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SCIENTIFIC OPINION

Commodity risk assessment of *Petunia* spp. and *Calibrachoa* spp. unrooted cuttings from Uganda

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

Abstract

The European Commission requested the EFSA Panel on Plant Health to evaluate the likelihood of pest freedom at entry in the EU, including both regulated and non-regulated pests, potentially associated with unrooted cuttings of the genera *Petunia* and *Calibrachoa* produced under physical isolation in Uganda. The relevance of any pest for this opinion was based on evidence collected according to specific criteria, following the methodology used for high-risk plants adapted for the specificity of this assessment. Twelve EU-regulated pests [*Bemisia tabaci* (non-European populations), cowpea mild mottle virus (CpMMV, *Carlavirus vignae),* potato leaf roll virus (PLRV, *Polerovirus PLRV*), potato spindle tuber viroid (PSTVd, *Pospiviroid fusituberis*), potato virus S (PVS, *Carlavirus sigmasolani,* non-EU isolates), potato virus × (PVX, *Potexvirus ecspotati,* non-EU isolates), *Ralstonia solanacearum*, *Ralstonia pseudosolanacearum, Scirtothrips dorsalis,* tomato leaf curl Uganda virus (ToLCUV), tomato spotted wilt virus (TSWV, *Orthotospovirus tomatomaculae)* and tomato yellow leaf curl virus (TYLCV, *Begomovirus coheni*)] and one non-regulated pest (*Nipaecoccus viridis*) were selected for further evaluation. For the selected pests, the risk mitigation measures implemented in Uganda and described in the technical dossier were evaluated taking into account the factors reducing their efficacy. For these pests, an expert judgement is given on the likelihood of pest freedom taking into consideration the risk mitigation measures acting on the pest. The degree of pest freedom varies between the pests evaluated, with the contact-transmitted viroid and virus [potato spindle tuber viroid (PSTVd, *P. fusituberis*) and potato virus × (PVX, *P. ecspotati,* non-EU isolates)] being the pests most frequently expected on *Petunia* and *Calibrachoa* spp. imported unrooted cuttings. Expert knowledge elicitation indicated, with 95% certainty, that between 9916 and 10,000 per 10,000 *Petunia* and *Calibrachoa* spp. unrooted cuttings would be free from these pests.

KEYWORDS

commodity risk assessment, European Union, plant health, plant pests, *Solanaceae*

CONTENTS

1 | INTRODUCTION

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

1.1.1 | Background

The introduction of plants for planting of Solanaceae other than seeds into the European Union (EU) is prohibited from certain origins, including the countries that have requested this derogation, as they are listed in point 18 of Annex VI to Regulation (EU) 2019/2072. In August 2021, Germany sent a request for derogation to import unrooted cuttings of the genera *Petunia* and *Calibrachoa* produced under physical isolation in Costa Rica, Kenya, and Uganda, accompanied by an application describing the production methods and the pests associated with the plants in the different third countries. A similar request has also been received from Guatemala, accompanied by a technical dossier.

In support of the request, the dossier prepared by Uganda, with the identified pests and the details of the growing conditions is submitted with this request.

1.1.2 | Terms of Reference

European Food Safety Authority (EFSA) is requested, pursuant to Article 29 of Regulation (EC) No 178/2002, to provide scientific opinion(s) on the field of plant health. In particular, EFSA is requested to assess the probability of entry of pests (likelihood of pest freedom at entry), including both, regulated Union quarantine pests, protected zone pests, and regulated non-quarantine pests (RNQPs) and non-regulated pests, associated with unrooted cuttings of the genera *Petunia* and *Calibrachoa* produced under physical isolation in Costa Rica, Guatemala, Kenya and Uganda.

The assessment shall include all pests present in Costa Rica, Guatemala, Kenya and Uganda that could be associated with the unrooted cuttings of the genera *Petunia* and *Calibrachoa* produced under physical isolation and could have an impact if they are introduced into the EU.

In this assessment, EFSA shall take into account the available scientific information, and in particular the scientific and technical information provided in the dossiers by Germany and Guatemala. If necessary to complete its assessment, EFSA may ask additional scientific and technical information or clarifications (e.g. regarding pests status, pests control, production sites and systems, processing and shipping) on unrooted cuttings of the genera Petunia and Calibrachoa produced under physical isolation in Costa Rica, Guatemala, Kenya and Uganda. Such information can be requested by EFSA to the National Plant Protection Organisations (NPPO's) of Costa Rica, Guatemala, Kenya, Uganda or Germany as appropriate. Following the provision of such information, EFSA shall proceed with the assessment.

1.2 | Interpretation of the Terms of Reference

This opinion refers only to the Uganda dossier. The EFSA Panel on Plant Health (hereafter referred to as 'the Panel') conducted a commodity risk assessment of *Petunia* spp. and *Calibrachoa* spp. unrooted cuttings from Uganda following the Guidance on commodity risk assessment for the evaluation of high-risk plant dossiers (EFSA PLH Panel, 2019), taking into account the available scientific information, including the technical information provided by Uganda.

Following an exchange with EC, the Panel was requested to broaden the scope of the assessment to Solanaceae host plants and to include RNQP species if they are relevant.

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.

In its evaluation the Panel:

- checked whether the information in the technical dossier (hereafter referred to as 'the Dossier') provided by the applicant (Ministry of Agriculture, Animal Industry and Fisheries (MAAIF): Department of Crop inspection and Certification (NPPO of Uganda)) was sufficient to conduct a commodity risk assessment. When necessary, additional information was requested from the applicant;
- considered the host status of *Petunia* spp. and *Calibrachoa* spp. as identical because they are very closely related genera;
- selected the relevant Union quarantine pests (as specified in Commission Implementing Regulation (EU) 2019/2072,[1] hereafter referred to as 'EU quarantine pests'), and the RNQPs regulated for *Petunia* spp., *Calibrachoa* spp. or for solanaceous crops, as specifically listed in Annex IV of Regulation (EU) 2019/2072, and potentially associated with unrooted cuttings of *Petunia* spp. and *Calibrachoa* spp., or to major solanaceous crops (tomato, pepper, potato and cultivated tobacco);
- included in the assessment, other pests with host plant records for *Petunia* spp. and/or *Calibrachoa* spp., as well as polyphagous pests with major solanaceous crops (tomato, pepper, potato and cultivated tobacco) and that were considered based, on expert judgement, likely to use *Petunia* spp. and/or *Calibrachoa* spp. as a host plant;
- assessed the effectiveness of the measures described in the dossier for the selected relevant pests;

- considered that the risk assessment and its conclusions are based on the information provided in the submitted technical dossier (specific place and procedure of production) and refer to the production sites described in the same document;

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 NPPO of Uganda.

2 | DATA AND METHODOLOGIES

2.1 | Data provided by NPPO of Uganda

The Panel considered all the data and information in the Dossiers provided by the NPPO of Uganda in December 2024. The Dossier is managed by EFSA. Further additional information was submitted by the NPPO of Uganda in response to EFSA's request on 4 April, 12 May, 26 August. The Dossier is managed by EFSA.

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

TABLE 1 Structure and overview of the Dossier.

Dossier section	Overview of contents	Filename
1	Technical dossier	Draft Technical Dossier for Petunia and Calichabroa Working Document.dox
2.1	Additional information: answers	Uganda additional information submitted to responses to the questions related to the content EFSA-q-2022-00773
2.2	Additional information: answers regarding sampling and collection for the detection of specific pests	Uganda additional information - Submitted Annex 1.dox
2.3	Additional information: answers regarding status of specific pests	Uganda additional information - Submitted Annex 2 - pest status specific requests.xlsx

2.2 | Literature searches performed by the NPPO of Uganda

The data and supporting information provided by the NPPO of Uganda formed the basis of the commodity risk assessment. Table 2 shows the main data sources used by the NPPO of Uganda to compile the Dossier.

TABLE 2 Databases used in the literature searches by the NPPO of Uganda.

Acronym	Database name and service provider	URL of database
CABI	CABI Crop Protection Compendium	https://www.cabi.org/cpc/
EUROPHYT	Interceptions of harmful organisms in imported plants and other objects.	https://food.ec.europa.eu/plants/plant-health-andbiosecurity/europhyt/interceptions_en
EPPO GD	EPPO Global Database	https://gd.eppo.int/
ScaleNet	USDA	https://scalenet.info
Spider Mites Web: A comprehensive database for the Tetranychidae	INRAE CBGP	https://www.montpellier.inra.fr/CBGP/spmweb/

Other resources used by the NPPO of Uganda

Agindotan, B., and Perry, K. L. (2008). Macroarray detection of eleven potato-infecting viruses and Potato spindle tuber viroid. *Plant Disease*, *92*(5), 730–740. https://doi.org/10.1094/PDIS-92-5-0730

Byarugaba, A. A., Mukasa, S. B., Barekye, A., and Rubaihayo, P. R. (2020). Interactive effects of Potato virus Y and Potato leafroll virus infection on potato yields in Uganda. *Open Agriculture*, *5*(1), 726–739. https://doi.org/10.1515/opag-2020-0073

CABI (Centre for Agriculture and Bioscience International). (online). Tetranychus neocaledonicus. https://www.cabidigitallibrary.org/doi/full/10.1079/cabicompendium.53356.

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, ELI: http://data.europa.eu/eli/reg_impl/2019/2072/oj).

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard, C., Chatzivassiliou, E., Di Serio, F., Baptista, P., Gonthier, P., and Potting, R. (2022). Commodity risk assessment of Jasminum polyanthum unrooted cuttings from Uganda. *EFSA Journal*, *20*(5), 7300. https://doi.org/10.2903/j.efsa.2022.7300

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Grégoire, J. C., Miret, J. A. J., González-Cabrera, J., Heimbach, U., Lucchi, A., Gardi, C., and Koufakis, I. (2017). Protocol for the evaluation of data concerning the necessity of the application of insecticide active substances to control a serious danger to plant health which cannot be contained by other available means, including non-chemical methods. *EFSA Supporting Publications*, 14(4).
EPPO (European and Mediterranean Plant Protection Organization). (online). EPPO Global Database. https://gd.eppo.int/
EUROPHYT. (online). Interceptions of harmful organisms in imported plants and other objects. https://food.ec.europa.eu/plants/plant-health-andbiosecurity/europhyt/interceptions_en
García Morales, M., Denno, B. D., Miller, D. R., Miller, G. L., Ben-Dov, Y., and Hardy, N. B. (2016). ScaleNet: A literature-based model of scale insect biology and systematics. *Database*, 2016, bav118. http://scalenet.info (accessed 29/10/2024).
ISPM 1. (1993). Principles of plant quarantine as related to international trade. Rome, IPPC, FAO. 2010-07 IPPC Secretariat amended ISPM 1.
ISPM 10. (1999). Requirements for the establishment of pest-free places of production and pest-free production sites. Rome, IPPC, FAO. 2010-07 IPPC Secretariat amended ISPM 10.
ISPM 12. (2001). Phytosanitary certificates. Rome, IPPC, FAO. 2010-07 IPPC Secretariat amended ISPM 12.
ISPM 19. (2003). Guidelines on lists of regulated pests. Rome, IPPC, FAO. 2010-07 IPPC Secretariat amended ISPM 19.
ISPM 2. (1995). Framework for pest risk analysis. Rome, IPPC, FAO. 2010-07 IPPC Secretariat amended ISPM 2.
ISPM 20. (2004). Guidelines for a phytosanitary import regulatory system. Rome, IPPC, FAO. 2010-07 IPPC Secretariat amended ISPM 20.
ISPM 23. (2005). Guidelines for inspection. Rome, IPPC, FAO. 2010-07 IPPC Secretariat amended ISPM 23.
ISPM 25. (2006). Consignments in transit. Rome, IPPC, FAO. 2010-07 IPPC Secretariat amended ISPM 25.
ISPM 3. (1996). Guidelines for the export, shipment, import, and release of biological control agents and other beneficial organisms. Rome, IPPC, FAO. 2010-07 IPPC Secretariat amended ISPM 3.
ISPM 31. (2008). Methodologies for sampling of consignments. Rome, IPPC, FAO. 2010-07 IPPC Secretariat amended ISPM 31.
ISPM 34. (2010). Design and operation of post-entry quarantine stations for plants. Rome, IPPC, FAO. 2010-07 IPPC Secretariat amended ISPM 34.
ISPM 36. (2012). Integrated measures for plants for planting. Rome, IPPC, FAO. 2010–07 IPPC Secretariat amended ISPM 36.
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ISPM 40. (2017). International movement of growing media in association with plants for planting. Rome, IPPC, FAO. 2010-07 IPPC Secretariat amended.
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ISPM 7. (1997). Export certification system. Rome, IPPC, FAO. 2010-07 IPPC Secretariat amended ISPM 7.
ISPM 8. (1998). Determination of pest status in an area. Rome, IPPC, FAO. 2010-07 IPPC Secretariat amended ISPM 8.
Migeon, A., and Dorkeld, F. (2022). Spider Mites Web: A comprehensive database for the Tetranychidae. https://www.montpellier.inra.fr/CBGP/spmweb/.
Regulation (EU) 2016/2031 of the European Parliament of the Council of 26 October 2016 on protective measures against pests of plants, amending Regulations (EU) No 228/2013, (EU) No 652/2014 and (EU) No 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, p. 4–104.
The Plant Protection and Health Act 2016.
The Plant Protection and Health Regulations (Import and Export) 20.

2.3 | Literature searches performed by EFSA

Literature searches were undertaken by EFSA to complete a list of pests potentially associated with the genera *Petunia, Calibrachoa* and other relevant solanaceous host plants (tomato, pepper, potato and cultivated tobacco). The following searches were combined: (i) a general search to identify pests of *Petunia* spp. and *Calibrachoa* spp. in different databases and (ii) a tailored search to identify whether these pests are present or not in Uganda and the EU. The searches were run between 30 May 2022 and 11 June 2022, and updated on 19 August 2024. No language, date or document type restrictions were applied in the search strategy. The Panel used the databases indicated in Table 3 to compile the list of pests associated with *Petunia* and *Calibrachoa* genera. As for Web of Science, the literature search was performed using a specific, ad hoc established search string (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 *Petunia* spp. and *Calibrachoa* spp.

Database	Platform/link
Aphids on World Plants	https://www.aphidsonworldsplants.info/C_HOSTS_AAIntro.htm
BIOTA of New Zealand	https://biotanz.landcareresearch.co.nz/
CABI Crop Protection Compendium	https://www.cabi.org/cpc/
Database of Insects and their Food Plants	https://www.brc.ac.uk/dbif/hosts.aspx
Database of the World's Lepidopteran Hostplants	https://www.nhm.ac.uk/our-science/data/hostplants/search/index.dsml
EPPO Global Database	https://gd.eppo.int/
EUROPHYT	https://food.ec.europa.eu/plants/plant-health-and-biosecurity/europhyt_en
Gallformers	https://www.gallformers.org/
Leaf-miners	https://www.leafmines.co.uk/html/plants.htm

TABLE 3 (Continued)

Database	Platform/link
GBIF	https://www.gbif.org/
MyCoPortal	https://www.mycoportal.org/portal/collections/harvestparams.php
Nemaplex	https://nemaplex.ucdavis.edu/Nemabase2010/PlantNematodeHostStatusDDQuery.aspx
PESI portal	https://www.eu-nomen.eu/portal/
Plant Parasites of Europe	https://bladmineerders.nl/scientific-plant-names-genera/
Plant Pest Information Network	https://www.mpi.govt.nz/news-and-resources/resources/registers-and-lists/plant-pest-information-network/
Scalenet	https://scalenet.info/associates/
Scolytinae hosts and distribution database	https://www.scolytinaehostsdatabase.eu/site/it/home/
Spider Mites Web	https://www1.montpellier.inra.fr/CBGP/spmweb/
USDA ARS Fungal Database	https://fungi.ars.usda.gov/
Web of Science: All Databases (Web of Science Core Collection, CABI: CAB Abstracts, BIOSIS Citation Index, Chinese Science Citation Database, Current Contents Connect, Data Citation Index, FSTA, KCI-Korean Journal Database, Russian Science Citation Index, MEDLINE, SciELO Citation Index, Zoological Record)	Web of Science https://www.webofknowledge.com
World Agroforestry	https://www.worldagroforestry.org/treedb2/speciesprofile.php?Spid=1749
Others if relevant	*Link*

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

2.4 | Methodology

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

In the first step, pests potentially associated with the commodity in the country of origin (EU-regulated pests and other pests) that may require risk mitigation measures were identified. Pests with no regulatory status in the EU and 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 were identified using expert judgements.

Pest freedom was assessed by estimating the number of bags containing infested/infected unrooted cuttings out of 10,000 exported bags. The information provided in some sections of the Opinion is the result of the Panel interpretation of the text of the applicant, Dossier.

2.4.1 | Commodity data

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

2.4.2 | Identification of pests potentially associated with the commodity

To evaluate the pest risk associated with the importation of the commodity from Uganda, a pest list was compiled. The pest list is a compilation of all identified pests reported to be associated with all species of the genera *Petunia* and *Calibrachoa*, and the polyphagous pests associated with major Solanaceae plants reported to be present in Uganda based on information provided in the submitted Dossier and additional information (see Section 2.1) and on searches performed by the Panel. All viruses and viroids infecting major solanaceous crops (tomato, pepper, potato and cultivated tobacco) retrieved from CABI and European and Mediterranean Plant Protection Organization (EPPO) databases (CABI, 2024; EPPO, 2024) and recent review articles on the subject were included.

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.

Plants of *Petunia* spp. are widely used in plant virology as experimental hosts. Therefore, many, if not most, available data concerning host status for plant viruses refer to laboratory tests in which *Petunia* spp. are reported either as a local host, where the virus is restricted to the inoculated leaf via cell-to-cell movement, or as a systemic host, where the virus spreads from the inoculated leaf to other parts of the plant via systemic/phloem movement. In this assessment, viruses known to infect *Petunia* spp. or *Calibrachoa* spp. were included for further evaluation. Viruses that are reported to infect *Petunia* spp. or*Calibrachoa* spp. experimentally were included for further evaluation if (i) they infect *Petunia* spp. or *Calibrachoa* spp. systemically or (ii) they infect *Petunia* spp. or *Calibrachoa* spp. locally, and their biology (e.g. highly contagious viruses) or transmission mode/epidemiology (e.g. spread via mechanical spread in the field) would allow *Petunia* spp. or *Calibrachoa* spp. to act as a virus source for further spread in the field.

The notifications of interceptions of EU member states were consulted for the Years 2009–2025 (EUROPHYT, 2024, from 2009 to 2020 and TRACES-NT, 2024, from May 2020 to October 2025, Accessed: October 28, 2025). To check whether *Petunia* spp. and *Calibrachoa* spp. can act as a pathway, all notifications (all origins) for *Petunia* spp. and *Calibrachoa* spp. were evaluated. It should be noted that the import of *Petunia* spp. and *Calibrachoa* spp. from Uganda is prohibited. For each selected pest, it was also checked if there were notification records for Uganda (all commodities).

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

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

The methodology used to establish pest presence depends in part on published literature. The limited number of publications from Uganda can lead to an underestimation of the number of pests present, particularly for viruses. A limited number of pest-specific surveys may increase the uncertainty of the pest status.

