrilus mali" OR "Agriopsis bajaran" OR "Agrobacterium rhizogenes" OR "Agrobacterium sp." OR "Agrobacterium tumefaciens" OR "Agrotis ipsilon" OR "Agrotis ipsilon aneituma" OR "Allocotaphis quaestionis" OR "Alternaria alternata" OR "Alternaria alternata f. sp. mali" OR "Alternaria arborescens" OR "Alternaria dumosa" OR "Alternaria eureka" OR "Alternaria frumenti" OR "Alternaria infectoria" OR "Alternaria kordkuyana" OR "Alternaria mali" OR "Alternaria malicola" OR "Alternaria sp." OR "Alternaria tenuis" OR "Alternaria tenuissima" OR "Amara eurynota" OR "Amblyseius andersoni" OR "American plum line pattern virus" OR "Ametastegia" OR "Amitermes wahrmani" OR "Amphipyra pyramidea" OR "Amphitetranychus viennensis" OR "Amylostereum sacratum" OR "Anagyris fusciventris" OR "Anarsia lineatella" OR "Anastrepha fraterculus" OR "Anastrepha ludens" OR "Anastrepha serpentina" OR "Anastrepha sp." OR "Anastrepha suspensa" OR "Anoplophora chinensis" OR "Anoplophora glabripennis" OR "Anthonomus piri" OR "Anthonomus pomorum" OR "Anthonomus pyri" OR "Anthonomus quadrigibbus" OR "Antrodia serialis" OR</p> |
|------------------------------|---|

"Anuraphis farfarae" OR "Anystis baccarum" OR "Aonidiella aurantii" OR "Apatе monachus" OR "Aphelinus mali" OR "Aphidunguis mali" OR "Aphis craccivora" OR "Aphis eugeniae" OR "Aphis fabae" OR "Aphis gossypii" OR "Aphis odinae" OR "Aphis pomi" OR "Aphis spiraeola" OR "Aphis spiraeophaga" OR "Aphis aurantii" OR "Aploneura ampelina" OR "Apocheima cinerarium" OR "Apocheima pilosaria" OR "Aporia crataegi" OR "Apple associated luteovirus" OR "Apple chat fruit agent" OR "Apple chat fruit disease" OR "Apple chlorotic leaf spot virus" OR "Apple chlorotic leafspot virus" OR "Apple dimple fruit viroid" OR "Apple fruit crinkle viroid" OR "Apple geminivirus" OR "Apple green crinkle agent" OR "Apple green crinkle associated virus" OR "Apple green crinkle disease" OR "Apple hammerhead viroid RNA" OR "Apple latent spherical virus" OR "Apple mosaic ilarvirus" OR "Apple mosaic virus" OR "Apple necrotic mosaic virus" OR "Apple proliferation phytoplasma" OR "Apple ringspot agent" OR "Apple ringspot disease" OR "Apple rough skin agent" OR "Apple rubbery wood agent" OR "Apple rubbery wood phytoplasma" OR "Apple rubbery wood-associated virus 1" OR "Apple rubbery wood-associated virus 2" OR "Apple scar skin viroid" OR "Apple sessile leaf phytoplasma" OR "Apple star crack agent" OR "Apple stem grooving virus" OR "Apple stem pitting virus" OR "Apriona cinerea" OR "Apriona germari" OR "Apterygothrips collyerae" OR "Archips argyrospilus" OR "Archips breviplicanus" OR "Archips crataegana" OR "Archips crataeganus" OR "Archips fuscocupreanus" OR "Archips podana" OR "Archips podanus" OR "Archips rosana" OR "Archips rosanus" OR "Archips subsidiaria" OR "Archips termias" OR "Archips xylosteanus" OR "Arcyria oerstedtii" OR "Argolamprotes micella" OR "Argyresthia conjugella" OR "Argyresthia cornella" OR "Argyroploce umbrosana" OR "Argyrotaenia citrana" OR "Argyrotaenia ljungiana" OR "Argyrotaenia velutinana" OR "Aridius nodifer" OR "Armillaria limonea" OR "Armillaria luteobubalina" OR "Armillaria mellea" OR "Armillaria novae-zelandiae" OR "Armillaria sp." OR "Armillaria tabescens" OR "Arrenoseius wainstein" OR "Ascochyta piricola" OR "Ascochyta pirina" OR "Ascochyta pyricola" OR "Aspergillus clavatus" OR "Aspergillus flavus" OR "Aspergillus niger" OR "Aspergillus ustus" OR "Aspergillus versicolor" OR "Asteromella mali" OR "Asymmetrasca decedens" OR "Asynonychus cervinus" OR "Athelia bombacina" OR "Athelia rolfsii" OR "Atractotomus mali" OR "Atrichatus aeneicollis" OR "Aulacorthum solani" OR "Aureobasidium pullulans" OR "Auriculariopsis ampla" OR "Automeris io" OR "Automeris zephyria" OR "Bacchisa fortunei" OR "Bacillus cereus" OR "Bacillus subtilis" OR "Bactrocera aquilonis" OR "Bactrocera dorsalis" OR "Bactrocera tryoni" OR "Bactrocera zonata" OR "Bdellodes sp." OR "Bionectria ochroleuca" OR "Bispora antennata" OR "Bituberculate scale" OR "Bjerkandera adusta" OR "Blackberry chlorotic ringspot virus" OR "Blastobasis decolorella" OR "Blastobasis sp. nr. tarda" OR "Blattella germanica" OR "Boeremia exigua var. exigua" OR "Bohemannia pulverosella" OR "Bonagota cranaodes" OR "Bonagota salubricola" OR "Botryodiplodia malorum" OR "Botryodiplodia theobromae" OR "Botryosphaeria berengeriana" OR "Botryosphaeria berengeriana f. sp. pyricola" OR "Botryosphaeria dothidea" OR "Botryosphaeria kuwatsukai" OR "Botryosphaeria lutea" OR "Botryosphaeria obtusa" OR "Botryosphaeria parva" OR "Botryosphaeria quercuum" OR "Botryosphaeria ribis" OR "Botryosphaeria sinensis" OR "Botryosphaeria sp." OR "Botryosphaeria stevensii" OR "Botryotinia fuckeliana" OR "Botrytis cinerea" OR "Botrytis mali" OR "Brachycaudus cardui" OR "Brachycaudus helichrysi" OR "Brahmina coriacea" OR "Brevipalpus noranae" OR "Brevipalpus obovatus" OR "Brevipalpus phoenicis" OR "Bryobia cristata" OR "Bryobia giannitsensis" OR "Bryobia graminum" OR "Bryobia macedonica" OR "Bryobia piliensis" OR "Bryobia praetiosa" OR "Bryobia rubrioculus" OR "Bryobia vasiljevi" OR "Burkholderia cepacia" OR "Byturus tomentosus" OR "Cacoecimorpha pronubana" OR "Cacopsylla costalis" OR "Cacopsylla mali" OR "Cacopsylla melanoneura" OR "Cacopsylla picta" OR "Cacopsylla pulchella" OR "Cacopsylla pulchra" OR "Cactodera chaubattia" OR "Caecilius flavus" OR "Caenorhabditis briggsae" OR "Caenorhabditis elegans" OR "Caenorhabditis remanei" OR "Calepitrimerus aphrastus" OR "Calepitrimerus baileyi" OR "Caliroa cerasi" OR "Callisto coffeella" OR "Calliteara horsfieldii" OR "Calocoris norvegicus" OR "Calonectria kyotensis" OR "Calosphaeria sp." OR "Camarosporium karstenii" OR "Camarosporium multiforme" OR "Campylopus verbasci" OR "Candidatus Phytoplasma asteris" OR "Candidatus Phytoplasma aurantifolia" OR "Candidatus phytoplasma mali" OR "Candidatus Phytoplasma pruni" OR "Candidatus Phytoplasma solani" OR "Candidatus Phytoplasma mali" OR "Candidatus Phytoplasma pruni" OR "Candidatus Phytoplasma solani" OR "Candidatus Phytoplasma ziziphi" OR "Candidula intersecta" OR "Capnodium citri" OR "Capua semiferana" OR "Carabidae sp." OR "Carcina quercana" OR "Carnation

ringspot virus" OR "Carpophilus gaveni" OR "Carpophilus mutilatus" OR "Carpocapsa sasakii" OR "Catoptes coronatus" OR "Cecidophyes malifoliae" OR "Cenopalpus irani" OR "Cenopalpus pulcher" OR "Cerambyx dux" OR "Ceratitis capitata" OR "Ceratitis quilicii" OR "Ceratitis rosa" OR "Ceratostomella mali" OR "Ceresa alta" OR "Ceroplastes ceriferus" OR "Ceroplastes sinensis" OR "Chaetocnema confinis" OR "Chaetomium sp." OR "Chalastospora gossypii" OR "Cheiroseius samani" OR "Cherry leaf roll virus" OR "Cherry necrotic rusty mottle virus" OR "Cherry rasp leaf virus" OR "Chinavia hilaris" OR "Chloroclystis v-ata" OR "Chondrostereum purpureum" OR "Choreutis pariana" OR "Choristoneura diversana" OR "Choristoneura hebenstreitella" OR "Choristoneura rosaceana" OR "Chrysobothris mali" OR "Chrysomphalus aonidium" OR "Chymomyza amoena" OR "Cicadatra persica" OR "Cicinobolus humuli" OR "Cilix glaucata" OR "Cirsium arvense" OR "Citrus concave gum-associated virus" OR "Cladophialophora sp." OR "Cladosporium cladosporioides" OR "Cladosporium fumago" OR "Cladosporium herbarum" OR "Cladosporium sp." OR "Clarkeulia bourquini" OR "Clavibacter michiganensis" OR "Clepsia spectrana" OR "Clonostachys rosea" OR "Clover yellow mosaic virus" OR "Cnephasia asseclana" OR "Cnephasia stephensiana" OR "Cochlicopa lubrica" OR "Cochliobolus cynodontis" OR "Colaspis brunnea" OR "Coleophora prunifoliae" OR "Coleophora serratella" OR "Colletogloeum sp." OR "Colletotrichum acerbum" OR "Colletotrichum acutatum" OR "Colletotrichum aenigma" OR "Colletotrichum alienum" OR "Colletotrichum clavatum" OR "Colletotrichum fioriniae" OR "Colletotrichum fragariae" OR "Colletotrichum fructicola" OR "Colletotrichum gloeosporioides" OR "Colletotrichum godetiae" OR "Colletotrichum kahawae" OR "Colletotrichum kahawae subsp. ciggare" OR "Colletotrichum karsti" OR "Colletotrichum karstii" OR "Colletotrichum limetticola" OR "Colletotrichum melonis" OR "Colletotrichum noveboracense" OR "Colletotrichum nymphaeae" OR "Colletotrichum paranaense" OR "Colletotrichum rhombiforme" OR "Colletotrichum salicis" OR "Colletotrichum siamense" OR "Colletotrichum sp." OR "Colletotrichum theobromicola" OR "Colletotrichum tropicale" OR "Colletotrichum gloeosporioides" OR "Collybia drucei" OR "Colocasia coryli" OR "Comstockaspis perniciososa" OR "Coniothecium chomatosporum" OR "Coniothyrium armeniacae" OR "Coniothyrium sp." OR "Conistra rubiginosa" OR "Conogethes punctiferalis" OR "Conotrachelus nenuphar" OR "Conyza bonariensis" OR "Conyza canadensis" OR "Coprinus" OR "Coprinus