2.4.3 | Listing and evaluation of risk mitigation measures

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

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

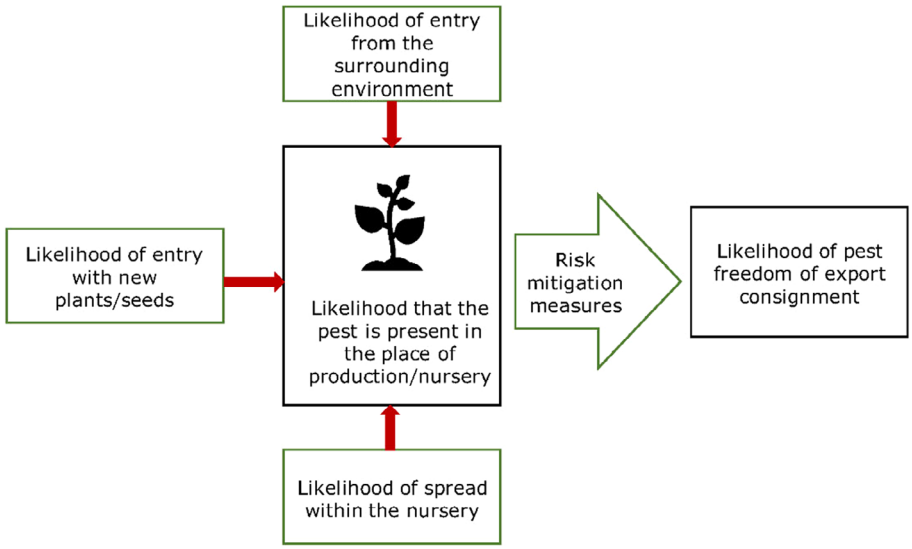

FIGURE 1 Conceptual framework to assess likelihood that plants are exported free from relevant pests (EFSA PLH Panel, 2019).

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

2.4.4 | Expert knowledge elicitation

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

The specific question for EKE was defined as follows: 'taking into account (i) the risk mitigation measures listed in the Dossier and (ii) other relevant information (reported in the specific pest datasheets), how many of 10,000 bags of *Petunia* spp. and *Calibrachoa* spp. unrooted cuttings will be infested with the relevant pest/pathogen when arriving in the EU?'. The risk assessment considers bags containing 50/52 unrooted cuttings each as unit (Dossier Section 1).

Before the elicitation, the list of pests was screened to identify pests with similar characteristics, risks, host-pest interactions, management practices in the production system. Pests with similar characteristics were grouped for a common assessment.

For the assessment of certain pests/cluster of pests, the results of the previous commodity risk assessment of *Petunia* spp. and *Calibrachoa* spp. unrooted cuttings were used (EFSA PLH Panel, 2024a, 2024b, 2024c). In the case of similar pest species associated with the commodity in the different countries, a comparison was made of the: (1) production conditions, including applied risk mitigation measures; (2) climatic and environmental conditions; (3) pest status. When no major differences were identified, the exact values of the previous risk assessment were adopted. When differences were identified, an EKE was performed that was based on the previous elicited values considering the necessary adaptations.

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

3 | COMMODITY DATA

3.1 | Description of the commodity

The commodity to be imported from Uganda consists of unrooted cuttings (stems with leaves) of *Petunia* Juss. (common name: petunia; family: Solanaceae; EPPO code: 1PEUG) and *Calibrachoa* Cerv. (common name: calibrachoa/mini petunia; family: Solanaceae; EPPO code: 1KBCG) (Table 4).

The cuttings of *Petunia* spp. have one pair of apical leaves developed, 3–4 cm length stem (Figure 2A), while the cuttings of *Calibrachoa* spp. have two pair of apical leaves developed, 3–4 cm length stem (Figure 2B) (Dossier Section 1: 3.2.1).

TABLE 4 Type of *Petunia* and *Calibrachoa* unrooted cuttings to be exported to the EU (Dossier Section 1: 3.2.1).

Type of plant	Exported commodity	Stem lenght	Age
***Petunia* spp.**	One pair of leaves and a pith located at the growing tip	3–4 cm	Various, depending on the growing period for the commodity
***Calibrachoa* spp.**	Two pairs of leaves and a pith located at the growing tip	3–4 cm	Various, depending on the growing period for the commodity

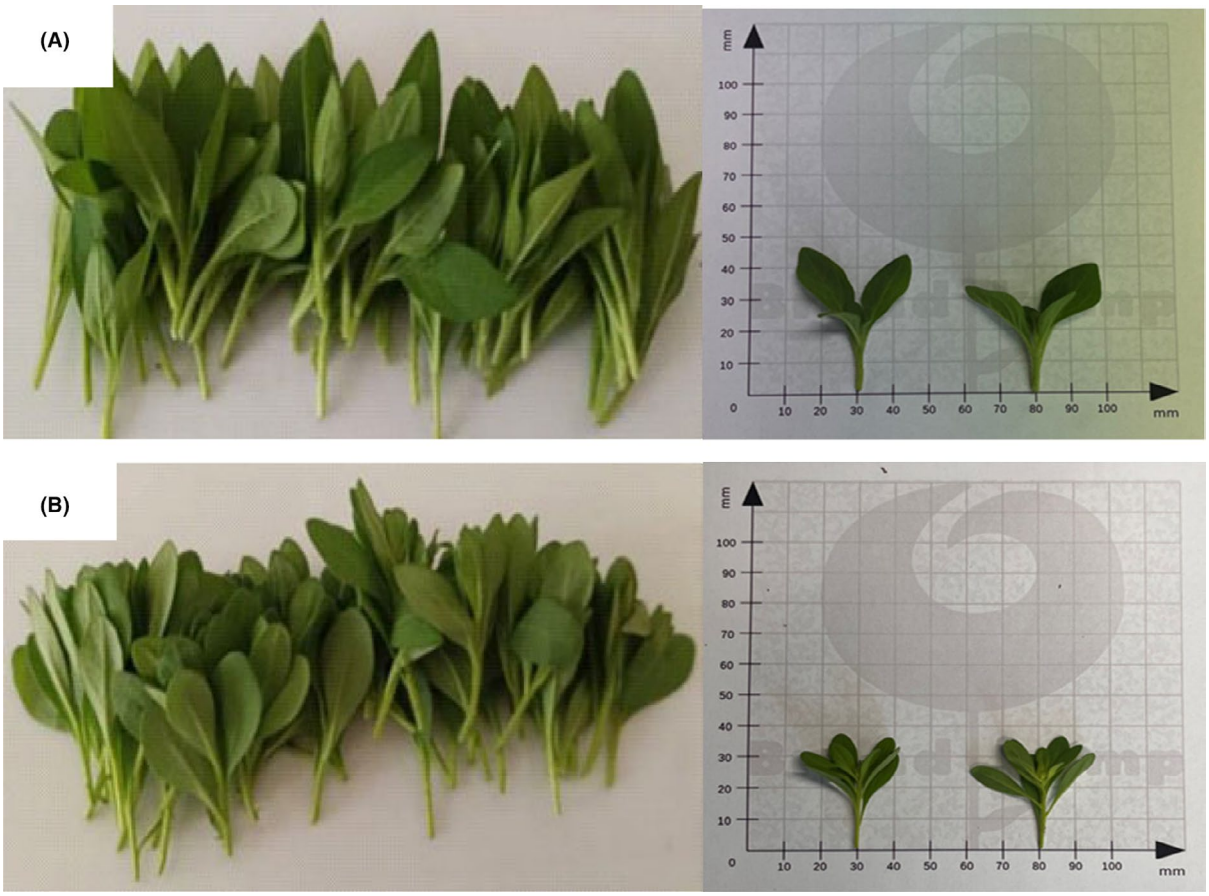

FIGURE 2 (A) *Petunia* sp. and (B) *Calibrachoa* sp. unrooted cuttings (Source: Dossier Section 3.13).

According to ISPM 36 (FAO, 2019) the commodity can be classified as 'unrooted cuttings'.

3.2 | Description of the production areas

Three different companies based in Uganda are involved in the production of *Petunia* spp. *Calibrachoa* spp. unrooted cuttings: JP cuttings, Beekenkamp Plants and Selecta Klemm. Beekenkamp and Selecta are both situated at Wagagai Ltd. (flower propagation companies of cuttings), while JP cuttings is nearby (approximately 2.7 km in a straight line). All locations are directly on the shores of Lake Victoria, both within 15 km from the town of Entebbe (Figure 3A,B) (Dossier Section 1).

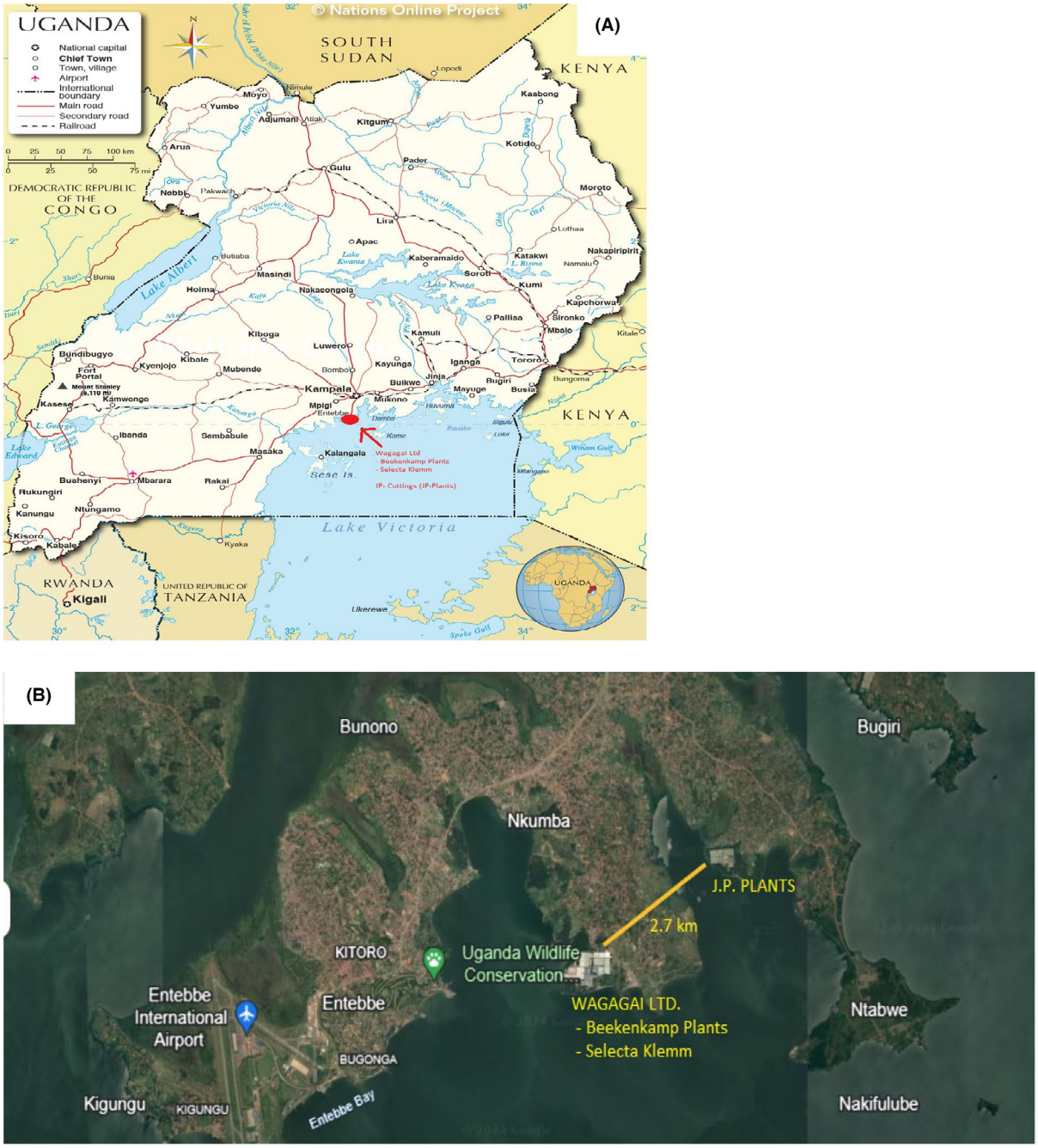

FIGURE 3 (A) Production areas of *Petunia* spp. and *Calibrachoa* spp. in Uganda for export to the EU; (B) location of the production facilities within vicinity of each other (Dossier Section 1: 3.10).

Based on the global Köppen–Geiger climate zone classification (Kottek et al., 2006), the climate of the production areas of *Petunia* spp. and *Calibrachoa* spp. in the production area is classified as tropical (A), specifically tropical rainforest climate (Af). The average weather indicators throughout the year in the production area are reported in Table 5 (Dossier Section 1: 3.2.2).

TABLE 5 Average weather indicators throughout the year in the production area (Dossier Section 1: 3.2.1).

Weather indicator	Recorded values
Highest temperature	29.1°C
Lowest temperature	15.8°C
Average temperature	21.9°C
Average rainfall per year	1268 mm
Wind speed	15 km/h

3.3 | Production and handling processes

3.3.1 | Growing conditions

The unrooted cuttings to be exported from Uganda will be grown and harvested from greenhouse production facilities approved by the National Plant Protection Organisation (NPPO). The cuttings are grown in closed greenhouses with insect-proof netting (Dossier Section 1: 3.2).

Source of planting material

Farms approved to receive and propagate such materials to be exported from Uganda are registered by the Department of Crop Inspection and Certification (DCIC) in the Ministry of Agriculture Animal Industry and Fisheries (MAAIF), which is the Uganda NPPO (www.agriculture.go.ug). All the intended planting materials will be imported from mother companies in The Netherlands and Germany. These are Elite-certified materials in the form of tissue culture (TC) plantlets or unrooted cuttings (URCs) for further multiplication in Uganda. Upon arrival in Uganda, the NPPO will conduct documentary and identity checks at entry before dispatch to post quarantine in contained facilities at the production farms. The plants to be used as motherstock for propagation in Uganda originate from mother plants that are grown with Elite status in approved certified nursery production facilities in The Netherlands and Germany (Dossier Section 1: 3.2 – 3.3). The motherstock material will be imported under quarantine and allowed entry into Uganda for production upon proof of compliance with the plant health requirements as to be indicated in the accompanying phytosanitary certificates for each consignment, issued by the NPPOs of The Netherlands and Germany. The mother plants will be grown in a medium of pumice (lava stones of 3–8 mm) in pots, which stand on tables (Figure 4A). Pumice is steamed for 40 minutes to a temperature of 80°C before use for every production round (Figure 4B) (Dossier Section 1: 3.2.2–3.3).

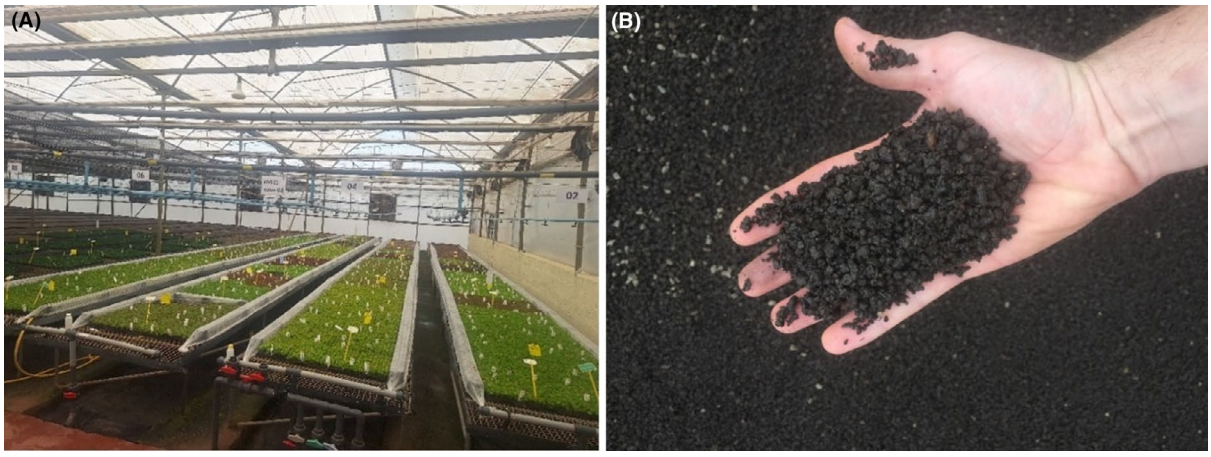

FIGURE 4 (A) Propagation unit for plants for planting; (B) Pumice particles measuring 3–8 mm in which mother plants are grown (Dossier Section 1).

Production cycle

The production of *Petunia* and *Calibrachoa* spp. has not yet started in the facilities of the applicant. Upon initiation, the following provisions will be implemented in accordance with their respective descriptions in the submitted Dossier.

Specifically, upon arrival, all the Elite-certified material will be maintained quarantined in a specific area for 7–8 weeks. During this period the TC plants will further develop by transplanting into paper pots for root development for about 2 weeks (Dossier Section 1). The rooted TCs will then plant in pots separated from each other. The developing plants will not allow to come into contact with each other as long as they remain in the quarantined area. In the case of the URCs, they are first rooted in this quarantine area and later subjected to the same process as the TC plants. During the quarantine period, pest monitoring will be carried out by farms on a daily while official inspections will be conducted every 3 weeks, throughout the production cycle. Laboratory functions will be performed by accredited laboratories known to the NPPO.

During the quarantine stage, samples of plants will be sent to the laboratory to analyse if there is any presence of viroids and viruses (TSWV, AMV, CMV, ToMV, TMV, etc.). When the NPPO of Uganda is convinced (after numerous tests) that the product is free from viroids and viruses, the plants are multiplied. This is done in a separate area called the foundation unit. In these areas, URCs from the Quarantine Unit are rooted and planted more densely. This should take about 8 weeks upon which URCs for the production unit are then harvested and rooted (Dossier Section 1).

After the rooting of the URCs from the foundation unit, the young plants are then planted in the production areas hereby referred to as greenhouses. The propagated plants are grown in separately marked batches (with planting date,

variety, species, quantity) within protected and marked labelled greenhouse structures, to enable the application of required phytosanitary measures, ensure pest exclusion and to enforce traceability.

The greenhouses are covered on top by polythene, and the sidewalls are fitted with insect-proof netting. Plants are grown on tables which are raised up to a height ranging from 0.8 to 1.2 m above the ground.

The farms use a hydroponic system of production with volcanic pumice as a growing media. The pumice is first sterilised by steaming up to 80°C and above for a duration of 40 min. New growing media will be used every season, and the plants are planted in new polythene bags or sterilised pots every season. Being a lake region the humidity ranges from 60% to 100%. There is only one production season per year.

Materials propagated from cuttings will spend 3–4 weeks in the propagation and quarantine unit to grow roots and further observance for phytosanitary concerns. Thereafter, they will be transferred to the production unit in the greenhouse structure, where they take about 4 weeks to grow before harvest begins during week 40 in the month of May or July.

Harvest dates depend on the export season and motherstock. Export week normally starts at week 30 for those from unrooted cuttings, from the date of propagation. Cuttings from TC motherstock are exported from week 42 till week 20 in the next year.

The commodity production stages (Dossier Section 1: 3.7) are summarised in Table 6.

TABLE 6 Commodity production stages (week of the year).

Stage	Description	Production time frame
Quarantine	Transplanting URCs forbuild up	Weeks 14 to 20–22
Foundation	Transplanting for mother plants	Weeks 20–22 to 30
Export	Harvesting for export	Weeks 30 to 8 (the following year)

The plants for planting from which the cuttings are harvested are grown in a soilless medium. At export stage, the age of the unrooted cuttings will vary depending on the growing period for the commodity. The unrooted cuttings will be officially certified to be entirely free from soil, debris and roots (Dossier Section 1: 3.2).

NPPO Uganda requires farms growing plants for planting to implement phytosanitary requirements for growing medium as per ISPM 40 to mitigate potential risks that may be associated with the growing medium. Examples of NPPO Uganda requirements to be included in additional declarations accompanying phytosanitary certificates for coco peat or pumice read as follows:

- the consignment must have been sterilised and the conditions (temperature & pressure) used must be indicated on the Phytosanitary Certificate;
- the consignment must be inspected and certified officially from the country of export or before use, for freedom from other plant debris of phytosanitary significance, pests, weed seeds, soil and animal matter;
- it should be entirely coco peat;
- it should not have been previously used for growing plants or for any other agricultural purpose;
- NPPO requires documentation proof that the producer of the growing medium is certified in the country of origin;
- the farm, produce of plants for planting is required to show and use a manual for transportation, storage and use of the growing medium to mitigate contamination;
- the growing farms also may further subject the planting beds to heat and high-temperature treatment;
- all consignments must be well packaged to prevent possible in-transit contamination by regulated pests or other contaminants.

3.3.2 | Post-harvest processes and export procedure

The unrooted cuttings are harvested with a harvesting knife, after which 50/52 cuttings are placed into individual plastic bag (Figure 5A). An average of 3000 unrooted cuttings will be packed in a box (Figure 5B) in the production area. The plastic bags are placed inside a carton box (Figure 5C). All these steps are done inside the greenhouse.

The boxes with plastic bags are taken into the cold room every 15 min. The cold room temperature is set at 7°C before further packaging for export. A sample of the harvested bags is taken into the quality and control area, where the cuttings are inspected first by the farm for pests and diseases, and product specifications (size, weight, colour, etc.). After 12 h (overnight) the cuttings are then ready for official exit phytosanitary inspection. The unrooted cuttings will be officially certified to be entirely free from soil, debris and roots. From there on they will remain in the bags until they arrive at the final destination, where they will be planted. After a document and quantity check, a phytosanitary inspection is done. Each box checked and approved for export receives an additional plastic sheet to protect the plastic bags with the cuttings, and finally, the box is closed (Figure 5D). The box then receives a bar code sticker indicating the greenhouse, variety, date harvested, contents, quantity and client number. The NPPO requires labelled boxes for traceability purposes.

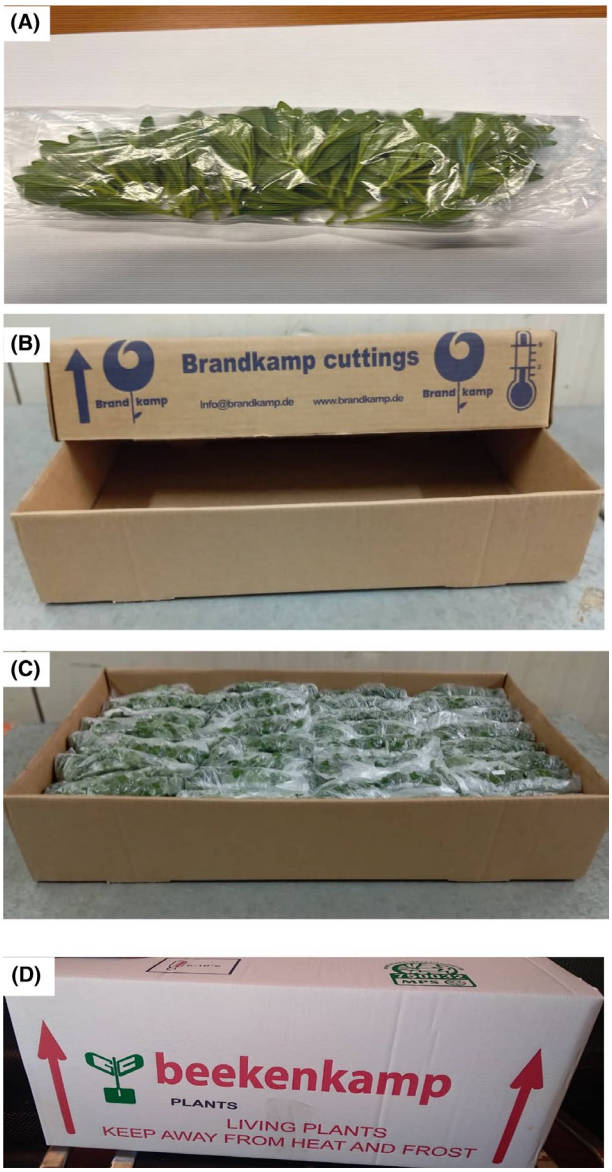

FIGURE 5 (A) Unrooted cutting placed inside of plastic bags (B) Empty box used for packing unrooted cuttings; (B) Box filled with unrooted cutting placed inside of plastic bags; (D) closed box destinated to delivery (Dossier Section 1: 5.5).

Completely sealed refrigerated trucks are used to transport the plants for planting (unrooted cuttings) to the Entebbe International Airport. The temperature in the refrigerated truck is maintained at 7°C degrees. Care is taken to maintain the cold chain by ensuring that the truck docks tightly to the cargo terminal. The boxes containing unrooted cuttings are further scanned for security detail and then loaded on the pallets ready for exit inspection by the NPPO Inspectors. Documentation is checked again at this point, but the cuttings are not opened to minimise temperature changes or being infected by unwanted pests or contaminants. Once the pallet is built up, the unrooted cuttings are transferred to the waiting aeroplane as per the company's booking.

Bags go either directly from Uganda to the final destination or will be shipped to the mother company in Europe, and then shipped to a customer. Either way, the cuttings will not be taken from the bag until they arrive at the final destination.

Consignments normally arrive at Schiphol Airport, the Netherlands (sometimes via Liege in Belgium), where the consignment is inspected by the relevant authorities (NVWA The Netherlands), before it is distributed to the client in the Netherlands and Germany.

The expected trade volume per year (number of items per year) and seasonal timing planned for export to the EU for *Petunia* spp. and *Calibrachoa* spp. unrooted cuttings may vary among the three production companies (Dossier Section 1). For JP Cuttings, trade is indicated to take place from week 30 to week 52, with a production volume ranging from 80,000 to 250,000 cuttings. For the two companies that are part of Wagagai Ltd. (see Section 3.2), the trade volume will entirely depend on potential orders and sales (Dossier Section 1).

4 | IDENTIFICATION OF PESTS POTENTIALLY ASSOCIATED WITH THE COMMODITY

The search for potential pests associated with unrooted cuttings of *Petunia* spp. and *Calibrachoa* spp. retrieved 485 pest species (for search string see Appendix B, for pest list see Appendix D). The list contains all the pests that were reported to infect/infest *Petunia* spp. or *Calibrachoa* spp. based on thematic databases and systematic literature searches. Additional relevant pests, with a broad host range, including solanaceous host plants, were included in the list, if there was evidence of presence in the country of export.

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

Thirty-seven EU regulated (QPs, RNQPs, emergency measures and PZ) species that are present in Uganda and reported to use *Petunia* spp. or *Calibrachoa* spp. were evaluated for their relevance of being included in this opinion (Table 7, Appendix D).

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

a. *Petunia* spp. or *Calibrachoa* spp. are a potential host of the pest;
b. the pest is present in Uganda;
c. one or more life stages of the pest can be associated with the specified commodity.

For pests regulated as RNQPs, only the ones regulated for solanaceous crops were selected for further evaluation. Of the 37 EU-regulated pest species evaluated, 12 were selected for further evaluation (Table 7). Potato virus M (PVM000, *Carlavirus misolani*) and potato virus Y (PVY000, *Potyvirus yituberosi*) are present in Uganda and listed in Annex V of (EU) 2019/2072 but not specifically listed as RNQP in Annex IV. Therefore, these viruses were not selected for further evaluation.

TABLE 7 Overview of the evaluation of the 37 EU-quarantine pests/ EU-regulated pests (QPs, RNQPs, Emergency Measures and PZ) present in Uganda known to use solanaceous host plants or specifically *Petunia* spp. and *Calibrachoa* spp. or for their relevance for this Opinion. In the column '*Petunia* spp. and *Calibrachoa* spp. as a host' categories are: (i) not relevant (commodity is not a pathway, e.g. root nematode, fruit pest); (ii) no (no records for *Petunia* /*Calibrachoa* spp. or important Solanaceae are present in literature); (iii) likely (no records for *Petunia*/*Calibrachoa* spp., but given the wide host range it is likely); (iv) Yes (there are records for *Petunia*/*Calibrachoa* spp. as host in the literature).

No.	Pest name according to EU legislation*	EPPO code	Group	EU regulatory status	Plant genera with RNQP requirements	*Petunia* spp. and*Calibrachoa* spp. as a host	Conclusion
1	*Aleurocanthus woglumi*	ALECWO	Insects	Quarantine pest (Annex II A)		Not relevant	Host unlikely
2	*Aphelenchoides besseyi*	APLOBE	Nematoda	RNQP (Annex IV)	*Oryza*, *Fragaria*	Not relevant	RNQP (Not for Solanaceae)
3	*Bactrocera cucurbitae*	DACUCU	Insects	Quarantine pest (Annex II A)		Not relevant	No pathway
4	*Bactrocera dorsalis*	DACUDO	Insects	Quarantine pest (Annex II A: Non-EU Tephritidae)		Not relevant	No pathway
5	*Bemisia tabaci* (non-European populations)	BEMITA	Insects	Quarantine pest (Annex II A)		Yes	Selected for further evaluation
6	*Ceratitis anonae*	CERTAN	Insects	Quarantine pest (Annex II A: Non-EU Tephritidae)		Not relevant	No pathway
7	*Ceratitis cosyra*	CERTCO	Insects	Quarantine pest (Annex II A: Non-EU Tephritidae)		Not relevant	No pathway
8	*Ceratitis fasciventris*	CERTFA	Insects	Quarantine pest (Annex II A: Non-EU Tephritidae)		Not relevant	No pathway
9	*Colletotrichum gossypii*	GLOMGO	Fungi	Protected Zone pest (Annex III)		Unlikely	Host unlikely
10	Cowpea mild mottle virus (*Carlavirus vignae*)	CPMMV0	Viruses	Quarantine pest (Annex II A)		Likely	Selected for further evaluation
11	Cucumber mosaic virus (*Cucumovirus CMV*)	CMV000	Viruses	RNQP (Annex IV)	*Ribes*, *Rubus*	Yes	RNQP (Not for Solanaceae)
12	*Dacus bivittatus*	DACUBI	Insects	Quarantine pest (Annex II A: Non-EU Tephritidae)		Not relevant	No pathway
13	*Dacus ciliatus*	DACUCI	Insects	Quarantine pest (Annex II A)		Not relevant	No pathway
14	*Globodera rostochiensis*	HETDRO	Nematoda	Quarantine pest (Annex II B)		Not relevant	No pathway
15	Impatiens necrotic spot virus *(Orthotospovirus impatiensnecromaculae)*	INSV00	Viruses	RNQP (Annex IV)		Yes	RNQP (Not for Solanaceae)
16	*Meloidogyne arenaria*	MELGAR	Nematoda	RNQP (Annex IV)		Yes	No pathway
17	*Meloidogyne incognita*	MELGIN	Nematoda	RNQP (Annex IV)	*Ficus, Olea, Prunus*	Yes	No pathway
18	*Meloidogyne javanica*	MELGJA	Nematoda	RNQP (Annex IV)	*Cydonia, Ficus, Malus, Olea, Prunus*	Yes	No pathway
19	*Phytophthora cinnamomi*	PHYTCN	Oomycetes	RNQP (Annex IV)	*Castanea*	Yes	RNQP (Not for Solanaceae)
20	Potato leafroll virus *(Polerovirus PLRV)* (non-EU isolates)	PLRV00	Viruses	Quarantine pest (Annex II A)		Likely	Selected for further evaluation

TABLE 7 (Continued)

No.	Pest name according to EU legislation*	EPPO code	Group	EU regulatory status	Plant genera with RNQP requirements	*Petunia* spp. and *Calibrachoa* spp. as a host	Conclusion
21	Potato spindle tuber viroid *(Pospiviroid fusituberis)*	PSTVD0	Viroids	RNQP (Annex IV)	*Capsicum, Solanum*	Yes	Selected for further evaluation
22	Potato virus S *(Carlavirus sigmasolani)* (non-EU isolates)	PVS000	Viruses	Quarantine pest (Annex II A)		Likely	Selected for further evaluation
23	Potato virus × *(Potexvirus ecspotati)* (non-EU isolates)	PVX000	Viruses	Quarantine pest (Annex II A)		Yes	Selected for further evaluation
24	*Ralstonia pseudosolanacearum*	RALSPS	Bacteria	Quarantine pest (Annex II A)		Likely	Selected for further evaluation
25	*Ralstonia solanacearum*	RALSSL	Bacteria	Quarantine pest (Annex II B)		Likely	Selected for further evaluation
26	*Scirtothrips aurantii*	SCITAU	Insects	Quarantine pest (Annex II A)		No	Host unlikely
27	*Scirtothrips dorsalis*	SCITDO	Insects	Quarantine pest (Annex II A)		Likely	Selected for further evaluation
28	*Spodoptera frugiperda*	LAPHFR	Insects	Quarantine pest (Annex II A)		No	Reserve list (expanding host range)
29	*Tetranychus urticae*	TETRUR	Insects	RNQP (Annex IV)	*Ribes*	Yes	RNQP (Not for Solanaceae)
30	*Thanatephorus cucumeris*	RHIZSO	Fungi	RNQP (Annex IV)	*Solanum*	Yes	No pathway
31	*Thaumatotibia leucotreta*	ARGPLE	Insects	Quarantine pest (Annex II A)		No	Reserve list (expanding host range)
32	Tomato spotted wilt virus *(Orthotospovirus tomatomaculae)*	TSWV00	Viruses	RNQP (Annex IV)	*Capsicum, Solanum*	Yes	Selected for further evaluation
33	Tomato leaf curl Uganda virus *(Begomovirus solanumuganaense)*	TLCUV	Viruses	Quarantine pest (Annex IIA: Non-EU Begomovirus)		Likely	Selected for further evaluation
34	Tomato yellow leaf curl virus *(Begomovirus coheni)*	TYLCV0	Viruses	RNQP (Annex IV)	*Solanum*	Yes	Selected for further evaluation
35	*Toxoptera citricida*	TOXOCI	Insects	Quarantine pest (Annex II B)		No	*Petunia/Calibrachoa* spp. is not expected to be a host
36	*Verticillium dahliae*	VERTDA	Fungi	RNQP (Annex IV)	*Cynara, Corylys, Cydonia, Fragaria, Humulus, Malus, Olea, Pistacia, Prunus, Pyrus*	Yes	RNQP (Not for Solanaceae)
37	*Xanthomonas axonopodis* pv. *phaseoli*	XANTPH	Bacteria	RNQP (Annex IV)	*Phaseolus*	No	RNQP (Not for Solanaceae)

*Commission Implementing Regulation (EU) 2019/2072.

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

The information provided by the NPPO of Uganda, integrated with the search EFSA performed, was evaluated in order to assess whether there are other relevant pests potentially associated with unrooted cuttings of *Petunia* spp. or *Calibrachoa* spp., 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 Uganda;
b. the pest is (i) absent or (ii) has a limited distribution in the EU;
c. *Petunia* spp. or *Calibrachoa* spp. are hosts of the pest;
d. one or more life stages of the pest can be associated with the traded commodity of *Petunia* spp. and *Calibrachoa* spp.;
e. the pest may have an impact in the EU.

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

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

Based on the information collected, 369 potential pests (non-EU quarantine) known to be associated with solanaceous host plants or potentially associated with *Petunia* spp. and *Calibrachoa* spp. were evaluated for their relevance to this Opinion.

Species were excluded from further evaluation when at least one of the conditions listed above (a-e) was not met. Details can be found in the pest list (Appendix D). Of the evaluated pests not regulated in the EU, one pest (*Nipaecoccus viridis)* was selected for further evaluation because it met all the selection criteria. More information on this species can be found in the pest datasheets (Appendix A).

4.3 | List of potential pests not further assessed (reserve list)

For pests for which there was uncertainty at least in one of the selection criteria, the Panel identified 11 pests that could be of potential concern for this Opinion. A specific justification for their selection is included in Appendix C.

4.4 | Summary of pests selected for further evaluation

Thirteen pests that were identified to be present in Uganda and having potential for association with *Petunia* spp. and *Calibrachoa* spp. plants designated for export to the EU, were selected for further evaluation (Table 8). The efficacy of the risk mitigation measures applied to the commodity were evaluated for these selected pests (Appendix A).

TABLE 8 List of relevant pests selected for further evaluation.

No.	Current scientific name	EPPO code	Taxonomic information	Group	Cluster	Regulatory status
1	*Bemisia tabaci* (non-European populations)	BEMITA	Order: Hemiptera; Family: Aleyrodidae	Insects	–	Quarantine pest (Annex II A)
2	*Begomovirus coheni* (tomato yellow leaf curl virus)	TYLCV0	Order: Geplafuvirales; Family: Geminiviridae	Viruses	*Bemisia tabaci*-transmitted viruses	RNQP for Solanum lycopersicum
3	*Carlavirus sigmasolani* (potato virus S) (non-EU isolates	PSV000	Order: Tymovirales; Family: Betaflexiviridae	Viruses	Aphid-trasmitted viruses	Quarantine pest (Annex II A)
4	*Carlavirus vignae* (cowpea mild mottle virus*)*	CPMMV0	Order: Tymovirales; Family: Betaflexiviridae	Viruses	*Bemisia tabaci*-transmitted viruses	Quarantine pest (Annex II A)
5	*Nipaecoccus viridis*	NIPAVI	Order: Hemiptera; Family: Pseudococcidae	Insects	–	Not regulated in the EU
6	*Polerovirus PLRV* (potato leafroll virus*)* (non-EU isolates)	PLRV00	Order: Sobelivirales; Family: Solemoviridae	Viruses	Aphid-trasmitted viruses	Quarantine pest (Annex II A)

TABLE 8 (Continued)

No.	Current scientific name	EPPO code	Taxonomic information	Group	Cluster	Regulatory status
7	*Orthotospovirus tomatomaculae* (tomato spotted wilt tospovirus)	TSWV00	Order: Elliovirales; Family: Tospoviridae	Viruses	–	RNQP for *Capsicum annuum* L., *Lactuca sativa* L., *Solanum lycopersicum* L., *Solanum melongena* L.
8	*Pospiviroid fusituberis* (potato spindle tuber viroid)	PSTVD0	Family: Pospiviroidae	Viroids	Contact-transmitted viroid and virus	RNQP for *Capsicum annuum* L., *Solanum lycopersicum* L., *Solanum tuberosum* L.
9	*Potexvirus ecspotati* (potato virus X) (non-EU isolates)	PVX000	Order: Tymovirales; Family: Alphaflexiviridae	Viruses	Contact-transmitted viroid and virus	Quarantine pest (Annex II A)
10	*Ralstonia pseudosolanacearum*	RALSPS	Order: Burkholderiales; Family: Burkholderiaceae	Bacteria	*Ralstonia solanacearum* species complex	Quarantine pest (Annex II A)
11	*Ralstonia solanacearum*	RALSSL	Order: Burkholderiales; Family: Burkholderiaceae	Bacteria	*Ralstonia solanacearum* species complex	Quarantine pest (Annex II B)
12	*Scirtothrips dorsalis*	SCITDO	Order: Thysanoptera; Family: Thripidae	Insects	-	Quarantine pest (Annex II A)
13	Tomato leaf curl Uganda virus	TOLCUG	Order: Geplafuvirales; Family: Geminiviridae	Viruses	*Bemisia tabaci*-transmitted viruses	Quarantine pest (Annex II A: Non-EU Begomovirus)

5 | RISK MITIGATION MEASURES

For each selected pest for further evaluation, the Panel assessed the possibility that it could be present in nurseries producing *Petunia* spp. and *Calibrachoa* spp. The information used in the evaluation of the efficacy of the risk mitigation measures is summarised in the pest data sheets (Appendix A).