atramentarius" OR "Cordana musae" OR "Coriolus velutinus" OR "Coriolus versicolor" OR "Coriolus zonatus" OR "Cornu aspersum" OR "Corticium centrifugum" OR "Corticium koleroga" OR "Corticium salmonicolor" OR "Corticium utriculicum" OR "Coryneum foliicola" OR "Corynoptera sp." OR "Cosmia trapezina" OR "Cossus cossus" OR "Cossus insularis" OR "Costelytra zealandica" OR "Cotinis nitida" OR "Croesia holmiana" OR "Cryptonectria parasitica" OR "Cryptocoryneum condensatum" OR "Cryptosporiopsis curvispora" OR "Cryptosporiopsis malicorticis" OR "Cryptosporiopsis perennans" OR "Ctenopseustis obliquana" OR "Cucumber mosaic virus" OR "Cydia funebrana" OR "Cydia inopinata" OR "Cydia janthinana" OR "Cydia lobarzewskii" OR "Cydia molesta" OR "Cydia packardii" OR "Cydia pomonella" OR "Cydia prunivora" OR "Cydia pyrivora" OR "Cylindrocarpon candidum" OR "Cylindrocarpon destructans" OR "Cylindrocarpon didymum" OR "Cylindrocarpon heteronemum" OR "Cylindrocarpon liriiodendri" OR "Cylindrocarpon macrodidymum" OR "Cylindrocarpon mali" OR "Cylindrocarpon obtusiusculum" OR "Cylindrocarpon pauciseptatum" OR "Cylindrocarpon sp." OR "Cylindrocladium floridanum" OR "Cyphellophora sessilis" OR "Cytospora calvillae" OR "Cytospora carphosperma" OR "Cytospora chrysosperma" OR "Cytospora cincta" OR "Cytospora leucostoma" OR "Cytospora mali" OR "Cytospora melnikii" OR "Cytospora nivea" OR "Cytospora parasitica" OR "Cytospora rubescens" OR "Cytospora schulzeri" OR "Cytospora sp." OR "Dactylonectria pauciseptata" OR "Daldinia concentrica" OR "Daldinia vernicosa" OR "Dasineura mali" OR "Deltinea bourquini" OR "Dematophora sp." OR "Dendrothele tetracornis" OR "Dendryphiella vinosa" OR "Dermestes lanarius" OR "Devriesia pseudoamericana" OR "Diabrotica speciosa" OR "Diaphora mendica" OR "Diaporthe actinidiae" OR "Diaporthe ambigua" OR "Diaporthe cotoneastris" OR "Diaporthe dothidea" OR "Diaporthe eres" OR "Diaporthe foeniculina" OR "Diaporthe infecunda" OR "Diaporthe malorum" OR "Diaporthe oxe" OR "Diaporthe perniciososa" OR "Diaporthe serafiniae" OR "Diaporthe sp." OR "Diaspidiotus ancyclus" OR "Diaspidiotus perniciosus" OR "Diatrype sp." OR "Dickeya dadantii" OR "Dictyosporium toruloides" OR "Diderma asteroides" OR "Didymella aliena" OR "Diloba caeruleocephala" OR "Diplocarpon mali" OR "Diplocarpon mespili" OR "Diplococcium asperum" OR "Diplodia bulgarica" OR "Diplodia intermedia" OR "Diplodia mutila" OR "Diplodia pseudoseriata" OR "Diplodia

seriata" OR "Diplodia sp." OR "Diptacus gigantorhynchus" OR "Diptacus sp." OR  
 "Discotylenchus" OR "Dissoconium aciculare" OR "Dissoconium eucalypti" OR  
 "Dissoconium proteae" OR "Dissoconium sp." OR "Diurnea fagella" OR "Dorysthenes  
 huegellii" OR "Dothiorella sarmentorum" OR "Drosophila immigrans" OR "Drosophila  
 lativittata" OR "Drosophila simulans" OR "Drosophila suzukii" OR "Dysaphis affinis" OR  
 "Dysaphis anthrisci" OR "Dysaphis anthrisci majkopicia" OR "Dysaphis armeniaca" OR  
 "Dysaphis brachycyclica" OR "Dysaphis brancoi" OR "Dysaphis brancoi spp. malina" OR  
 "Dysaphis brancoi spp. rogersoni" OR "Dysaphis brunii" OR "Dysaphis chaerophylli" OR  
 "Dysaphis chaerophyllina" OR "Dysaphis devecta" OR "Dysaphis gallica" OR "Dysaphis  
 malidauci" OR "Dysaphis meridialis" OR "Dysaphis mordvilkoii" OR "Dysaphis orientalis"  
 OR "Dysaphis physocaulis" OR "Dysaphis plantaginea" OR "Dysaphis pyri" OR "Dysaphis  
 radicola" OR "Dysaphis sibirica" OR "Dysaphis zini" OR "Dysaphys flava" OR  
 "Dysmicoccus brevipes" OR "Eccopisa effractella" OR "Edwardsiana crataegi" OR  
 "Edwardsiana lamellaris" OR "Edwardsiana rosae" OR "Elsinoe piri" OR "Elsinoe pyri"  
 OR "Ematurga atomaria" OR "Emex australis" OR "Emex spinosa" OR "Empoasca  
 decipiens" OR "Empoasca fabae" OR "Enarmonia formosana" OR "Eotetranychus  
 ancora" OR "Eotetranychus carpini" OR "Eotetranychus clitus" OR "Eotetranychus frosti"  
 OR "Eotetranychus pruni" OR "Eotetranychus prunicola" OR "Eotetranychus  
 sexmaculatus" OR "Eotetranychus smithi" OR "Eotetranychus uncutus" OR  
 "Eotetranychus willamettei" OR "Epiblema foenella" OR "Epicoccum nigrum" OR  
 "Epicoccum sp." OR "Epidiaspis leperii" OR "Epiphyas postvittana" OR "Eptrimerus pyri"  
 OR "Epuraea imperialis" OR "Erannis defoliaria" OR "Eriococcus coccineus" OR  
 "Eriogaster lanestris" OR "Eriophyes mali" OR "Eriophyes pyri" OR "Eriophyoidea sp."  