5.1 | Risk mitigation measures applied in Uganda

With the information provided by Uganda (Dossier Sections 1, 2.1, 2.2, 2.3), the Panel summarised the risk mitigation measures (Table 9) that are implemented in the production nursery.

TABLE 9 Overview of implemented risk mitigation measures for *Petunia* spp. and *Calibrachoa* spp. plants designated for export to the EU from Uganda.

No.	Risk mitigation measure	Implementation in Uganda
1	Growing plants in isolation	The unrooted cuttings to be exported from Uganda will be grown and harvested from greenhouse production facilities approved by the NPPO. The cuttings are grown in closed greenhouses (closed production). A double-door entry system is used to control temperatures in the greenhouse as well as mitigate entry of pests. *Petunia* spp. and *Calibrachoa* spp. are produced in separate units.
2	Dedicated hygiene measures	For accessing the greenhouse there is a double door system. Changing rooms and disinfection facility allow the personnel to wear dedicated boots and clothes before entering the greenhouse. There are dedicated tools used for each greenhouse unit. Each unit has a specific set of clothes including a disinfection area.
3	Treatment of growing media	The plants for planting from which the cuttings are harvested are grown in a soilless medium (100% pumice in hydroponic greenhouses). The growing media used in production and at the moment of export is according to ISPM 40 (FAO, 2017) and to the NPPO Uganda requirements.
4	Quality of source plant material	All the intended planting materials are to be imported from mother companies in the Netherlands and Germany (Dossier Section 1). These are Elite-certified materials in the form of TC plantlets or URCs for further multiplication in Uganda. Upon arrival in Uganda, the NPPO conducts documentary and identity checks at entry before dispatch to post quarantine in contained facilities at the production farms.
5	Crop rotation	No crop rotation takes place. Specific greenhouses units are used for producing *Petunia* spp. and *Calibrachoa* spp.
6	Disinfection of irrigation water	The irrigation water is treated with sodium chloride and UV irradiation (Dossier Section 1).
7	Pest monitoring and inspections	The presence of pests and symptoms in plants is monitored, including yellow sticky traps, on a daily basis by nurseries staff. A compiled weekly report is produced by the scouting team, which is used to decide the weekly pest control measures in the greenhouses (Dossier Section 1).

(Continues)

TABLE 9 (Continued)

No.	Risk mitigation measure	Implementation in Uganda
8	Treatment of crop during production	Fungicides, insecticides, acaricides and biological control agents are applied on weekly basis, following scouting inspections and are reported in Dossier Section 4 (Table E1.1–6). Rotation among active substances (a.s.) is adopted to prevent the development of insecticide resistance. Details on the a.s. are reported in Dossier Section 4.
9	Sampling and testing	A detailed protocol for sampling and testing plants is described in Dossier Section 4. The sampling Protocol is implemented according to Risk-Based Estimator for Surveillance Systems (RiBESS+) (https://r4eu.efsa.europa.eu/app/ribess). A subsample per variety, per batch is sent to the accredited laboratory for further pest analyses. The testing procedures follow the PM7 diagnostic standards of EPPO (https://www.eppo.int/RESOURCES/eppo_standards/pm7_diagnostics).
10	Official supervision by NPPO	NPPO Uganda conducts a 3-week to monthly pest surveillance frequency to monitor pest incidence and prevalence on each plant variety and species guided by the pests relevant for the EU. NPPO Uganda enforces compliance with phytosanitary measures as provided for in the EU Directive 2016/2031.
11	Surveillance of surrounding environment	No details are given for the surveillance on the surrounding environment.

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

The relevant risk mitigation measures acting on the selected pests were identified. Factors reducing the efficacy of the measures were documented. All the relevant information including the related uncertainties deriving from the limiting factors used in the evaluation are summarised in the pest datasheets provided in Appendix A. Based on this information, an expert judgement has been given for the likelihood of pest freedom of the commodity taking into consideration the risk mitigation measures acting on the pest and their combination. An overview of the evaluation of the selected pests is given in the sections below (Sections 5.2.1–5.2.8). The outcome of EKE on pest freedom after the evaluation of the proposed risk mitigation measures is summarised in the Section 5.2.9.

5.2.1 | Overview of the evaluation of aphid-transmitted viruses (potato leafroll virus, potato virus S)

Overview of evaluation of aphid-transmitted viruses for unrooted cuttings					
Rating of the likelihood of pest freedom	**Almost always pest free** (based on the median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9990 out of 10,000 plants	9995 out of 10,000 plants	9997 out of 10,000 plants	9999 out of 10,000 plants	10,000 out of 10,000 plants
Proportion of infected plants	0 out of 10,000 plants	1 out of 10,000 plants	3 out of 10,000 plants	5 out of 10,000 plants	10 out of 10,000 plants
Summary of the formation used for the evaluation	**Possibility that the pest could become associated with the commodity** The aphid-transmitted potato leafroll virus (PLRV) and potato virus S (PVS) are present in Uganda. There are no records that *Petunia* spp. or *Calibrachoa* spp. are hosts of PLRV and PVS. However, given the broad host range of PLRV and PVS among solanaceous plants, they are likely to be hosts as well. The main pathway of entrance of these viruses from the surrounding environment in the nursery is through viruliferous aphids. **Pest control measures applied during production** Plant material (unrooted cuttings without soil or tissue culture material) for *Petunia* sp. and *Calibrachoa* sp. mother plants used for the production of unrooted cuttings originate from the Netherlands and Germany. These are Elite-certified materials in the form of TC plantlets or URCs for further multiplication in Uganda. The cuttings are grown in closed greenhouses, entirely confined with controlled and regulated environmental growing conditions. A double-door entry system is used to control temperatures in the greenhouse as well as mitigate entry of aphid vectors. *Petunia* spp. and *Calibrachoa* spp. are produced in separate units. The certification scheme in place for *Petunia* spp. and *Calibrachoa* spp. does not include PLRV and PVS. **Evaluation of control measures** The insect-proof netting prevents the introduction of insects from the surrounding environment. However, aphids may be introduced through defects in the greenhouse or as hitchhiking on workers. PLRV and PVS are not included in the testing scheme, hence there is no testing of these viruses in mother plants and during production. **Main uncertainties** • The host status of *Petunia*/*Calibrachoa* spp. • The efficiency of detecting early aphid infestations and virus presence, especially in low infection levels. • The efficiency of the sampling method and testing intensity to detect virus infections (if any). • Infection (PLRV and PVS) and infestation (aphids) pressure in the environment of the nursery (presence and distribution of host plants in the surroundings).				

5.2.2 | Overview of the evaluation of *Bemisia tabaci* (non-European populations)

Overview of evaluation of *Bemisia tabaci* for unrooted cuttings					
Rating of the likelihood of pest freedom	**Almost always pest free** (based on the median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9977 out of 10,000 plants	9990 out of 10,000 plants	9995 out of 10,000 plants	9998 out of 10,000 plants	9999 out of 10,000 plants
Proportion of infested plants	1 out of 10,000 plants	2 out of 10,000 plants	5 out of 10,000 plants	10 out of 10,000 plants	23 out of 10,000 plants
Summary of the information used for the evaluation	**Possibility that the pest could become associated with the commodity** *Bemisia tabaci* is a polyphagous whitefly (Aleyrodidae) present in Uganda. Certain *Petunia* spp. (*P. axillaris*, *P. grandiflora*, *P. integrifolia*, *P. hybrida*) and *Calibrachoa* spp. are reported as host plants for *B. tabaci*. The pest can be present on host plant species in the neighbouring environment of the nursery producing *Petunia* spp. and *Calibrachoa* spp. cuttings for export to the EU. The pest is very small and can enter the production greenhouse through defects in the greenhouse structure or through hitchhiking on nursery workers. Eggs and first instar larvae are difficult to detect and may be present on the harvested cuttings. **Pest control measures applied during production** Unrooted cuttings are produced in dedicated units in officially registered greenhouses protected with thrips-proof netting. The starting material originates from the EU and is Elite-certified (i.e. tested for several viruses and bacteria). All greenhouses have double doors. There are hygienic measures in place for nursery workers entering the production unit. Daily scouting is conducted by nursery staff. **Evaluation of control measures** The mother plants used for the production of unrooted cuttings are derived from imported certified material and considered pest free. *Bemisia tabaci* could enter the nursery through unnoticed holes in the insect-proof netting or through hitchhiking on nursery staff. If hygiene measures, inspections and pesticide applications during the growing period and prior to export are implemented correctly, it is unlikely that the pest is present on the harvested and exported *Petunia* spp. and *Calibrachoa* spp. unrooted cuttings. **Main uncertainties** • *Bemisia tabaci* population pressure in the surrounding environment of the nursery. • The level of resistance of *B. tabaci* populations in Uganda against the listed insecticides. • Presence of unnoticed defects in the greenhouse structure.				

5.2.3 | Overview of the evaluation of *Bemisia tabaci*-transmitted viruses (cowpea mild mottle virus, tomato leaf curl Uganda virus, tomato yellow leaf curl virus)

Overview of evaluation of *Bemisia tabaci*-transmitted viruses for unrooted cuttings					
Rating of the likelihood of pest freedom	**Pest free with few exceptional cases** (based on the Median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9953 out of 10,000 plants	9970 out of 10,000 plants	9992 out of 10,000 plants	9997 out of 10,000 plants	9999 out of 10,000 plants
Proportion of infected plants	1 out of 10,000 plants	3 out of 10,000 plants	8 out of 10,000 plants	30 out of 10,000 plants	47 out of 10,000 plants
Summary of the information used for the evaluation	**Possibility that the pest could become associated with the commodity** Cowpea mild mottle virus (CPMMV), tomato leaf curl Uganda virus (TLCUV) and tomato yellow leaf curl virus (TYLCV) are clustered as *B. tabaci*-transmitted viruses (Appendix A). These viruses are present in Uganda, and they have a broad host range including solanaceous plants. *Petunia* sp. is a natural host of TYLCV. The main pathway of entrance of these viruses from the surrounding environment in the nursery is through viruliferous *B. tabaci* adults. **Pest control measures applied during production** The imported plant material (in vitro tissue cultures and unrooted cuttings) from the Netherlands and Germany is reported to be Elite-certified. The mother plants used for the producing of cuttings to be exported are then grown in dedicated greenhouses, enclosed with thrips-proof nets (vector control). There are hygienic measures in place for nursery workers entering the production unit. Daily scouting is conducted by nursery staff. Mother plants for the production of cuttings are reported to be sampled according to RiBESS+ and tested for virus presence following the respective PM7 diagnostic standards of EPPO.				

(Continues)

(Continued)

Evaluation of control measures

CPMMV, TLCUV and TYLCV are not included in the certification scheme applied. Although there is no testing of mother plants against these viruses, the probability that these viruses which are causing distinct symptoms are present on the certified starting material is very low/negligible. The vector *B. tabaci* could enter the nursery through unnoticed holes in the insect-proof netting or through hitchhiking on nursery staff and introduce or spread these viruses. During production, plants are reported to be tested following the PM7 diagnostic standards of EPPO which include begomoviruses. However, no details are given for the specific methods used for virus detection and identification and the specific virus targeted.

Main uncertainties

- The efficiency of detecting early *B. tabaci* infestations and virus presence, especially at low pest incidence.
- The efficiency of the sampling method and testing intensity to detect virus infections (if any).
- Infection (CPMMV, TLCUV and TYLCV) and infestation (*B. tabaci*) pressure in the environment of the nursery (presence and distribution of host plants in the surroundings).

5.2.4 | Overview of the evaluation of contact-transmitted viroid and virus (potato spindle tuber viroid, potato virus X)

Overview of evaluation of contact-transmitted viruses for unrooted cuttings					
Rating of the likelihood of pest freedom	**Pest free with few exceptional cases** (based on the median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9916 out of 10,000 plants	9960 out of 10,000 plants	9990 out of 10,000 plants	9998 out of 10,000 plants	9999 out of 10,000 plants
Proportion of infected plants	1 out of 10,000 plants	2 out of 10,000 plants	10 out of 10,000 plants	40 out of 10,000 plants	84 out of 10,000 plants
Summary of the information used for the evaluation	**Possibility that the pest could become associated with the commodity** Potato spindle tuber viroid (PSTVd) and Potato virus × (PVX) are present in Uganda. *Petunia* spp. and *Calibrachoa* spp. including numerous solanaceous species are reported to be hosts of PSTVd and PVX. PSTVd can be experimentally transmitted by contact and cutting tools. In addition, PSTVd can spread by vegetative propagation and transmission via seeds. Furthermore, horizontal transmission through infected pollen has been documented for PSTVd. PSTVd spread via contact can be also facilitated by insects. PVX can be transmitted by vegetative propagation (via tubers) and mechanically. PVX is not known to be transmitted by pollen or true seeds. **Pest control measures applied during production** The imported plant material (in vitro tissue cultures and unrooted cuttings) from the Netherlands and Germany is reported to be Elite-certified. Molecular tests are used for Pospiviroids (including PSTVd) and serological tests for PVX. The certification scheme in place for *Petunia* spp. and *Calibrachoa* spp. includes PSTVd and PVX and therefore it can be assumed that the starting material is pathogen-free. PSTVd is included in the PM7 diagnostic standards of EPPO, while PVX is not included, therefore *Petunia* spp. and *Calibrachoa* spp. are not expected to be tested for PVX during production. **Evaluation of control measures** Because mother plants are tested for PSTVd and PVX as part of the certification scheme, it is assumed that the starting material is PSTVd- and PVX-free. No major shortcomings were identified in the evaluation. If all the measures described are implemented correctly it is unlikely that the pest is present on the harvested and exported *Petunia* spp. and *Calibrachoa* spp. unrooted cuttings. **Main uncertainties** • The efficiency of detecting early or low infection levels. • The efficiency of the sampling method and testing intensity to detect virus infections (if any). • Infection pressure in the environment of the nursery (presence and distribution of host plants in the surroundings).					

5.2.5 | Overview of the evaluation of *Nipaecoccus viridis*

Overview of evaluation of *Nipaecoccus viridis* for unrooted cuttings					
Rating of the likelihood of pest freedom	**Almost always pest free** (based on the median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9985 out of 10,000 plants	9992 out of 10,000 plants	9996 out of 10,000 plants	9998 out of 10,000 plants	9999 out of 10,000 plants
Proportion of infected plants	1 out of 10,000 plants	2 out of 10,000 plants	4 out of 10,000 plants	8 out of 10,000 plants	15 out of 10,000 plants

(Continued)

Summary of the information used for the evaluation	**Possibility that the pest could become associated with the commodity** The mealybug *N. viridis* (Newstead) (Hemiptera: Pseudococcidae) is a polyphagous pest present in Uganda. *N. viridis* has a broad host range including solanaceous plants, therefore *Petunia* spp. or *Calibrachoa* spp. are likely to be suitable host plants for *N. viridis*. Local populations of *N. viridis* may be present in the neighbouring environment. The crawlers can enter the nursery through holes in the thrips-proof netting or by hitchhiking on nursery staff. During the crawler stage, infestation is difficult to detect and *N. viridis* may be present on the harvested cuttings. **Pest control measures applied during production** Unrooted cuttings are produced in dedicated units in officially registered greenhouses protected with thrips-proof netting. The starting material originates from the EU and is Elite certified (i.e. tested for several viruses and bacteria). All greenhouses have double doors. There are hygienic measures in place for nursery workers entering the production unit. Daily scouting is conducted by facilities. **Evaluation of control measures** If all the measures described (clean starting material, hygienic measures, insecticides) are implemented correctly, it is unlikely that the pest is present on the harvested and exported *Petunia* spp. and *Calibrachoa* spp. unrooted cuttings. **Main uncertainties** • Presence of unnoticed defects in the greenhouse structure. • The population pressure in the surrounding environment of the nursery (presence and distribution of host plants in the surroundings). • The efficacy of the plant protection products specifically against these mealybugs are not known.

5.2.6 | Overview of the evaluation of *Ralstonia solanacearum* species complex (*R. solanacearum* and *R. pseudosolanacearum*)

Overview of evaluation of *Ralstonia solanacearum* species complex for unrooted cuttings					
Rating of the likelihood of pest freedom	Pest free with some exceptional cases (based on the median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9981 out of 10,000 plants	9990 out of 10,000 plants	9994out of 10,000 plants	9997 out of 10,000 plants	9999 out of 10,000 plants
Proportion of infected plants	1 out of 10,000 plants	3 out of 10,000 plants	6 out of 10,000 plants	10 out of 10,000 plants	19 out of 10,000 plants
Summary of the information used for the evaluation	**Possibility that the pest could become associated with the commodity** *Ralstonia solanacearum* and *R. pseudosolanacearum* have a wide host range including solanaceous host plants (including potato, tomato, pepper and eggplant), and therefore the Panel assumes that *Petunia*/*Calibrachoa* could also be a natural host for *R. pseudosolanacearum*. It is probable that isolates of *R. pseudosolanacearum* were identified as *R. solanacearum* before 2017. *R. solanacearum* and *R. pseudosolanacearum* are soil-borne bacteria present and widespread in Uganda. They are transmitted by contaminated soil, irrigation water, tools and infected plant materials. Bacteria enter the plants usually by root and stem injuries and colonise the xylem vessels. Unrooted cuttings of *Petunia* and *Calibrachoa* can be systemically infected. **Pest control measures applied during production** The propagation material used for establishing mother plants originates from the Netherlands and Germany. Propagation material is not reported to be tested for bacterial infection; however, it is unlikely that the imported Elite-certified material from the EU is infected with *Ralstonia* spp. The greenhouses with polythene roof and sidewalls fitted with insect-proof nets as well as double door prevent passive introduction of *Ralstonia* spp. by air movements. There are hygienic measures in place for nursery workers entering the production unit. Daily scouting is conducted by nursery staff. Hygienic procedures described prevent the introduction of bacteria from the surrounding environment via contaminated clothes and tools. Disinfection of pruning tools prevents the spread of bacteria within the greenhouse in case of the introduction of *Ralstonia* spp. Sterilisation by steam is reported to be efficient to reduce bacterial populations in volcanic pumice. The disinfection of irrigation water is effective in eliminating the presence of *Ralstonia* spp. in the irrigation water. Furthermore, once every 3 weeks, NPPO does an official inspection in the greenhouses. **Evaluation of control measures** Plants for planting are regularly tested during production. When production of *Petunia* and *Calibrachoa* begins, plants will be routinely tested, including for the *R. solanacearum* species complex. Visual inspection of the crop could detect symptoms of *Ralstonia* spp., however, due to the long latent period some infections may go undetected. **Main uncertainties** • Efficiency of the hot treatments for disinfection. • Efficiency of monitoring and inspection and the lenght of latent period necessary to the expression of symptoms. • Presence and distribution of infected host plants or soil as such in the surroundings.				