 OR "Eriosoma lanigerum" OR "Eriosoma lanuginosum" OR "Erwinia amylovora" OR  
 "Erysiphe heraclei" OR "Erythricium salmonicolor" OR "Eucolaspis brunnea" OR  
 "Eucolaspis sp." OR "Eulecanium mali" OR "Eulecanium tiliae" OR "Eupalopsis  
 vandergeesti" OR "Eupithecia insigniata" OR "Euproctis chrysorrhoea" OR  
 "Eurhizococcus brasiliensis" OR "Eurytetranychus ulmi" OR "Eurytoma schreineri" OR  
 "Eutetranychus africanus" OR "Eutetranychus orientalis" OR "Eutypa lata" OR  
 "Euzophera bigella" OR "Euzophera pinguis" OR "Exophiala sp." OR "Falagria sp." OR  
 "Fibulorhizoctonia psychrophila" OR "Fieberiella florii" OR "Flammulina velutipes" OR  
 "Fomitopsis pinicola" OR "Forficula auricularia" OR "Fracchiata sp." OR "Frankliniella"  
 OR "Frankliniella occidentalis" OR "Fusarium acuminatum" OR "Fusarium apiogenum"  
 OR "Fusarium avenaceum" OR "Fusarium compactum" OR "Fusarium crookwellense"  
 OR "Fusarium culmorum" OR "Fusarium equiseti" OR "Fusarium lateritium" OR  
 "Fusarium oxysporum" OR "Fusarium proliferatum" OR "Fusarium pseudograminearum"  
 OR "Fusarium semitectum" OR "Fusarium solani" OR "Fusarium stilboides" OR  
 "Fusarium tricinctum" OR "Fusicladium dendriticum" OR "Fusicladium pomi" OR  
 "Fusicladium pyrorum" OR "Fusicoccum luteum" OR "Fusicoccum parvum" OR  
 "Galinsoga parviflora" OR "Galinsoga quadriradiata" OR "Ganoderma applanatum" OR  
 "Geastrum polystigmatis" OR "Gelechia rhombella" OR "Geniculosporium sp." OR  
 "Geosmithia sp." OR "Geotrichum candidum" OR "Gibberella acuminata" OR "Gibberella  
 avenacea" OR "Gibberella baccata" OR "Gibberella intricans" OR "Gibberella tricincta"  
 OR "Globisporangium echinulatum" OR "Globisporangium heterothallicum" OR  
 "Globisporangium irregulare" OR "Globisporangium paroecandrum" OR  
 "Globisporangium rostratum" OR "Globisporangium ultimum" OR "Globodera pallida"  
 OR "Globodera rostochiensis" OR "Gloeocystidiellum sacratum" OR "Gloeodes  
 pomigena" OR "Gloeopeniophorella sacrata" OR "Gloeosporium album" OR  
 "Gloeosporium fructigenum" OR "Gloeosporium perennans" OR "Gloeosporium sp." OR  
 "Glomerella cingulata" OR "Glomerella miyabeana" OR "Glomus constrictum" OR  
 "Glomus deserticola" OR "Glomus etunicatum" OR "Glomus fasciculatum" OR "Glomus  
 geosporum" OR "Glomus mosseae" OR "Glonium parvulum" OR "Gluconobacter  
 oxydans" OR "Goniapterus scutellatus" OR "Gracilacus peperpotti" OR "Graphania  
 mutans" OR "Graphiphora augur" OR "Grapholita dimorpha" OR "Grapholita funebrana"  
 OR "Grapholita inopinata" OR "Grapholita molesta" OR "Grapholita packardi" OR  
 "Grapholita prunivora" OR "Gryllotalpa gryllotalpa" OR "Gymnobathra parca" OR  
 "Gymnosporangium clavipes" OR "Gymnosporangium confusum" OR  
 "Gymnosporangium globosum" OR "Gymnosporangium juniperi" OR  
 "Gymnosporangium juniperi-virginiae" OR "Gymnosporangium juniperi-virginianae" OR  
 "Gymnosporangium tremelloides" OR "Gymnosporangium yamadae" OR "Gypsonoma  
 minutana" OR "Hadrotrichum populi" OR "Halyomorpha halys" OR "Halyomorpha mista"  
 OR "Haplothrips kurdjumovi" OR "Haplothrips niger" OR "Haptoncus luteolus" OR

"Harmonia axyridis" OR "Harpalus calceatus" OR "Harpalus distinguendus" OR "Hedya dimidioalba" OR "Hedya nubiferana" OR "Helicobasidium mompa" OR "Helicotylenchus dihystera" OR "Helicoverpa armigera" OR "Heliiothrips haemorrhoidalis" OR  
 "Hemiberlesia cyanophylli" OR "Hemiberlesia lataniae" OR "Hemiberlesia rapax" OR  
 "Hemicycliophora theinmanni" OR "Hendersonia lignicola" OR "Hendersonia mali" OR  
 "Hendersonia piricola" OR "Hesperophanes sericeus" OR "Heteroporus biennis" OR  
 "Heterorhabditis indica" OR "Hirneola auricula-judae" OR "Holcocerus arenicolus" OR  
 "Holotrichia longipennis" OR "Homeopronematus cf. staercki" OR "Homona coffearia"  
 OR "Homona magnanima" OR "Hop stunt viroid" OR "Hop stut viroid" OR  
 "Hoplocampa" OR "Hoplocampa minuta" OR "Hoplocampa testudinea" OR "Houjia sp."  
 OR "Houjia yanglingensis" OR "Hyalomyzus eriobotryae" OR "Hyalophora cecropia" OR  
 "Hyalopterus pruni" OR "Hylastes ater" OR "Hymenobacter marinus" OR  
 "Hymenobacter metalli" OR "Hymenobacter pomorum" OR "Hyphantria cunea" OR  
 "Hyphodontia gossypina" OR "Hypholoma incertum" OR "Hypoaspis myrmophila" OR  
 "Hypocrea sp." OR "Hypoxyton serpens" OR "Hypsicera femoralis" OR "Icerya  
 aegyptiaca" OR "Icerya purchasi" OR "Ilyonectria liriodendri" OR "Ilyonectria radicola"  
 OR "Janus compressus" OR "Lacanobia oleracea" OR "Lacanobia subjuncta" OR  
 "Lachnella anomala" OR "Lambertella corni-maris" OR "Lasiodiplodia brasiliense" OR  
 "Lasiodiplodia brasiliensis" OR "Lasiodiplodia theobromae" OR "Lepidium draba" OR  
 "Lepidosaphes ulmi" OR "Lepidosaphes ussuriensis" OR "Lepiota naucina" OR  
 "Leptodontidium elatius" OR "Leptodontium elatius" OR "Leptosphaeria coniothyrium"  
 OR "Leptothyrium pomi" OR "Leucoptera malifoliella" OR "Leucostoma cinctum" OR  
 "Leucostoma personii" OR "Leucostoma personii" OR "Leucothyreus marginicollis" OR  
 "Liberibacter europaeus" OR "Libertella blepharis" OR "Libertella sp." OR "Limothrips  
 cerealium" OR "Liothula omnivora" OR "Little cherry virus 2" OR "Longidorus  
 caespiticola" OR "Longidorus danuvii" OR "Longidorus elongatus" OR "Longidorus  
 euonymus" OR "Longidorus iranicus" OR "Longidorus leptocephalus" OR "Longidorus  
 nanus" OR "Longidorus pisi" OR "Longidorus profundorum" OR "Longidorus rubi" OR  
 "Longidorus sturhani" OR "Longistigma xizangensis" OR "Longitarsus fuliginosus" OR  
 "Lonicera japonica" OR "Lophiostoma compressum" OR "Lophiostoma holmiorum" OR  
 "Lophiostoma subcorticale" OR "Lophiostoma vicinum" OR "Lophium mytilinum" OR  
 "Lopholeucaspis japonica" OR "Lorryia cristata" OR "Lorryia palpsetosa" OR "Lycorma  
 delicatula" OR "Lygocoris communis" OR "Lygocoris pabulinus" OR "Lygus lineolaris" OR  
 "Lymantria dispar" OR "Lymantria mathura" OR "Lymantria monacha" OR "Lymantria  
 obfuscata" OR "Lyonetia clerkella" OR "Lyonetia prunifoliella" OR "Lyonetia prunifoliella  
 malinella" OR "Lyonetia speculella" OR "Maconellicoccus hirsutus" OR "Macrodactylus  
 subspinosus" OR "Macrolabis mali" OR "Macrophthalthothrips argus" OR "Macrosiphum  
 chukotense" OR "Macrosiphum euphorbiae" OR "Macrosiphum rosae" OR  
 "Macrosporium sp." OR "Macrothylacia rubi" OR "Malacosoma americana" OR  
 "Malacosoma americanum" OR "Malacosoma distria" OR "Malacosoma indicum" OR  
 "Malacosoma neustria" OR "Malacosoma parallela" OR "Mamestra brassicae" OR  
 "Margarodes vitis" OR "Marssonina coronaria" OR "Marssonina sp." OR "Medicago  
 lupulina" OR "Megalometis chilensis" OR "Megaplatypus mutatus" OR "Megaselia sp."  