5.2.7 | Overview of the evaluation of *Scirtothrips dorsalis*

Overview of evaluation of *Scirtothrips dorsalis* for unrooted cuttings					
Rating of the likelihood of pest freedom	**Pest free with some exceptional cases** (based on the median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9955 out of 10,000 plants	9975 out of 10,000 plants	9985 out of 10,000 plants	9993 out of 10,000 plants	9998 out of 10,000 plants
Proportion of infected plants	2 out of 10,000 plants	7 out of 10,000 plants	15 out of 10,000 plants	25 out of 10,000 plants	45 out of 10,000 plants
Summary of the information used for the evaluation	**Possibility that the pest could become associated with the commodity** *Scirtothrips dorsalis* (Hood) (Thysanoptera: Thripidae) is a polyphagous pest present in Uganda and reported to occur on *Petunia* × *hybrida*. Adults fly actively for short distances, but they are transported passively by wind currents, which enables long-distance spread. The pest can be present on host plant species in the surrounding environment of the nursery producing *Petunia* spp. and *Calibrachoa* spp. cuttings for export to the EU. The pest is very small and can enter the production greenhouse through defects in the greenhouse structure or through hitchhiking on nursery workers. Eggs and early stages are difficult to detect and may be present on the harvested cuttings. All life stages of *S. dorsalis* (eggs, larvae and adults) besides pupae, could be present on the leaves of *Petunia* spp. and *Calibrachoa* spp. unrooted cuttings. **Pest control measures applied during production** Unrooted cuttings are produced in dedicated units in officially registered greenhouses protected with thrips-proof netting. The starting material originates from the EU and is Elite certified (i.e. tested for several viruses and bacteria). All greenhouses have double doors. There are hygienic measures in place for nursery workers entering the production unit. Daily scouting is conducted by facilities. **Evaluation of control measures** If all the measures described (clean starting material, hygienic measures, insecticides) are implemented correctly, it is unlikely that the pest is present on the harvested and exported *Petunia* spp. and *Calibrachoa* spp. unrooted cuttings. **Main uncertainties** • Presence of unnoticed defects in the greenhouse structure. • The *S. dorsalis* population pressure in the surrounding environment of the nursery (presence and distribution of host plants in the surroundings). • Inclusion of *S. dorsalis* in the surveillance programme.				

5.2.8 | Overview of the evaluation of tomato spotted wilt virus

Overview of evaluation of tomato spotted wilt virus for unrooted cuttings					
Rating of the likelihood of pest freedom	**Pest free with some exceptional cases** (based on the median)				
Percentile of the distribution	5%	25%	Median	75%	95%
Proportion of pest-free plants	9956 out of 10,000 plants	9975 out of 10,000 plants	9994 out of 10,000 plants	9997 out of 10,000 plants	9999 out of 10,000 plants
Proportion of infected plants	1 out of 10,000 plants	3 out of 10,000 plants	6 out of 10,000 plants	25 out of 10,000 plants	44 out of 10,000 plants
Summary of the information used for the evaluation	**Possibility that the pest could become associated with the commodity** The thrips-transmitted tomato spotted wilt virus (TSWV) is present in Uganda. TSWV infects *Petunia* spp., tomato, pepper and potato in nature, but there are no records that *Calibrachoa* spp. are hosts. *Frankliniella occidentalis*, the most efficient vector of TSWV is present in Kenya. The virus can also be very efficiently transmitted by *Thrips tabaci* populations, which are also present in Uganda. Unrooted cuttings of *Petunia* spp. and *Calibrachoa* spp. can be infected by TSWV and/or infested by viruliferous thrips. The main pathway of entrance of TSWV from the surrounding environment in the nursery is through viruliferous thrips. **Pest control measures applied during production** The imported plant material (in vitro tissue cultures and unrooted cuttings) from the Netherlands and Germany is reported to be Elite certified and TSWV is included in the certification scheme. The mother plants used for the producing of cuttings to be exported are then grown in dedicated greenhouses, enclosed with thrips-proof nets (vector control). There are hygienic measures in place for nursery workers entering the production unit. Daily scouting is conducted by nursery staff. Mother plants for the production of cuttings are reported to be sampled according to RiBESS+ and tested for virus presence following the respective PM7 diagnostic standards of EPPO.				

(Continued)

Evaluation of control measures

Imported mother plants (Elite-certified material) are tested for TSWV to be certified and propagated plants are expected to be tested for TSWV as there is a PM7 diagnostic standards of EPPO. However, no details are given for the specific methods used for virus detection and identification and the specific virus targeted. Viruliferous thrips could enter the nursery through unnoticed holes in the insect-proof netting or through hitchhiking on nursery staff and introduce or spread TSWV. Thrips and especially their larvae are minute insects while TSWV infections are local on *Petunia* sp. therefore both are very difficult to be detected, especially in low infection/infection levels.

Main uncertainties

- The efficiency of detecting early thrips infestations and TSWV presence, especially in low infection levels.
- The efficiency of the sampling method and testing intensity to detect virus infections (if any).
- Infection (TSWV) and infestation (thrips) pressure in the environment of the nursery (presence and distribution of host plants in the surroundings).

5.2.9 | Outcome of expert knowledge elicitation

Table 10 and Figure 6 show the outcome of the EKE regarding pest freedom after the evaluation of the currently proposed risk mitigation measures for the selected pests. Specifically, Figure 6 provides the descending distribution function that describes the likelihood of pest freedom after evaluating the proposed risk mitigation measures for unrooted cuttings of *Petunia* and *Calibrachoa* spp., designated for export to the EU, with respect to aphid-transmitted viruses (potato leafroll virus, potato virus S), *B. tabaci*, *B. tabaci*-transmitted viruses (cowpea mild mottle virus, tomato yellow leaf curl virus, tomato leaf curl Uganda virus), contact-transmitted viroid and virus (potato spindle tuber viroid, potato virus X), *N. viridis*, *R. solanacearum* species complex (*R. solanacearum* and *R. pseudosolanacearum*), *S. dorsalis*, tomato spotted wilt virus (Figure 7).

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

	Pest(s)	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	Aphid-transmitted viruses (potato leafroll virus, potato virus S)							L	MU
2	*Bemisia tabaci* (non-European populations)						L		MU
3	*Bemisia tabaci*-transmitted viruses (cowpea mild mottle virus, tomato yellow leaf curl virus, tomato leaf curl Uganda virus)						LM		U
4	Contact-transmitted virus and viroid (potato virus X, potato spindle tuber viroid)					L	M		
5	*Nipaecoccus viridis*						L		MU
6	*Ralstonia solanacearum* species complex						L	M	U
7	*Scirtothrips dorsalis*						LM		U
8	Tomato spotted wilt virus						L	M	U

Panel A

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

Panel B

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

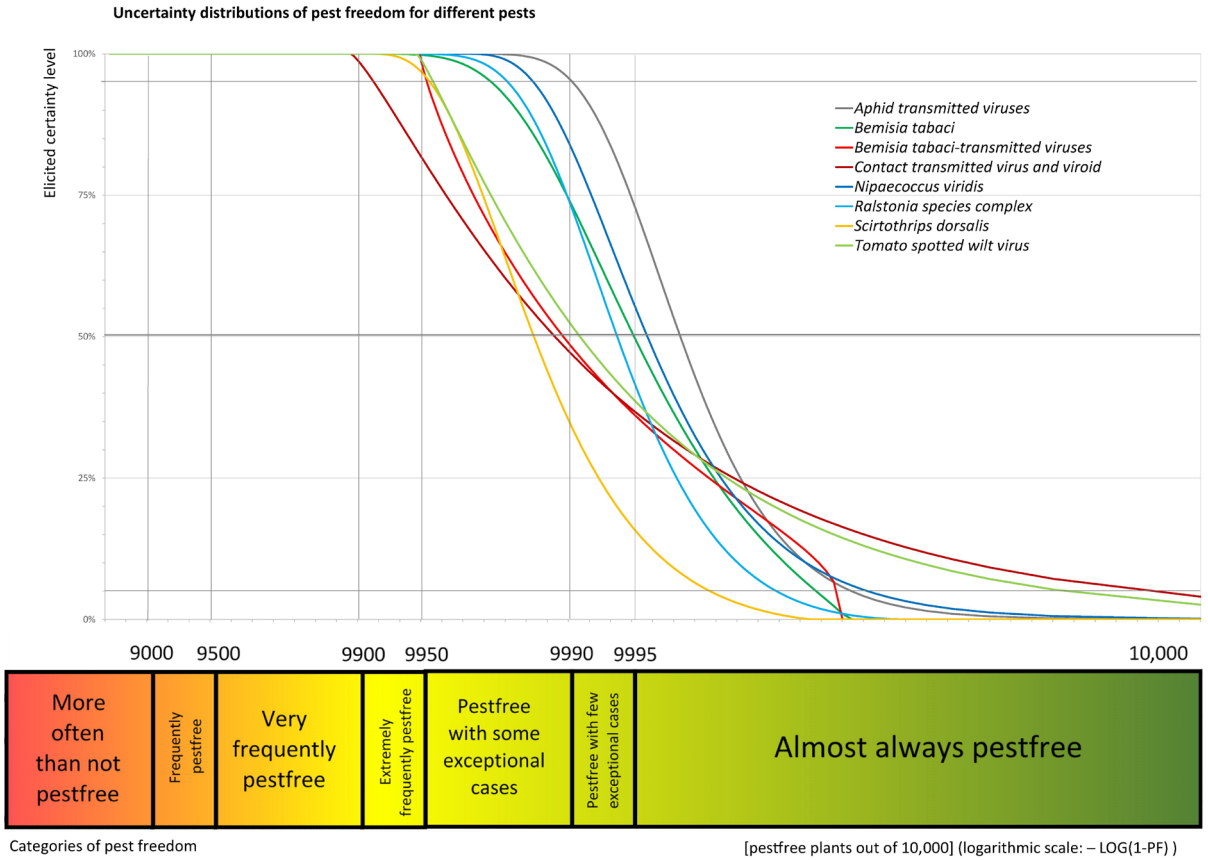

FIGURE 6 The elicited certainty (y-axis) of the number of pest-free *Petunia* spp. and *Calibrachoa* spp., unrooted cuttings (*x*-axis; log-scaled) out of 10,000 plants designated for export to the EU introduced from Uganda for all evaluated pests visualised as descending distribution function. Horizontal lines indicate the percentiles (starting from the bottom 5%, 25%, 50%, 75%, 95%).

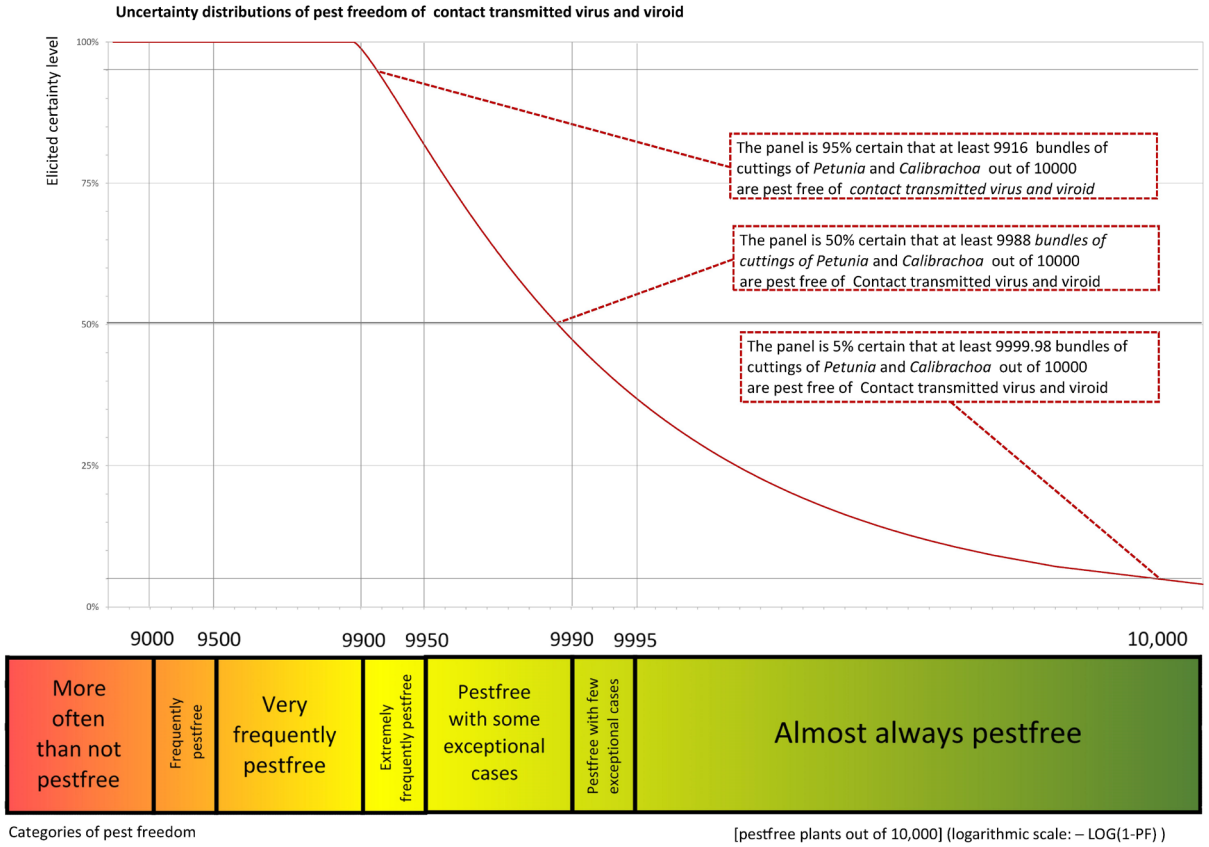

FIGURE 7 The explanation of the descending distribution function describing the likelihood of pest freedom for *Petunia* spp. and *Calibrachoa* spp. unrooted cuttings designated for export to the EU based on the example of contact-transmitted virus and viroid.

6 | CONCLUSIONS

Thirteen pests were identified to be present in Uganda and considered to be potentially associated with *Petunia* spp. and *Calibrachoa* spp. unrooted cuttings from Uganda and relevant for the EU. The likelihood of the pest freedom after the evaluation of the implemented risk mitigation measures for unrooted cuttings of *Petunia* spp. and *Calibrachoa* spp. designated for export to the EU was estimated.

For aphid-transmitted viruses (potato leafroll virus and potato virus S), 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 few exceptional cases' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9990 and 9999 plants per 10,000 will be free from aphid-transmitted viruses.

For *B. tabaci* (non-European populations), 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 few exceptional cases' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9977 and 9999 plants per 10,000 will be free from *B. tabaci*.

For *B. tabaci*-transmitted viruses (cowpea mild mottle virus, tomato yellow leaf curl virus, tomato leaf curl Uganda virus), the likelihood of pest freedom following evaluation of current risk mitigation measures was estimated as 'pest free with few exceptional cases' with the 90% uncertainty range reaching from 'pest free with few exceptional cases' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9953 and 9999 plants per 10,000 will be free from *B. tabaci*-transmitted viruses.

For contact-transmitted viroid and virus (potato virus X, potato spindle tuber viroid), the likelihood of pest freedom following evaluation of current risk mitigation measures was estimated as 'pest free with few exceptional cases' with the 90% uncertainty range reaching from 'extremely frequently pest free' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9916 and 9999 plants per 10,000 will be free from contact-transmitted viruses.

For *N. viridis*, 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 few exceptional cases' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9985 and 9997 plants per 10,000 will be free from *N. viridis*.

For *R. solanacearum* species complex (*R. solanacearum* and *R. pseudosolanacearum*), the likelihood of pest freedom following evaluation of current risk mitigation measures was estimated as 'pest free with few exceptional cases' with the 90% uncertainty range reaching from 'pest free with few exceptional cases' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9981 and 9999 plants per 10,000 will be free from *R. solanacearum* species complex.

For *S. dorsalis*, the likelihood of pest freedom following evaluation of current risk mitigation measures was estimated as 'pest free with few exceptional cases' with the 90% uncertainty range reaching from 'pest free with few exceptional cases' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9955 and 9997 plants per 10,000 will be free from *S. dorsalis*.

For tomato spotted wilt virus, the likelihood of pest freedom following evaluation of current risk mitigation measures was estimated as 'pest free with few exceptional cases' with the 90% uncertainty range reaching from 'pest free with few exceptional cases' to 'almost always pest free'. The EKE indicated, with 95% certainty, that between 9956 and 9997 plants per 10,000 will be free from tomato spotted wilt virus.