 OR "Melanopsamma pomiformis" OR "Meloidogyne arenaria" OR "Meloidogyne  
 ethiopica" OR "Meloidogyne incognita" OR "Meloidogyne javanica" OR "Meloidogyne  
 mali" OR "Meloidogyne nataliei" OR "Melolontha melolontha" OR "Merothrips brunneus"  
 OR "Merulius sp." OR "Metaseiulus muma" OR "Metaseiulus occidentalis" OR "Metcalfa  
 pruinosa" OR "Meyernychus emeticae" OR "Micrambina rutila" OR "Microcerotermes  
 diversus" OR "Microcyclospora malicola" OR "Microcyclospora pomicola" OR  
 "Microcyclospora sp." OR "Microcyclospora tardicrescens" OR "Microcyclosporella mali"  
 OR "Microcyclosporella sp." OR "Microdiplodia microsporella" OR "Micromus tasmaniae"  
 OR "Microsphaeropsis ochracea" OR "Microthyriella rubi" OR "Monilia fructigena" OR  
 "Monilia polystroma" OR "Monilia yunnanensis" OR "Monilinia fructicola" OR "Monilinia  
 fructigena" OR "Monilinia laxa" OR "Monilinia laxa f.sp. mali" OR "Monilinia mali" OR  
 "Monilinia mumeicola" OR "Monilinia polystroma" OR "Monilinia yunnanensis" OR  
 "Mucor piriformis" OR "Mycosphaerella pomi" OR "Mycosphaerella punctiformis" OR  
 "Mycosphaerella sentina" OR "Mycosphaerella tassiana" OR "Myzus ornatus" OR "Myzus  
 persicae" OR "Nanidorus minor" OR "Natrassia mangiferae" OR "Naupactus  
 xanthographus" OR "Nearctaphis bakeri" OR "Nectria cinnabarina" OR "Nectria  
 discophora" OR "Nectria ditissima" OR "Nectria galligena" OR "Nectria haematococca"  
 OR "Nectria ochroleuca" OR "Nectria peziza" OR "Nectria pseudotrichia" OR "Nectria  
 radicola" OR "Nectria sp." OR "Nectriaceae" OR "Nematoloma fasciculare" OR

"Neodelphax fuscoterminata" OR "Neofabraea actinidiae" OR "Neofabraea alba" OR  
 "Neofabraea brasiliensis" OR "Neofabraea kienholzii" OR "Neofabraea malicorticis" OR  
 "Neofabraea perennans" OR "Neofabraea sp." OR "Neofabraea vagabunda" OR  
 "Neofusicoccum algeriense" OR "Neofusicoccum australe" OR "Neofusicoccum italicum"  
 OR "Neofusicoccum luteum" OR "Neofusicoccum nonquaesitum" OR "Neofusicoccum  
 parvum" OR "Neofusicoccum ribis" OR "Neonectria ditissima" OR "Neonectria galligena"  
 OR "Neonectria macrodidyma" OR "Neonectria radicola" OR "Nesothrips propinquus"  
 OR "Nezara viridula" OR "Niesslia sp." OR "Nigrospora sp." OR "Nippolachnus piri" OR  
 "Nitschkia parasitans" OR "Nyctemera annulata" OR "Nysius huttoni" OR "Ochroporus  
 ossatus" OR "Oemona hirta" OR "Oidium farinosum" OR "Oligonychus biharensis" OR  
 "Oligonychus litchii" OR "Oligonychus newcomeri" OR "Oligonychus sayedi" OR  
 "Oligonychus yothersi" OR "Oncopodiella robusta" OR "Opatrum sabulosum" OR  
 "Operophtera bruceata" OR "Operophtera brumata" OR "Ophiostoma quercus" OR  
 "Ophiostoma roboris" OR "Opodiphthera eucalypti" OR "Opogona omoscopa" OR  
 "Orchestes fagi" OR "Orgyia antiqua" OR "Orgyia leucostigma" OR "Orgyia recens" OR  
 "Oribius destructor" OR "Oribius inimicus" OR "Orthosia cerasi" OR "Orthosia cruda" OR  
 "Orthosia hibisci" OR "Orthosia incerta" OR "Orthosia stabilis" OR "Orthotydeus  
 californicus" OR "Orthotylus marginalis" OR "Osmia cornifrons" OR "Osmoderma  
 eremita" OR "Ostrinia nubilalis" OR "Otiorynchus cribricollis" OR "Otiorynchus  
 meridionalis" OR "Otthia spiraeae" OR "Ovatus crataegarius" OR "Ovatus insitus" OR  
 "Ovatus malisuctus" OR "Oxalis latifolia" OR "Oxalis pes-caprae" OR "Pachyseius  
 humeralis" OR "Pachysphinx modesta" OR "Paecilomyces niveus" OR "Paecilomyces sp."  