GLOSSARY

Control (of a pest)	Suppression, containment or eradication of a pest population (FAO, 2024a, 2024b)
Entry (of a pest)	Movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled (FAO, 2024b)
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2024b)
Impact (of a pest)	The impact of the pest on the crop output and quality and on the environment in the occupied spatial units
Introduction (of a pest)	The entry of a pest resulting in its establishment (FAO, 2024b)
Measures	Control (of a pest) is defined in ISPM 5 (FAO, 2024b) as 'Suppression, containment or eradication of a pest population' (FAO, 2024a). Control measures are measures that have a direct effect on pest abundance. Supporting measures are organisational measures or procedures supporting the choice of appropriate risk mitigation measures that do not directly affect pest abundance.
Pathway	Any means that allows the entry or spread of a pest (FAO, 2024b)
Phytosanitary measures	Any legislation, regulation or official procedure having the purpose to prevent the introduction or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests (FAO, 2024b)
Protected zone	A Protected zone is an area recognised at EU level to be free from a harmful organism, which is established in one or more other parts of the Union.
Quarantine pest	A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (FAO, 2024b)
Regulated non-quarantine pest	A non-quarantine pest whose presence in plants for planting affects the intended use of those plants with an economically unacceptable impact and which is therefore regulated within the territory of the importing contracting party (FAO, 2024b)

Risk mitigation measure	A measure acting on pest introduction and/or pest spread and/or the magnitude of the biological impact of the pest should the pest be present. A risk mitigation measure may become a phytosanitary measure, action or procedure according to the decision of the risk manager.
Spread (of a pest)	Expansion of the geographical distribution of a pest within an area (FAO, 2024b)

ABBREVIATIONS

AAP	acquisition access period
a.s.	active substances
APHA	Animal and Plant Health Agency
CABI	Centre for Agriculture and Bioscience International
CaCV	capsicum chlorosis virus
CPMMV	cowpea mild mottle virus
DCIC	Department of Crop Inspection and Certification
EKE	expert knowledge elicitation
EPPO	European and Mediterranean Plant Protection Organization
FAO	Food and Agriculture Organization
GBNV	groundnut bud necrosis virus
ISPM	International Standards for Phytosanitary Measures
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
MYSV	melon yellow spot virus
NPPO	National Plant Protection Organisation
PBNV	peanut necrosis virus
PLH	Plant Health
PLRV	potato leafroll virus
PRA	Pest Risk Assessment
PSTVd	potato spindle tuber viroid
PVS	potato virus S
PVX	potato virus X
PZQPs	protected zone quarantine pests
RiBESS	Risk-Based Estimator for Surveillance Systems
RNQPs	Regulated Non-Quarantine Pests
TC	tissue culture
TLCUV	tomato leaf curl Uganda virus
TSWV	thrips-transmitted tomato spotted wilt virus
TYLCV	tomato yellow leaf curl virus
URCs	unrooted cuttings
WsMoV	watermelon silver mottle virus

REQUESTOR

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SUPPORTING INFORMATION

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

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APPENDIX A

Datasheets of pests selected for further evaluation

A.1 | APHID-TRANSMITTED VIRUSES (POTATO LEAFROLL VIRUS, POTATO VIRUS S)

A.1.1 | Organism information

Taxonomic information	**1. Potato leafroll virus (PLRV)** **Current valid scientific name**: *Polerovirus* PLRV **Synonyms/Common names**: Potato leafroll virus, potato leafroll luteovirus, potato leafroll polerovirus, PLRV (ICTV; EPPO, online) **EPPO code**: PLRV00 **Name used in the EU legislation**: Potato leafroll virus **Group:** Virus **Order:** Pisoniviricetes **Family**: Solemoviridae **2. Potato virus S (PVS)** **Current valid scientific name**: *Carlavirus sigmasolani* **Synonyms/Common names**: Potato virus S, potato S carlavirus, pepino latent virus, PVS (ICTV; EPPO, online) **EPPO code**: PVS000 **Name used in the EU legislation**: Potato virus S **Group:** Virus **Order:** Sobelivirales **Family**: Betaflexiviridae **Reasons for clustering:** the above-listed viruses are both transmitted by aphids. Although they belong to different genus, their epidemiology shares sufficient commonalities to justify their clustering.		
Regulatory status	The non-EU isolates of PLRV and PVS are regulated as Quarantine pests not known to occur in the union territory in Commission Implementing Regulation (EU) 2019/2072, Annex II, Part A.		
Pest status in Uganda	PLRV and PVS are present (EPPO; CABI, online; Priegnitz et al., 2019).		
Pest status in the EU	Not relevant for EU Quarantine pests		
Host status on Petunia spp. and Calibrachoa spp.	**Virus**	***Petunia*/*Calibrachoa* spp. host status**	**Solanaceae host plants**
	PLRV	Uncertain. *Petunia* spp. are likely to be hosts	Most known hosts (about 20 species) are in the Solanaceae family (Harrison, 1984)
	PVS	Uncertain. *Petunia* spp. are likely to be hosts	Natural host range is restricted to some species in the families Solanaceae, including tomato and potato, and Chenopodiaceae
	There are no records that *Petunia* spp. and *Calibrachoa* spp. are hosts of PLRV and PVS. Given their host range especially among solanaceous species, the Panel considered likely that these viruses infect Petunia spp. and Calibrachoa spp.		
PRA information	Pest categorisation of non-EU viruses and viroids of potato (EFSA PLH Panel, 2020)		

Other relevant information for the assessment

Biology

Transmission

PLRV: PLRV occurs almost worldwide in all potato growing areas. PLRV is transmitted by several aphid species, such as *Myzus persicae*, *Macrosiphum euphorbiae*, *Aulacorthum solani*, *Aphis gossypii* and *Aphis fabae*, in a persistent, circulative manner, whereas *M. persicae* is considered the main and the most effective vector of the virus in nature (CABI, 2021; Singh et al., 1988; Taliansky et al., 2003).

PVS: PVS is one of the most prevalent potato viruses globally (Topkaya et al., 2023).

PVS: The host range of PVS is restricted to few species, including some species in the Solanaceae family: *Arracacia xanthorrhiza, Lamium purpureum, Solanum lycopersicum, Solanum phureja, Solanum tuberosum* (major host) (EPPO, online). It is transmitted by several aphid species, especially *M. persicae, Aphis frangulae, A. nasturtii, A. fabae* and *Rhopalosiphum padi* in a non-persistent manner (Santillan et al., 2018). Different strains/isolates of the virus exhibit different molecular and/or biological (host range and transmission properties) profile (Topkaya et al., 2023).

Host range and distribution of host plants in the environment

PLRV: The host range of PLRV includes: *Capsella bursa-pastoris, Capsicum annuum, Cicer arietinum, Corchorus olitorius, Cyphomandra betacea, Fritillaria thunbergii, Gossypium hirsutum, Lens culinaris, Sisymbrium altissimum, Solanum acaule, Solanum lycopersicum, Solanum phureja, Solanum quitoense, Solanum sarrachoides, Solanum tuberosum* (major host), *Solanum viarum, Ullucus tuberosus* (major host), *Vicia faba* (CABI, online; Sastry et al., 2019).

PVS: The host range of PVS is narrow and restricted to some species in the families Solanaceae and Chenopodiaceae: *Arracacia xanthorrhiza, Lamium purpureum, Solanum lycopersicum, Solanum phureja, Solanum tuberosum* (major host) (EPPO, online).

Uncertainty on host range

The host status of *Petunia* spp. and *Calibrachoa* spp. for PLRV and PVS.

(Continued)

	Ecology and biology of the vectors The aphid vectors of PLRV and PVS occur in Uganda, including *M. persicae*, the most efficient vector of all aphid-transmitted viruses (CABI, online). Although the aphid-transmitted viruses may be transmitted by all aphid developmental stages, they are mainly spread by the alatae. **Uncertainty on ecology and biology of the vectors** The prevalence and distribution of aphid vector species in Uganda. **Symptoms on *Petunia/Calibrachoa*** Virus- induced symptoms vary according to the host species and cultivar, the virus isolate/strain, the environmental conditions and the developmental stage of the plant upon infection. There is no record of *Petunia* spp. or *Calibrachoa* spp. infection by PLRV or PVS. Symptoms on potato by most viruses may include chlorosis, necrosis and leaf curling (Sastry et al., 2019); however, PVS infections may remain symptomless (Santillan et al., 2018). **Uncertainties on symptoms on Petunia/Calibrachoa spp**. The host status of *Petunia* spp. and *Calibrachoa* spp. for PLRV and PVS and the symptoms caused by the different strains especially of PVS.
Evidence that the commodity can be a pathway	Unrooted cuttings of *Petunia* spp. and *Calibrachoa* spp. can be infected by PLRV and PVS. Also, the exported commodity may be infested by viruliferous aphids which can act as an additional pathway for PLRV due to the persistency of this virus in its aphid vectors.

A.1.2 | Possibility of pest presence in the nursery

A.1.2.1 | Possibility of entry from the surrounding environment

The natural host range of PLRV and to a lesser extent of PVS, includes weeds and other annual or perennial plants that may be found in the surrounding environment of the nursery and can act as virus reservoirs. These viruses and at least *M. persicae* that is their most efficient vector are present in Uganda. Defect in the insect proof structure of the production greenhouses could enable aphids to enter, as well as hitchhiking aphids on persons or materials entering the greenhouse. Therefore, the infestation of plants in the nursery with viruliferous aphids, that acquire the virus from the surrounding environment, is the main entry pathway of PLRV and PVS in the nursery. PVS is non-persistently transmitted i.e. aphids can only transmit for only very short period of time and therefore present a limited risk compared to the persistently transmitted PLRV. However, aphid presence in the production greenhouses is continuously monitored using yellow traps and insecticides are applied, therefore is highly unlikely for these viruses to enter the nursery via viruliferous aphids from the surrounding environment.

Uncertainties:

- Presence of defects in the greenhouse structure.
- Infection (virus) and infestation (aphid vectors) pressure in the surroundings.
- Presence and distribution of host plants in the surroundings.

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

Plant material (unrooted cuttings without soil or tissue culture material) for *Petunia* sp. and *Calibrachoa* sp. mother plants used for the production of unrooted cuttings originate from the Netherlands and Germany (https://iribov.com/departments-and-serv/naktuinbouw-elite-certification/), (https://www.brandkamp.de/en/). The certification scheme in place for *Petunia* spp. and *Calibrachoa* spp. does not include PLRV and PVS, however, the non-EU isolates of PLRV and PVS are not present in the EU.

A.1.2.3 | Possibility of spread within the nursery

Petunia spp. and *Calibrachoa* spp. are cultivated in compartments dedicated for their cultivation without mixing with other crop/plants (Dossier Section 2, reply 4). However, other plants (solanaceous and non-solanaceous) possible hosts of PLRV and PVS are cultivated, and aphids could be present in other greenhouses/compartments of the nursery. No data is provided for the identity, proportion, origin and phytosanitary status of plants other than *Petunia* spp. and *Calibrachoa* spp. produced in the same nursery. *Myzus persicae* is the most efficient vector of all aphid-transmitted viruses occurring in greenhouses and a major pest of ornamentals (CABI, online). Viruliferous aphids could spread PLRV and PVS between the different or within the same greenhouse/compartment. These viruses may also spread by vegetative propagation of infected mother plants. There are strict hygiene conditions inside the nursery that may prevent the spread of the aphids within the nursery compartments, while the probability of alatae aphid infestation is low.

Uncertainties:

- the presence and density of PLRV and PVS and aphids-vectors in the nursery;
- the presence and phytosanitary status for PLRV and PVS of other host plant species (solanaceous, non-solanaceous) growing in the same nursery.

A.1.3 | Information from interceptions

There were no interceptions of the aphid-transmitted virus listed above on any imported commodity from Uganda, or on *Petunia* spp./*Calibrachoa* spp. from all origins (EUROPHYT and TRACES, online).

A.1.4 | Evaluation of the risk mitigation measures

In the table below, all risk mitigation measures currently applied in Uganda are listed and an indication of their effectiveness on aphid-transmitted viruses is provided. The description of the implemented risk mitigation measures is provided in Table 9.

No.	Risk mitigation measure	Effect (yes/No)	Evaluation and uncertainties
1	Growing plants in isolation	Yes	Description The unrooted cuttings to be exported from Uganda will be grown and harvested from greenhouse production facilities approved by the NPPO. The cuttings are grown in closed greenhouses (closed production). A double-door entry system is used to control temperatures in the greenhouse as well as mitigate entry of pests. *Petunia* spp. and *Calibrachoa* spp. are produced in separate units. Evaluation The insect-proof netting prevents the introduction of insects from the surrounding environment. However, aphids may be introduced through defects in the greenhouse or as hitchhiking on workers. Uncertainties Presence of unnoticed defects in the greenhouse structure
2	Dedicated hygiene measures	Yes	Description For accessing the greenhouse there is a double door system. Changing rooms and disinfection facility allow the personnel to wear dedicated boots and clothes before entering the greenhouse. There are dedicated tools used for each greenhouse unit. Each unit has a specific set of clothes including a disinfection area. Evaluation The double door system can be effective in preventing the entry of aphids via active flying and entry and spread of the aphid-transmitted viruses. Uncertainties The strictness of the measures applied.
3	Treatment of growing media	No	Description The plants for planting from which the cuttings are harvested are grown in a soilless medium. The growing media used in production and at the moment of export is according to ISPM 40 (FAO, 2017a) and to the NPPO Uganda requirements.
4	Quality of source plant material	Yes	Description All the intended planting materials are to be imported from mother companies in the Netherlands and Germany (Dossier section 1). These are Elite-certified materials in the form of TC plantlets or URCs for further multiplication in Uganda. Upon arrival in Uganda, the NPPO conducts documentary and identity checks at entry before dispatch to post quarantine in contained facilities at the production farms. Evaluation PLRV and PVS is not included in the certification scheme applied therefore plants are not expected to be tested for PLRV and PVS. Uncertainties None.
5	Crop rotation	Yes	Description No crop rotation takes place. Specific greenhouses units are used for producing *Petunia* spp. and *Calibrachoa* spp. Evaluation No crop rotation with non-host plants takes place. In case of introduction into the greenhouse, populations of aphid vectors may build up since the same unit is used for production of *Petunia* spp. and *Calibrachoa* spp. Uncertainties None.
6	Disinfection of irrigation water	No	Description The irrigation water is treated with sodium chloride and UV irradiation (Dossier Section 1).
7	Pest monitoring and inspections	Yes	Description The presence of pests and symptoms in plants is monitored, including yellow sticky traps, on a daily basis by nurseries staff. A compiled weekly report is produced by the scouting team, which is used to decide the weekly pest control measures in the greenhouses (Dossier Section 1).

(Continued)

No.	Risk mitigation measure	Effect (yes/No)	Evaluation and uncertainties
			Evaluation Yellow sticky traps are effective to detect the presence of alate aphids. Monitoring could detect virus-infected petunia plants. However, early infections cannot be detected due to the lack of symptoms. Uncertainties • The efficiency of yellow sticky traps to detect early aphid infestations. • The efficiency of monitoring and inspection. • The symptoms on *Petunia* spp. and *Calibrachoa* spp. and the length of the latent period till the expression of symptoms.
8	Treatment of crop during production	Yes	Description Fungicides, insecticides, acaricides and biological control agents are applied on weekly basis, following scouting inspections and are reported in Dossier Section 4 (Table E1.1–6). Rotation among active substances (a.s.) is adopted to prevent the development of insecticide resistance. Details on the a.s. are reported in Dossier Section 4. Evaluation The products used are known to control a range of insect species (including and aphids). Aphids are easier to control than other insect vectors. Uncertainties The efficiency of the applied insecticides against aphid species that might have developed insecticide resistance.
9	Sampling and testing	Yes	Description A detailed protocol for sampling and testing plants is described in Dossier Section 4. The sampling Protocol is implemented according to Risk-Based Estimator for Surveillance Systems (RiBESS+) (https://r4eu.efsa.europa.eu/app/ribess). A subsample per variety, per batch is sent to the accredited laboratory for further pest analyses. The testing procedures follow the PM7 diagnostic standards of EPPO (https://www.eppo.int/RESOURCES/eppo_standards/pm7_diagnostics). Evaluation PLRV and PVS are not included in the PM7 diagnostic standards of EPPO therefore *Petunia* spp. and *Calibrachoa* spp. are not expected to be tested for these viruses. Uncertainties • If PLRV and PVS are included in the testing procedure. • If tested samples are representative/efficient to detect infections (size of bulk samples, subsamples etc).
10	Official supervision by NPPO	Yes	Description NPPO Uganda conducts a 3-week to monthly pest surveillance frequency to monitor pest incidence and prevalence on each plant variety and species guided by the pests relevant for the EU. NPPO Uganda enforces compliance with phytosanitary measures as provided for in the EU Directive 2016/2031. Evaluation No official measures present for aphid control in the production system. Uncertainties The intensity and the design of surveillance scheme for aphids and the aphid-transmitted viruses (if any).

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

A.1.5.1 | Comparison with other relevant commodity Risk Assessments involving aphid-transmitted viruses

PLRV and PVS were already assessed for the commodity risk assessment of *Petunia* spp. and *Calibrachoa* spp. unrooted cuttings from Kenya (EFSA PLH Panel, 2024). The similarities between the dossiers of Uganda and Kenya are:

- The type of commodity exported: unrooted cuttings of *Petunia/Calibrachoa* spp. of similar size and age.
- The production system (production in greenhouse in separate units and dedicated hygiene measures) and climatic and environmental conditions are very similar compared to Kenya.
- The inoculum pressure in the surrounding environment is expected to be similar.
- The starting material originates in both countries from EU countries and is certified material.
- No regular testing is done for PLRV and PVS in both countries.
- No differences in the effect of the risk mitigating measures were identified.

Because no major differences were identified the Panel applied the results and reasoning of the Expert Knowledge Elicitation (EKE) of pest freedom of PLRV and PVS from unrooted cuttings of *Petunia/Calibrachoa* spp. from Kenya (EFSA PLH Panel, 2024).

There is low uncertainty about the protective effect of the greenhouse structure.

A.1.6 | Elicitation outcomes of the assessment of the pest freedom for aphid-transmitted viruses

The elicited and fitted values for aphid-transmitted viruses for pest infestation and pest freedom agreed by the Panel are shown in Tables A.1and A.2 and in Figure A.1.

TABLE A.1 Elicited and fitted values of the uncertainty distribution of pest infestation by aphid-transmitted viruses per 10,000 unrooted cuttings.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0					2		3		5					20
EKE	0.152	0.282	0.454	0.746	1.10	1.5	1.96	2.94	4.21	5.07	6.23	7.67	9.56	11.4	13.8

Note: The EKE results is the *BetaGeneral (1.5414, 4157.9, 0, 10,000)* distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infected plants the pest freedom was calculated (i.e. = 10,000 – number of infected plants per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.2.

TABLE A.2 The uncertainty distribution of plants free of aphid-transmitted viruses per 10,000 unrooted cuttings calculated by Table A.1.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9980					9995		9997		9999					10,000
EKE results	9986	9989	9990	9992	9994	9995	9996	9997	9998.0	9998.5	9998.9	9999.3	9999.5	9999.7	9999.8

Note: The EKE results are the fitted values.

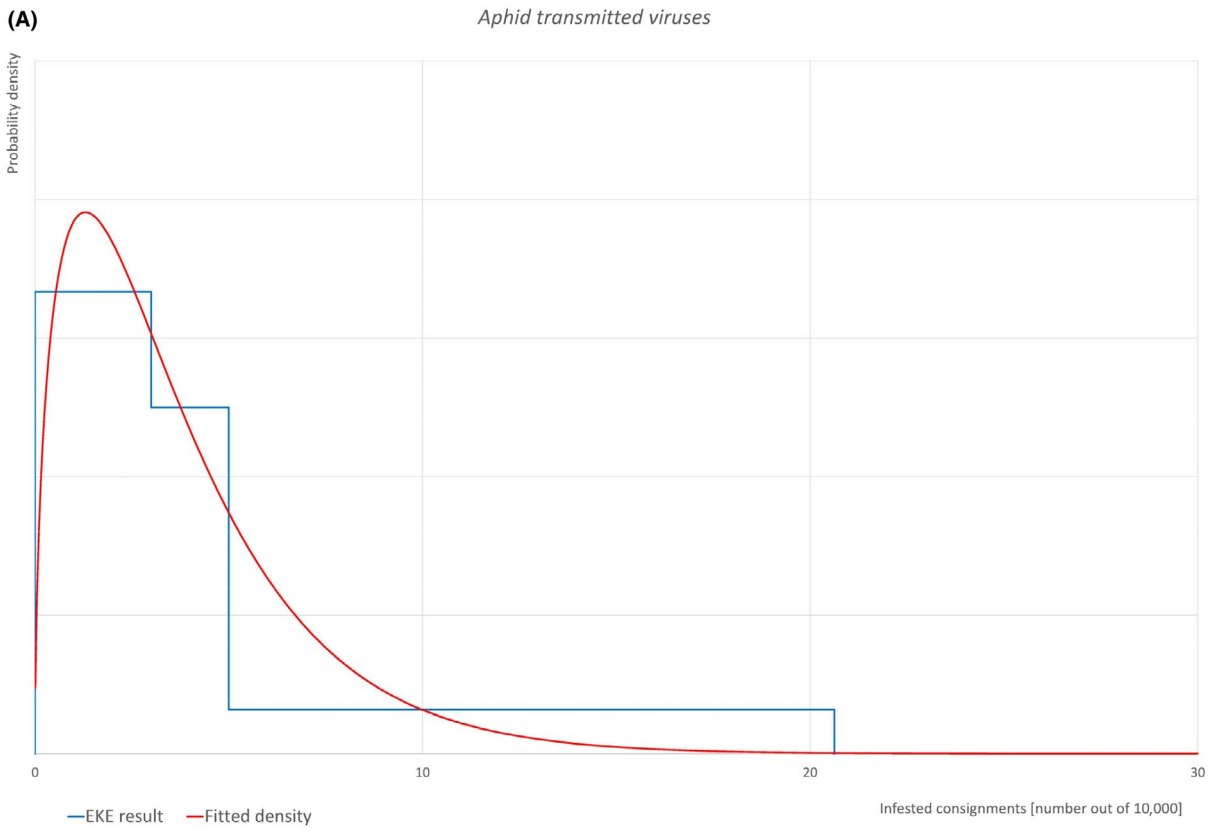

FIGURE A.1 (Continued)

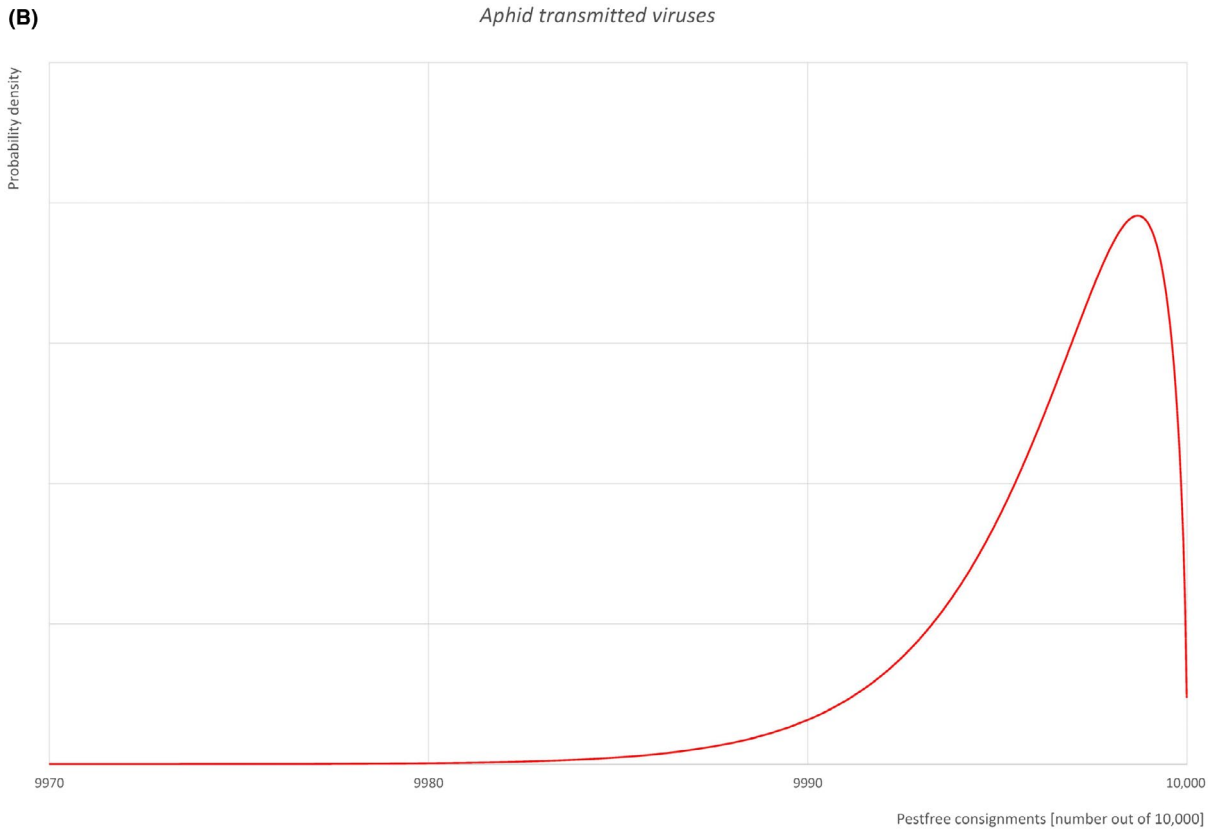

FIGURE A.1 (Continued)

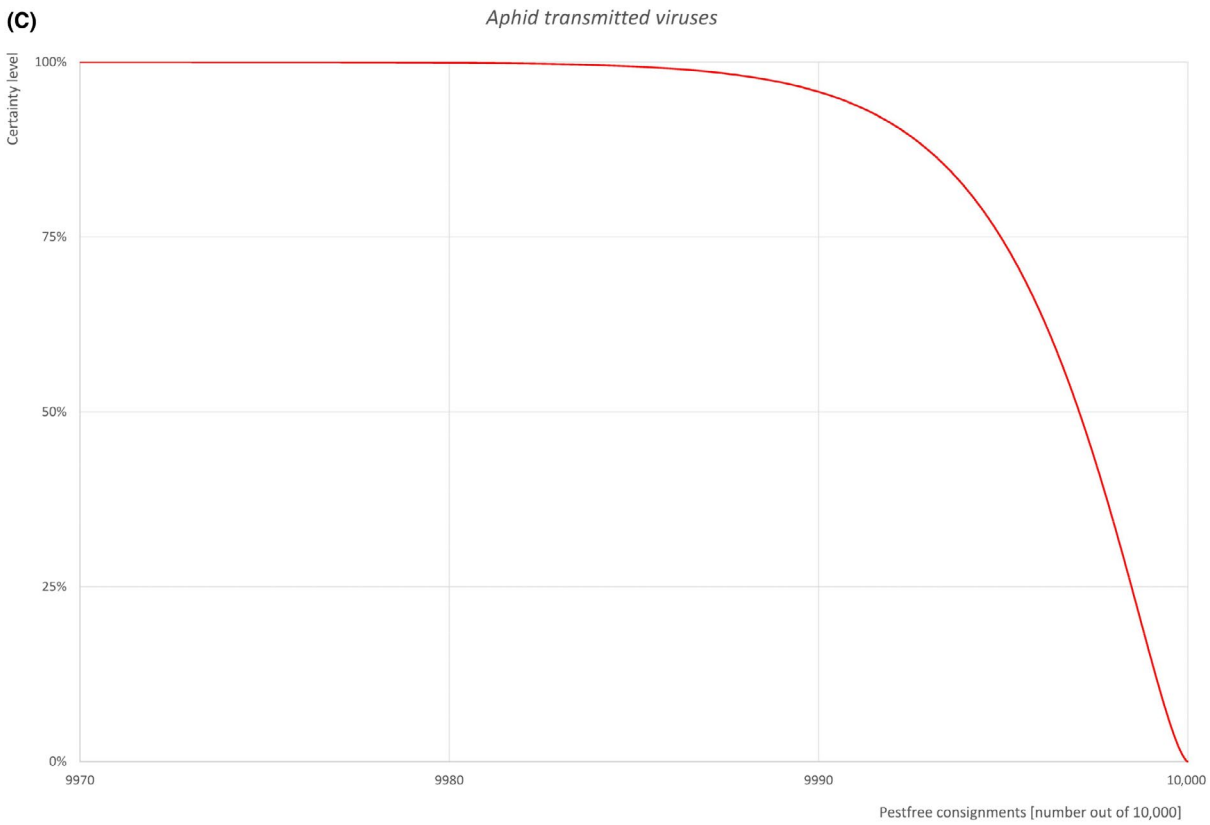

FIGURE A.1 (A) Elicited uncertainty of pest infection per 10,000 plants of unrooted cuttings (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free plants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

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A.2 | *BEMISIA TABACI* (NON-EUROPEAN POPULATIONS)

A.2.1 | Organism information

Taxonomic information	**Current valid scientific name:** *Bemisia tabaci* (Gennadius, 1889) **Synonyms:** *Aleurodes inconspicua*, *Aleurodes tabaci*, *Bemisia achyranthes*, *Bemisia bahiana*, *Bemisia costa-limai*, *Bemisia emiliae*, *Bemisia goldingi*, *Bemisia gossypiperda*, *Bemisia gossypiperda mosaicivectura*, *Bemisia hibisci*, *Bemisia inconspicua*, *Bemisia longispina*, *Bemisia lonicerae*, *Bemisia manihotis*, *Bemisia minima*, *Bemisia minuscula*, *Bemisia nigeriensis*, *Bemisia rhodesiaensis*, *Bemisia signata*, *Bemisia vayssieri* **EPPO code:** BEMITA **Name used in the EU legislation**: *Bemisia tabaci* Genn. (non-European populations) known to be vector of viruses [BEMITA] **Group**: Insect **Order**: Hemiptera **Family**: Aleyrodidae **Common name:** tobacco whitefly, cassava whitefly, cotton whitefly, silver-leaf whitefly, sweet-potato whitefly
Regulatory status	The pest is listed in Annex II/A of Commission implementing Regulation (EU) 2019/2072 as *Bemisia tabaci* Genn. (non-European populations) known to be vector of viruses [BEMITA], and in Annex III as Protected Zone Quarantine Pest (European populations).
Pest status in Uganda	*Bemisia tabaci* is present in Uganda (present no details) (CABI, online; EPPO, online). In the Dossier Section 1, it is stated that *B. tabaci* is regularly reported at the production site.
Pest status in the EU	Not relevant for EU Quarantine pest
Host status on Petunia sp. and Calibrachoa sp.	Certain *Petunia* species (*Petunia* sp., *P. axillaris*, *P. grandiflora*, *P. integrifolia*, *P. hybrida*) and *Calibrachoa* sp. are reported as host plants for *B. tabaci* (EPPO, online). *Petunia hybrida* is reported as field-verified host plant for *B. tabaci in* China, Iran and Türkiye (Bayhan eta al. 2006; Li et al. 2011; Samin et al. 2015). In Brasil, *B. tabaci is reported to infest* petunia plants in commercial green greenhouses (de Moraes et al. 2017).
PRA information	• Scientific Opinion on the risks to plant health posed by *Bemisia tabaci* species complex and viruses it transmits for the EU territory (EFSA PLH Panel, 2013) • Scientific Opinion on the commodity risk assessment of *Persea americana* from Israel (EFSA PLH Panel, 2021) • Scientific report on the commodity risk assessment of specified species of *Lonicera* potted plants from Turkey (EFSA PLH Panel, 2022a) • Scientific Opinion on the commodity risk assessment of *Jasminum polyanthum* unrooted cuttings from Uganda (EFSA PLH Panel, 2022b) • UK Risk Register Details for *Bemisia tabaci* non-European populations (DEFRA, online) • Scientific Opinion on the commodity risk assessment of *Petunia* spp. *and Calibrachoa* spp. unrooted cuttings from Kenya (EFSA PLH Panel, 2024)
Other relevant information for the assessment	
Biology	*Bemisia tabaci* is a complex of at least 40 cryptic species that are morphologically identical but distinguishable at molecular level (Khatun et al., 2018). The species differ from each other in host association, spread capacity, transmission of viruses and resistance to insecticides (De Barro et al., 2011). It is an important agricultural pest that can transmit more than 121 viruses (belonging to genera Begomovirus, Crinivirus, Ipomovirus, Carlavirus and Torradovirus) and cause significant damage to major food crops such as *Solanaceous* and cucurbits crops and ornamental plants (EFSA PLH Panel, 2013). *Bemisia tabaci* adult is about 1 mm long. It develops through three life stages: egg, nymph (four instars) and adult (Walker et al., 2009). Nymphs of *B. tabaci* mainly feed on phloem in minor veins of the underside leaf surface (Cohen et al., 1996). Adults feed on both phloem and xylem of leaves (Walker et al., 2009).

(Continued)

	Bemisia tabaci is multivoltine with up to 15 generations per year (Ren et al., 2001). The life cycle from egg to adult requires from 2.5 weeks up to 2 months depending on the temperature (Norman et al., 1995) and the host plant (Coudriet et al., 1985). *B. tabaci* has a high reproductive potential and each female can lay more than 300 eggs during their lifetime (Gerling et al., 1986), which can be found mainly on the underside of the leaves (CABI, online). During oviposition, females insert eggs with the pedicel directly into leaf tissue (Paulson and Beardsley, 1985). Out of all life stages, only the first instar nymph (crawler) and adults are mobile. Movement of crawlers by walking is very limited, usually within the leaf where they hatched (Price and Taborsky, 1992) or to more suitable neighbouring leaves. The average distance was estimated to be within 10–70 mm (Summers et al., 1996). For these reasons, they are not considered to be good colonisers. On the contrary, adults can fly reaching quite long distances in a search of a permanent host. According to Cohen et al. (1988), some of the marked individuals were trapped 7 km away from the initial place after 6 days. Long-distance passive dispersal by wind is also possible (Byrne, 1999).	
Symptoms	**Main type of symptoms**	Wide range of symptoms can occur on plants due to direct feeding of the pest, contamination of honeydew and sooty moulds, transmitted viruses and phytotoxic responses. Plants exhibit one or more of these symptoms: chlorotic spotting, vein yellowing, intervein yellowing, leaf yellowing, yellow blotching of leaves, yellow mosaic of leaves, leaf curling, leaf crumpling, leaf vein thickening, leaf enations, leaf cupping, stem twisting, plant stunting, wilting, leaf loss and silvering of leaves (CABI, online; EPPO, 2004).
	Presence of asymptomatic plants	No asymptomatic period is known to occur in the infested plants. However, eggs and first instar larvae are difficult to detect. Symptoms of the infestation by the insect are visible.
	Confusion with other pathogens/pests	*Bemisia tabaci* can be easily confused with other whitefly species such as *B. afer, Trialeurodes lauri, T. packardi, T. ricini, T. vaporariorum* and *T. variabilis*. A microscopic slide is needed for morphological identification (EPPO, 2004). Different species of *B. tabaci* complex can be distinguished using molecular methods (De Barro et al., 2011).
Host plant range	*Bemisia tabaci* is a polyphagous pest with a wide host range, including more than 1000 different plant species (Abd-Rabou and Simmons, 2010).	
Life stages expected to be on the commodity	All life stages of *B. tabaci* (eggs, larvae and adults) are present on the leaves of the plants and could be present on unrooted cuttings of *Petunia*.	

A.2.2 | Possibility of pest presence in the nursery

A.2.2.1 | Possibility of entry from the surrounding environment

Bemisia tabaci is a polyphagous whitefly that is present in Uganda (EPPO GD, CABI). *B. tabaci* is reported to be regularly found at production sites. Flying adults of *B. tabaci* can be transferred by the wind over kilometres and could enter the nursery from host plants that might be present in the surrounding environment. *Petunia/Calibrachoa* cuttings are produced in a greenhouse protected against insects by screened windows and double doors. Small insects as *B. tabaci* (1mm) may enter the greenhouse through defects in the protective screens or as hitchhiker on clothes of nursery staff. The use of yellow sticky cards to monitor insect presence suggests that insects are able to enter the production facilities.

Uncertainties:

- The *B. tabaci* population pressure in the surrounding environment of the nursery (presence and distribution of host plants in the surroundings).
- The presence of defects in the greenhouse structure.

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

The probability that *B. tabaci* is present on the starting material is very low/negligible as the imported material originate from the EU and it is certified (Elite) and is kept in the post-quarantine facility before released to the nursery.

A.2.2.3 | Possibility of spread within the nursery

Bemisia tabaci can be present in other host plants (perennials, bedding plants and succulents that are mainly intended to be exported to the EU, but not for the local markets) in other production units of the nursery. When present, flying adults can spread from infested host plants within the nursery. *Petunia* for export are produced in a separate unit with hygienic standards (double doors, clean uniforms) with no mixing with the other ornamentals. If *B. tabaci* is detected, the production unit will be under official control.

Uncertainties:

Specific host plants of *B. tabaci* other than *Petunia* spp. and *Calibrachoa* spp. that are grown in the nursery and their official control measures.

A.2.3 | Information from interceptions

Bemisia tabaci is an highly intercepted pest species on plants for planting in the EU, including unrooted cuttings. There were 26 interceptions of *B. tabaci* on different commodities (*Amaranthus* sp.: two; *Chlorophytum* sp.: one; *Chrysanthemum* sp.: one; *Eupatorium* sp.: two; *Manhiot esculenta*: three; *Melissa officinalis*: two; *Ocimum basilicum*: two; *Persicaria* sp.: nine; *Rosa* sp.: four) on commodities imported into the EU from Uganda. There are two records of interceptions of *B. tabaci* on *Petunia* sp. and one records of interception on *Calibrachoa* sp. from Israel (EUROPHYT and TRACES, online).

A.2.4 | Evaluation of the risk mitigation measures

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

No.	Risk mitigation measure	Effect (Yes/No)	Evaluation and uncertaines
1	Growing plants in isolation	Yes	Description The unrooted cuttings to be exported from Uganda will be grown and harvested from greenhouse production facilities approved by the NPPO. The cuttings are grown in closed greenhouses (closed production). A double-door entry system is used to control temperatures in the greenhouse as well as mitigate entry of pests. *Petunia* spp. and *Calibrachoa* spp. are produced in separate units. Evaluation The thrips-proof netting prevents the introduction of whiteflies from the surrounding environment. However, *B. tabaci* adults may be introduced through defects in the greenhouse. Uncertainties Presence of unnoticed defects in the greenhouse structure.
2	Dedicated hygiene measures	Yes	Description For accessing the greenhouse there is a double door system. Changing rooms and disinfection facility allow the personnel to wear dedicated boots and clothes before entering the greenhouse. There are dedicated tools used for each greenhouse unit. Each unit has a specific set of clothes including a disinfection area. Evaluation The measures prevent the entrance and spread in the nursery of hitchhiking crawlers of *B. tabaci*. Uncertainties It is not known if there is an additional change and disinfection area before entering the *Petunia/Calibrachoa* spp. production units.
3	Treatment of growing media	No	Description The plants for planting from which the cuttings are harvested are grown in a soilless medium. The growing media used in production and at the moment of export is according to ISPM 40 (FAO, 2017a) and to the NPPO Uganda requirements.
4	Quality of source plant material	Yes	Description All the intended planting materials are to be imported from mother companies in the Netherlands and Germany (Dossier section 1). These are Elite-certified materials in the form of TC plantlets or URCs for further multiplication in Uganda. Upon arrival in Uganda, the NPPO conducts documentary and identity checks at entry before dispatch to post quarantine in contained facilities at the production farms. Evaluation The probability that *B. tabaci* is present on the certified starting material is very low/ negligible. Uncertainties None.
5	Crop rotation	Yes	Description No crop rotation takes place. Specific greenhouses units are used for producing *Petunia* spp. and *Calibrachoa* spp. Evaluation No crop rotation with non-host plants takes place. In case of introduction into the greenhouse, populations of *B. tabaci* may build up since the same unit is used for production of *Petunia* spp. and *Calibrachoa* spp. Uncertainties None.