 OR "Palaeolecanium bituberculatum" OR "Pammene argyrana" OR "Pammene rhediella"  
 OR "Panaeolus" OR "Pandemis cerasana" OR "Pandemis cinnamomeana" OR "Pandemis  
 heparana" OR "Pandemis pyrusana" OR "Panonychus citri" OR "Panonychus inca" OR  
 "Panonychus lishanensis" OR "Panonychus ulmi" OR "Pantoea agglomerans" OR  
 "Pantomorus cervinus" OR "Pappia fissilis" OR "Paracoccus marginatus" OR  
 "Paradevriesia pseudoamericana" OR "Paraphloeostiba gayndahensis" OR  
 "Paratrachodorus allius" OR "Paratrachodorus porosus" OR "Paratrachodorus tunisiensis"  
 OR "Paratylenchus" OR "Paratylenchus curvatus" OR "Parlatoria crypta" OR "Parlatoria  
 oleae" OR "Parlatoria pergandii" OR "Parlatoria pittospori" OR "Paropsis charybdis" OR  
 "Parornix geminatella" OR "Parthenolecanium corni" OR "Parthenolecanium persicae"  
 OR "Pasiphila rectangulata" OR "Paspalum urvillei" OR "Patellaria atrata" OR "Peach  
 latent mosaic viroid" OR "Pear blister canker viroid" OR "Pellicularia koleroga" OR  
 "Peltaster cerophilus" OR "Peltaster fructicola" OR "Peltaster gemmifer" OR "Peltaster  
 sp." OR "Peltosphaeria pustulans" OR "Penicillium aurantiogriseum" OR "Penicillium  
 biourgeianum" OR "Penicillium brevicompactum" OR "Penicillium carneum" OR  
 "Penicillium chrysogenum" OR "Penicillium commune" OR "Penicillium crustosum" OR  
 "Penicillium digitatum" OR "Penicillium expansum" OR "Penicillium glabrum" OR  
 "Penicillium glaucum" OR "Penicillium griseofulvum" OR "Penicillium novae-zelandiae"  
 OR "Penicillium paneum" OR "Penicillium polonicum" OR "Penicillium ramulosum" OR  
 "Penicillium rugulosum" OR "Penicillium solitum" OR "Penicillium sp." OR "Penicillium  
 viridicatum" OR "Peniophora lycii" OR "Pennisetum clandestinum" OR "Pentatoma  
 rufipes" OR "Perichaena corticalis" OR "Perichaena depressa" OR "Peridroma saucia" OR  
 "Peritelus sphaeroides" OR "Pestalotia hartigii" OR "Pestalotia sp." OR "Pestalotiopsis  
 maculans" OR "Pestalotiopsis sp." OR "Petiveria alliacea" OR "Petrobia harti" OR  
 "Petrobia latens" OR "Petunia asteroid mosaic virus" OR "Pezicula alba" OR "Pezicula  
 corticola" OR "Pezicula malicorticis" OR "Phacidiopycnis washingtonensis" OR  
 "Phacidium lacerum" OR "Phaeoacremonium aleophilum" OR "Phaeoacremonium  
 australiense" OR "Phaeoacremonium fraxinopennsylvanicum" OR "Phaeoacremonium  
 geminum" OR "Phaeoacremonium inflatipes" OR "Phaeoacremonium iranianum" OR  
 "Phaeoacremonium italicum" OR "Phaeoacremonium minimum" OR "Phaeoacremonium  
 mortoniae" OR "Phaeoacremonium parasiticum" OR "Phaeoacremonium proliferatum"  
 OR "Phaeoacremonium scolyti" OR "Phaeoacremonium subulatum" OR "Phanerochaete  
 salmonicolor" OR "Phellinus alni" OR "Phellinus igniarius" OR "Phenacoccus aceris" OR  
 "Phialophora sessilis" OR "Phigalia pilosaria" OR "Phlyctema vagabunda" OR "Phlyctinus  
 callosus" OR "Pholiota aurivella" OR "Pholiota squarrosa" OR "Phoma cava" OR "Phoma  
 enteroleuca" OR "Phoma exigua var. exigua" OR "Phoma glomerata" OR "Phoma  
 herbarum" OR "Phoma macrostoma" OR "Phoma macrostoma var. macrostoma" OR  
 "Phoma pirinia" OR "Phoma pomorum" OR "Phoma pomorum var. pomorum" OR  
 "Phoma pyrina" OR "Phoma sp." OR "Phomopsis" OR "Phomopsis cotoneastri" OR  
 "Phomopsis mali" OR "Phomopsis oblonga" OR "Phomopsis perniciososa" OR "Phomopsis

sp." OR "Phorodon humuli" OR "Phyllachora pomigena" OR "Phyllactinia mali" OR  
 "Phyllobius oblongus" OR "Phyllocoptes mali" OR "Phyllocoptes malinus" OR  
 "Phyllonorycter blancardella" OR "Phyllonorycter corylifoliella" OR "Phyllonorycter  
 crataegella" OR "Phyllonorycter cydoniella" OR "Phyllonorycter elmaella" OR  
 "Phyllonorycter gerasimowi" OR "Phyllonorycter hostis" OR "Phyllonorycter mespilella"  
 OR "Phyllonorycter oxyacanthae" OR "Phyllonorycter ringoniella" OR "Phyllosticta  
 briardi" OR "Phyllosticta briardii" OR "Phyllosticta solitaria" OR "Phyllosticta sp." OR  
 "Phyllotreta nemorum" OR "Phyllotreta nigripes" OR "Phymatotrichopsis omnivora" OR  
 "Physalospora malorum" OR "Physarum sp." OR "Physocleora dimidiaria" OR  
 "Phytomyza heringiana" OR "Phytophthora cactorum" OR "Phytophthora cambivora" OR  
 "Phytophthora citricola" OR "Phytophthora cryptogea" OR "Phytophthora drechsleri" OR  
 "Phytophthora fragariae" OR "Phytophthora gonapodyides" OR "Phytophthora  
 megasperma" OR "Phytophthora megasperma var. megasperma" OR "Phytophthora  
 nicotianae" OR "Phytophthora plurivora" OR "Phytophthora rosacearum" OR  
 "Phytophthora sp." OR "Phytophthora syringae" OR "Phytoplasma aurantifolia" OR  
 "Phytoplasma mali" OR "Phytoplasma pruni" OR "Phytoplasma pyri" OR "Phytopythium  
 vexans" OR "Phytoseiidae sp." OR "Piezodorus guildinii" OR "Planococcus citri" OR  
 "Planotortrix excessana" OR "Platynota flavedana" OR "Platynota idaeusalis" OR  
 "Platynota stultana" OR "Pleochaeta mali" OR "Pleomassaria mali" OR "Pleospora allii"  
 OR "Pleospora herbarum" OR "Pleospora mali" OR "Pleospora scrophulariae" OR  
 "Pleospora sp." OR "Pleospora tarda" OR "Plesiocoris rugicollis" OR "Pleurophoma cava"  
 OR "Pleurotus sp." OR "Plocamaphis gyirongensis" OR "Plum pox potyvirus" OR  
 "Plutella xylostella" OR "Poa annua" OR "Podosphaera leucotricha" OR "Podosphaera  
 leucotricha" OR "Podosphaera pannosa" OR "Poecilopachys australasia" OR "Polygonum  
 aviculare" OR "Polyopeus pomi" OR "Polyphylla fullo" OR "Polyporus admirabilis" OR  
 "Polyporus badius" OR "Polyporus ciliatus" OR "Polyporus leptoccephalus" OR "Popillia  
 japonica" OR "Poria ferruginosa" OR "Potebniamyces pyri" OR "Pratylenchus coffeae"  
 OR "Pratylenchus curviatus" OR "Pratylenchus hippeastrum" OR "Pratylenchus  
 laticaudata" OR "Pratylenchus loosi" OR "Pratylenchus neglectus" OR "Pratylenchus  
 penetrans" OR "Pratylenchus scribneri" OR "Pratylenchus thornei" OR "Pratylenchus  
 vulnus" OR "Prociphilus caryae ssp. fitchii" OR "Prociphilus kuwanai" OR "Prociphilus  
 oriens" OR "Prociphilus pini" OR "Prociphilus sasakii" OR "Prodiplosis longifila" OR  
 "Proeulia auraria" OR "Proeulia chrysopteris" OR "Prunus necrotic ringspot virus" OR  
 "Psallus ambiguus" OR "Pseudaulacaspis pentagona" OR "Pseudexentera mali" OR  
 "Pseudocamarosporium sp." OR "Pseudocercospora mali" OR "Pseudocercospora sp."  
 OR "Pseudocercospora sp." OR "Pseudococcus calceolariae" OR "Pseudococcus  
 comstocki" OR "Pseudococcus longispinus" OR "Pseudococcus maritimus" OR  
 "Pseudococcus viburni" OR "Pseudocoremia suavis" OR "Pseudomonas cichorii" OR  
 "Pseudomonas fluorescens" OR "Pseudomonas syringae" OR "Pseudomonas syringae  
 pv. papulans" OR "Pseudomonas syringae pv. syringae" OR "Pseudomonas syringae pv.  
 tomato" OR "Pseudomonas viridiflava" OR "Pseudoveronaea ellipsoidea" OR  
 "Pseudoveronaea obclavata" OR "Pseudozyma fusiformata" OR "Psychoda surcoufi" OR  
 "Psylla mali" OR "Psylla melanoneura" OR "Pterochloroides persicae" OR "Ptycholoma  
 lecheanum" OR "Pycnoporus cinnabarinus" OR "Pyrenochaeta furfuracea" OR  
 "Pyrolachnus pyri" OR "Pythium abapressorium" OR "Pythium arrhenomanes" OR  
 "Pythium debaryanum" OR "Pythium echinulatum" OR "Pythium heterothallicum" OR  
 "Pythium irregulare" OR "Pythium paroecandrum" OR "Pythium rostratum" OR "Pythium  
 sp." OR "Pythium sylvaticum" OR "Pythium ultimum" OR "Pythium vexans" OR  
 "Quadraspidiotus ostreaeformis" OR "Quadraspidiotus perniciosus" OR "Quadraspidiotus  
 pyri" OR "Ramichloridium apiculatum" OR "Ramichloridium luteum" OR "Ramichloridium  
 sp." OR "Ramularia eucalypti" OR "Ramularia mali" OR "Ramularia sp." OR "Recurvaria  
 nanella" OR "Recurvaria leucateella" OR "Recurvaria nanella" OR "Resseliella oculiperda"  
 OR "Reticulitermes lucifugus" OR "Retithrips syriacus" OR "Rhagoletis pomonella" OR  
 "Rhagoletis tabellaria" OR "Rhinoclaadiella" OR "Rhinotergum schestovici" OR  
 "Rhizobium radiobacter" OR "Rhizobium rhizogenes" OR "Rhizoctonia" OR "Rhizoctonia  
 solani" OR "Rhizopus sp." OR "Rhizopus stolonifer" OR "Rhodocollybia purpurata" OR  
 "Rhodosporidium babjevae" OR "Rhodotorula" OR "Rhopalosiphum insertum" OR  
 "Rhopalosiphum oxyacanthae" OR "Rhopalosiphum padi" OR "Rhopobota naevana" OR  
 "Rhopobota unipunctana" OR "Rhynchaenus pallicornis" OR "Rhynchites aequatus" OR  
 "Rhynchites bacchus" OR "Ribautiana tenerima" OR "Ricania speculum" OR "Richardia  
 brasiliensis" OR "Rosellinia necatrix" OR "Rosellinia radiciperda" OR "Rosellinia sp." OR  
 "Rotylenchus quartus" OR "Rubus ellipticus" OR "Saperda candida" OR "Sarcodontia



crocea" OR "Sarocladium liquanensis" OR "Sarocladium mali" OR "Saturnia pavonia" OR "Saturnia pyri" OR "Scelodonta strigicolis" OR "Schizoneurella indica" OR "Schizophyllum alneum" OR "Schizophyllum commune" OR "Schizotetranychus smirnovi" OR "Schizothyrium pomi" OR "Scleroramularia abundans" OR "Sclerotinia fruticola" OR "Sclerotinia sclerotiorum" OR "Sclerotium delphinii" OR "Sclerotium rolfsii" OR "Sclerotium rolfsii var. delphinii" OR "Scolypopa australis" OR "Scolytus amygdali" OR "Scolytus mali" OR "Scolytus nitidus" OR "Scolytus rugulosus" OR "Scutellospora pellucida" OR "Seimatosporium fusisporum" OR "Seimatosporium lichenicola" OR "Selenosporella" OR "Senecio vulgaris" OR "Septocylindrium aderholdii" OR "Septocylindrium radicola" OR "Septoria sp." OR "Sigmothrips aotearoana" OR "Siphanta acuta" OR "Sitobion avenae" OR "Solanum carolinense" OR "Somena scintillans" OR "Spencermartinsia plurivora" OR "Sperchia intractana" OR "Sphaeria microtheca" OR "Sphaeropsis mali" OR "Sphaeropsis malorum" OR "Sphaeropsis pyriputrescens" OR "Sphaeropsis sapinea" OR "Sphaerotheca pannosa" OR "Sphinx perelegans" OR "Spilocaea pomi" OR "Spilonota ocellana" OR "Spodoptera eridania" OR "Spodoptera frugiperda" OR "Spodoptera littoralis" OR "Spodoptera litura" OR "Sporidesmajora pennsylvaniensis" OR "Sporidesmium asperum" OR "Sporidesmium sp." OR "Sporobolomyces roseus" OR "Sporormiella sp." OR "Stellaria media" OR "Stemphylium botryosum" OR "Stemphylium ilicis" OR "Stemphylium vesicarium" OR "Stenostola ferrea" OR "Stenotrophomonas maltophilia" OR "Sterium hirsutum" OR "Stethorus bifidus" OR "Stigmella magdalenae" OR "Stigmella malella" OR "Stigmella sorbi" OR "Stigmina carpophila" OR "Stomiopeltis sp." OR "Strelitziana mali" OR "Strickeria kochii" OR "Strickeria obducens" OR "Swammerdamia pyrella" OR "Synantheson hector" OR "Synantheson myopaeformis" OR "Synantheson scitula" OR "Syndemis musculana" OR "Tachypterellus quadrigibbus" OR "Tapinoma nigerrimum" OR "Tarsonemus nodosus" OR "Tatianaerhynchites aequatus" OR "Tebenna micalis" OR "Technomyrmex albipes" OR "Teichospora cruentula" OR "Teichospora seminuda" OR "Teleiodes vulgella" OR "Temperate fruit decay associated virus" OR "Tetranychus arabicus" OR "Tetranychus canadensis" OR "Tetranychus cinnabarinus" OR "Tetranychus desertorum" OR "Tetranychus frater" OR "Tetranychus kanzawai" OR "Tetranychus lambi" OR "Tetranychus ludeni" OR "Tetranychus mcdanieli" OR "Tetranychus mexicanus" OR "Tetranychus neocaledonicus" OR "Tetranychus pacificus" OR "Tetranychus schoenei" OR "Tetranychus turkestanii" OR "Tetranychus urticae" OR "Tetranychus viennensis" OR "Thelonectria lucida" OR "Theocolax formiciformis" OR "Thielavia sp." OR "Thrips australis" OR "Thrips hawaiiensis" OR "Thrips imaginis" OR "Thrips italicus" OR "Thrips obscuratus" OR "Thrips tabaci" OR "Tilletiopsis pallescens" OR "Tiracola grandirena" OR "Tischeria malifoliella" OR "Tobacco bushy stunt virus" OR "Tobacco mosaic virus" OR "Tobacco necrosis virus" OR "Tobacco ringspot virus" OR "Tomato bushy stunt virus" OR "Tomato ringspot virus" OR "Torula herbarum" OR "Torymus druparum" OR "Toxoptera aurantii" OR "Trametes hispida" OR "Trametes pubescens" OR "Trametes sp." OR "Trametes versicolor" OR "Trametes zonata" OR "Trematosphaeria communis" OR "Trichia botrytis" OR "Trichoderma" OR "Trichoderma harzianum" OR "Trichoderma sp." OR "Trichodorus" OR "Trichodorus cedarus" OR "Trichodorus nanjingensis" OR "Trichodorus persicus" OR "Trichodorus similis" OR "Trichodorus viruliferus" OR "Trichoferus campestris" OR "Trichoseptoria fructigena" OR "Trichothecium roseum" OR "Trioza urticae" OR "Tripospermum acerinum" OR "Tripospermum camelopardus" OR "Tripospermum myrti" OR "Tropinota hirta" OR "Tropinota squalida" OR "Truncatella angustata" OR "Trybliella rufula" OR "Trypodendron signatum" OR "Tubercularia vulgaris" OR "Tulare apple mosaic virus" OR "Tumularia" OR "Turanoclytus namanganensis" OR "Tydeus ancorarius" OR "Tydeus dorothyae" OR "Tydeus magnanus" OR "Tydeus plumosus" OR "Tydeus shabestariensis" OR "Tydeus unguis" OR "Tylenchorhynchus mashhood" OR "Typhlocyba pomaria" OR "Typhlodromus khosrovensis" OR "Typhlodromus pyri" OR "Typhlodromus vulgaris" OR "Tyrophagus curvipenis" OR "Urophorus humeralis" OR "Uwebraunia commune" OR "Uwebraunia dekkeri" OR "Valsa ambiens" OR "Valsa amphibola" OR "Valsa ceratosperma" OR "Valsa cincta" OR "Valsa leucostoma" OR "Valsa mali" OR "Valsa mali var. mali" OR "Valsa mali var. pyri" OR "Valsa malicola" OR "Valsa nivea" OR "Valsa persoonii" OR "Valsaria insitiva" OR "Valsella melastoma" OR "Venturia asperata" OR "Venturia inaequalis" OR "Venturia pyrina" OR "Verticillium albo-atrum" OR "Verticillium dahliae" OR "Watabura nishiyae" OR "Xenotemna pallorana" OR "Xestia c-nigrum" OR "Xiphinema americanum" OR "Xiphinema belmontense" OR "Xiphinema bricolense" OR "Xiphinema browni" OR "Xiphinema californicum" OR "Xiphinema diversicaudatum" OR

"Xiphinema index" OR "Xiphinema mali" OR "Xiphinema meridianum" OR "Xiphinema mluci" OR "Xiphinema paramonovi" OR "Xiphinema parvistilus" OR "Xiphinema radicola" OR "Xiphinema rivesi" OR "Xiphinema vuittenezi" OR "Xylaria sp." OR "Xyleborinus saxesenii" OR "Xyleborus dispar" OR "Xylinothorus strigifrons" OR "Xylosandrus crassiusculus" OR "Xylosandrus germanus" OR "Xylotoles laetus" OR "Xylotrechus namanganensis" OR "Yponomeuta malinella" OR "Yponomeuta malinellus" OR "Zasmidium angulare" OR "Zetiasplozua thuenenii" OR "Zeugodacus cucurbitae" OR "Zeuzera coffeae" OR "Zeuzera pyrina" OR "Zygina zealandica" OR "Zygophiala cryptogama" OR "Zygophiala cylindrica" OR "Zygophiala emperorae" OR "Zygophiala qianensis" OR "Zygophiala sp." OR "Zygophiala tardicrescens" OR "Zygophiala jamaicensis" OR "Zygophiala wisconsinensis")

## **Appendix C – Excel file with the pest list of *Malus domestica***

Appendix C can be found in the online version of this output (in the 'Supporting information' section): <https://efsa.onlinelibrary.wiley.com/doi/10.2903/j.efsa.2021.6909#support-information-section>