(Continued)

No.	Risk mitigation measure	Effect (Yes/No)	Evaluation and uncertaines
6	Disinfection of irrigation water	No	Description The irrigation water is treated with sodium chloride and UV irradiation (Dossier Section 1).
7	Pest monitoring and inspections	Yes	Description The presence of pests and symptoms in plants is monitored, including yellow sticky traps, on a daily basis by nurseries staff. A compiled weekly report is produced by the scouting team, which is used to decide the weekly pest control measures in the greenhouses (Dossier Section 1). Evaluation Populations of *B. tabaci* are monitored through sticky traps and the presence of the pest in the nursery may be detected at an early stage. Early infestation of *B. tabaci* in the crop may be difficult to detect. Uncertainties The efficiency of detecting the early infestations of *B. tabaci*.
8	Treatment of crop during production	Yes	Description Fungicides, insecticides, acaricides and biological control agents are applied on weekly basis, following scouting inspections and are reported in Dossier Section 4 (Table E1.1–6). Rotation among active substances (a.s.) is adopted to prevent the development of insecticide resistance. Details on the a.s. are reported in Dossier Section 4. Evaluation The products used may have an effect on populations of *B. tabaci*. Uncertainties The level of resistance against the listed insecticides of *B. tabaci* populations in Uganda.
9	Sampling and testing	Yes	Description A detailed protocol for sampling and testing plants is described in Dossier Section 4. The sampling Protocol is implemented according to Risk-Based Estimator for Surveillance Systems (RiBESS+) (https://r4eu.efsa.europa.eu/app/ribess). The testing procedures follow the PM7 diagnostic standards of EPPO (https://www.eppo.int/RESOURCES/eppo_standards/pm7_diagnostics). A subsample of all the picked samples (per variety, per batch) is sent to the accredited laboratory for further pest analyses. Evaluation Sampling for virus testing may detect the presence of *B. tabaci*. Uncertainties The efficiency of detecting the early infestations of *B. tabaci*.
10	Official supervision by NPPO	Yes	Description NPPO Uganda conducts a 3-week to monthly pest surveillance frequency to monitor pest incidence and prevalence on each plant variety and species guided by the pests relevant for the EU. NPPO Uganda enforces compliance with phytosanitary measures as provided for in the EU Directive 2016/2031. Evaluation Official measures are targeted to *B. tabaci* and may efficiently prevent the presence of *B. tabaci* on unrooted cuttings designated for export to the EU. Uncertainties The efficiency of detecting the early infestations of *B. tabaci*.

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

A.2.5.1 | Comparison with other relevant commodity Risk Assessments involving *Bemisia tabaci*

Bemisia tabaci was already assessed as relevant pest for the commodity risk assessment of *Petunia* and *Calibrachoa* from Kenya (EFSA PLH Panel, 2024). The similarities between the dossier are:

- The type of commodity exported: unrooted cuttings of *Petunia/Calibrachoa* spp. of similar size and age;
- The production system (production in greenhouse in separate units) and climatic and environmental conditions are very similar compared to Kenya.
- The population pressure in the surrounding environment is considered the same.
- The starting material originates in both countries from EU countries and is certified material.

No differences in the effect of the risk mitigating measures were identified.

The Panel considered that there are no differences in the overall likelihood of pest freedom of the unrooted cutting from Kenya and Uganda and, therefore, the same values were used.

A.2.6 | Elicitation outcomes of the assessment of the pest freedom for *Bemisia tabaci*

The elicited and fitted values for *B. tabaci* for pest infestation and pest freedom 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 *Bemisia tabaci* per 10,000 unrooted cuttings.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	1					2		5		10					50
EKE	0.501	0.555	0.668	0.941	1.38	2.04	2.82	4.88	7.94	10.2	13.4	17.5	23.2	29.0	36.6

Note: The EKE results is the *BetaGeneral (0.80047, 1140, 0.475, 10,000)* distribution fitted with @Risk version 7.6.

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

TABLE A.4 The uncertainty distribution of plants free of *Bemisia tabaci* per 10,000 unrooted cuttings calculated by Table A.1.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9950					9990		9995		9998					10,000
EKE results	9963	9971	9977	9982	9987	9990	9992	9995	9997	9998.0	9998.6	9999.1	9999.3	9999.4	9999.5

Note: The EKE results are the fitted values.

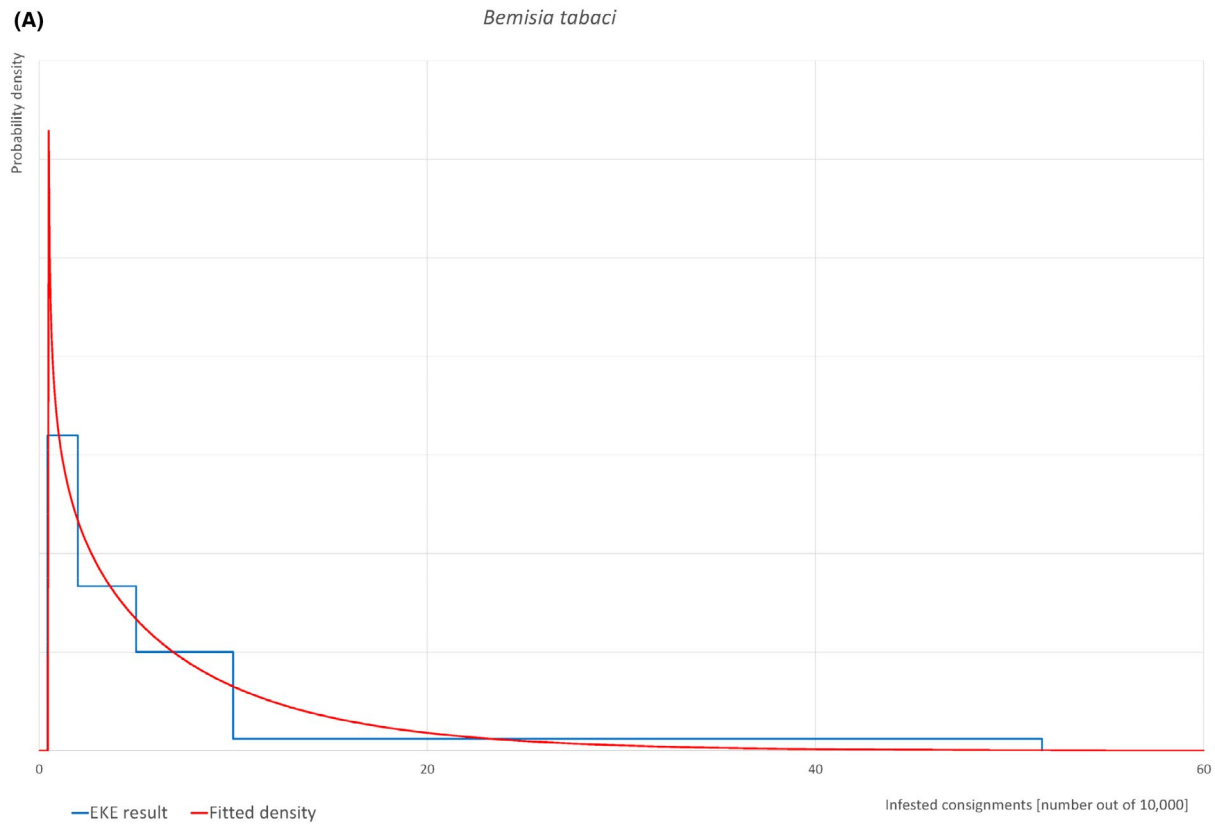
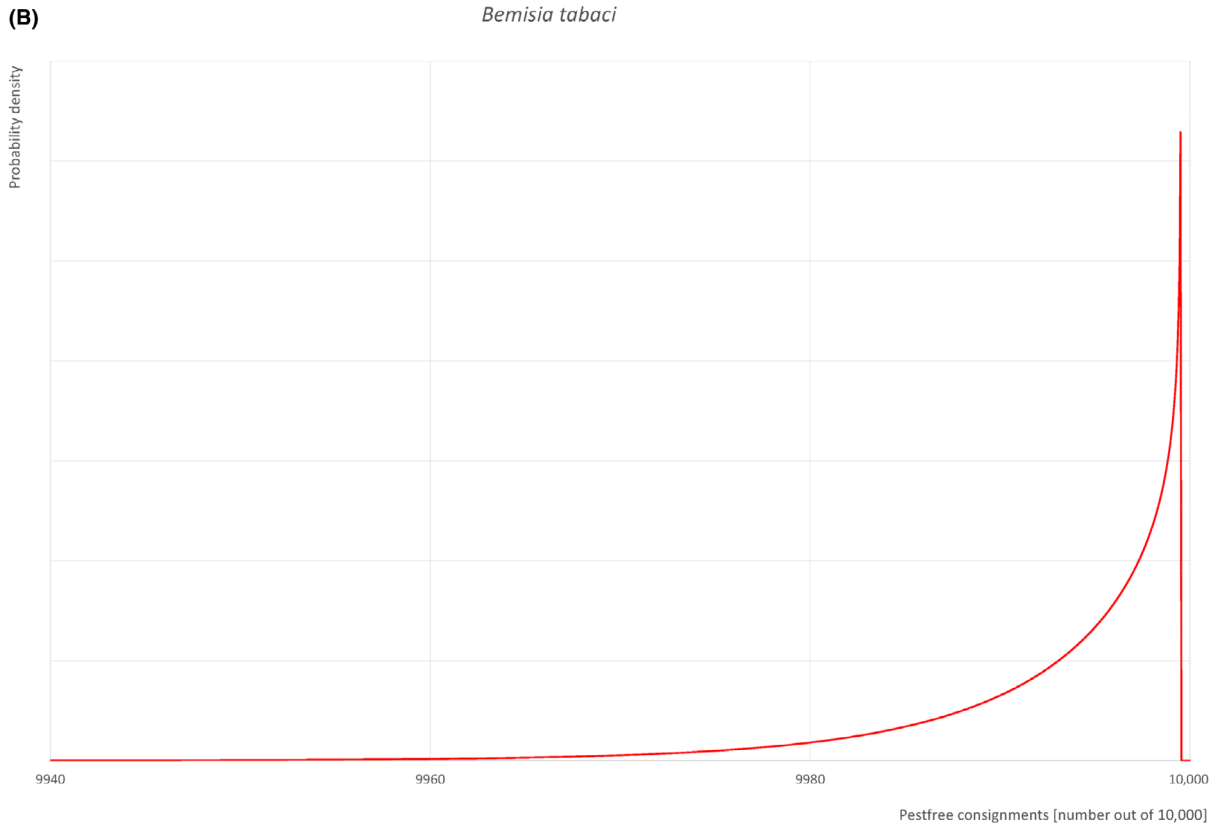


FIGURE A.2 (Continued)



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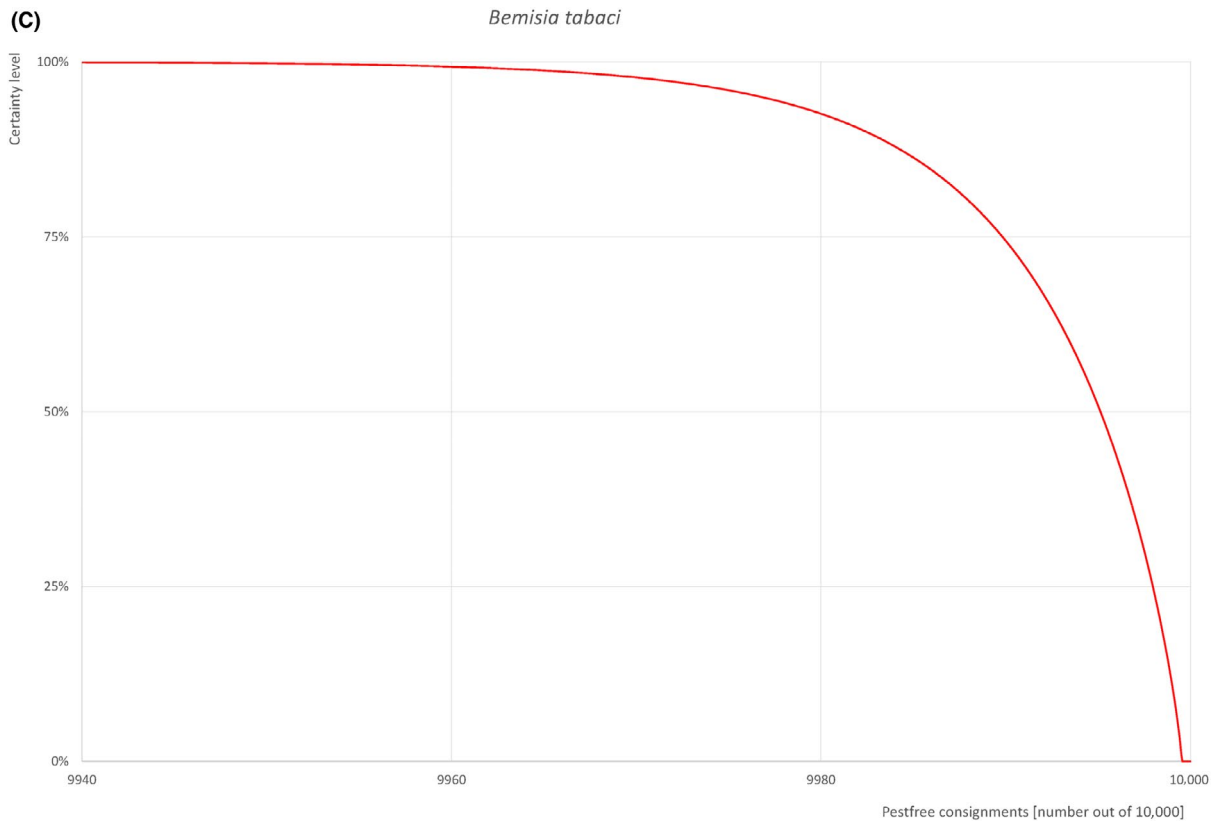

FIGURE A.2 (A) Elicited uncertainty of pest infection per 10,000 plants of specimen trees (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free plants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

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A.3 | *BEMISIA TABACI*-TRANSMITTED VIRUSES (COWPEA MILD MOTTLE VIRUS, TOMATO YELLOW LEAF CURL VIRUS, TOMATO LEAF CURL UGANDA VIRUS)

A.3.1 | Organism information

Taxonomic information of the organisms in the cluster	1. **Cowpea mild mottle virus (CPMMV)** **Current scientific name**: *Carlavirus vignae* **EPPO code:** CPMMV0 **Synonyms/Common names**: Cowpea mild mottle carlavirus, Cowpea mild mottle virus, CPMMV (ICTV; EPPO, online) **Name used in the EU legislation**: Cowpea mild mottle virus [CPMMV0] **Group:** virus **Order:** Tymovirales **Family**: Betaflexiviridae 2. **Tomato leaf curl Uganda virus (ToLCUV)** **Current scientific name:** *Begomovirus solanumugandaense* **EPPO code**: TOLCUV **Synonyms/Common names**: Tomato leaf curl Uganda virus, ToLCUV **Name used in the EU legislation**: - **Group:** virus **Order**: Geplafuvirales **Family**: Geminiviridae 3. **Tomato yellow leaf curl virus (TYLCV)** **Current scientific name**: *Begomovirus coheni* **EPPO code:** TYLCV0 **Synonyms/Common names**: tomato yellow leaf curl begomovirus, (EPPO; online) **Name used in the EU legislation:** Tomato yellow leaf curl virus [TYLCV0] **Group:** virus **Order:** Geplafuvirales **Family**: Geminiviridae **Reasons for clustering**: The above-listed viruses, although belonging to different genera, are all transmitted by the whitefly *B. tabaci*. They share similar biology and epidemiology characteristics that affect the risk they pose for the EU.		
Regulatory status	CPMMV and ToLCUV (as non- EU Begomoviruses) are quarantine pest not known to occur in the EU territory (Commission Implementing Regulation (EU) 2019/2072, Annex II, Part A). TYLCV is regulated as an RNQP in Commission Implementing Regulation (EU) 2019/2072, ANNEX IV, Part I.		
Pest status in Uganda	CPMMV, ToLCUV and TYLCV are present in Uganda (CABI, EPPO; online; Dossier Section 2.3).		
Pest status in the EU	Not relevant, CPMMV, TYLCV and ToLCUV have a regulatory status in EU. (CABI, EPPO; online).		
Host status on Petunia sp./Calibrachoa sp.	**Virus name**	***Petunia*/Calibrachoa host status**	**Solanaceae host plants**
	Cowpea mild mottle virus (CPMMV)	Uncertain, *Petunia* is likely to be a host	Tomato, eggplant, *Nicotiana* spp. (the later experimentally)
	Tomato leaf curl Uganda virus (ToLCUV)	Uncertain, *Petunia* is likely to be a host	Tomato, tobacco, *N. benthamiana* and African nightshade
	Tomato yellow leaf curl virus (TYLCV)	*Petunia* is a natural host (CABI, online)	Tomato, potato, pepper, tobacco
	Uncertainties: There are no records that *Calibrachoa* spp. is a host of CPMMV, ToLCUV and TYLCV. The same applies for *Petunia* spp. ToLCUV and CPMMV. Begomoviruses (ToLCUV, TYLCV) infecting solanaceous species are expected to have an extended host range especially within the Solanaceae family (Devendran et al., 2022; Hančinský et al., 2021), while CPMMV infects tomato, eggplant and (experimentally) some *Nicotiana* spp. hosts (CABI, EPPO; online). Therefore, *Petunia* spp. is likely to be a host plant of CPMMoV, and *Calibrachoa* spp. to be a host of CPMMV and TYLCV.		
PRA information	• Scientific Opinion on the risks to plant health posed by *Bemisia tabaci* species complex and viruses it transmits for the EU territory (Health (PLH), 2013) • Scientific Opinion on the pest categorisation of Tomato yellow leaf curl virus and related viruses causing tomato yellow leaf curl disease in Europe (EFSA, 2014) • Scientific Opinion on the commodity risk assessment of *Petunia* spp. *and Calibrachoa* spp. unrooted cuttings from Kenya (EFSA PLH Panel, 2024)		

(Continues)

(Continued)

Other relevant information for the assessment	
Biology	**Transmission:** **CPMMV** is transmitted by the whitefly *B. tabaci* in a non-persistent manner with an acquisition access period of 10 min, an inoculation access period of 5 min and without a latent period (Marubayashi et al., 2010; Zanardo and Carvalho, 2017). The ability of CPMMV to be seed transmissible is still unclear, due to contradictory results which might indicate that seed transmissibility depends on the CPMMV strain, the host cultivar, the time of infection and the environmental conditions (CABI, EPPO; online; Zanardo and Carvalho, 2017). **ToLCUV** is a recently characterised virus (Kimathi et al., 2020). The Panel assumes that the transmission characteristic of ToLCUV is similar to TYLCV. **ToLCUV and TYLCV** are transmitted by *B. tabaci* species complex most probably in a circulative, non-propagative manner. The minimum acquisition access period (AAP) and inoculation access period for begomoviruses ranges from 10 to 60 min with increasing frequency of transmission when the AAP is extended. Following acquisition, some begomoviruses are retained in the whitefly vector for a period of several weeks up to the entire lifespan (Rosen et al., 2015). For TYLCV, a single insect is capable of infecting tomato plants. Even nymphs can ingest and transmit begomoviruses. All evidence reported so far supports that infectious begomoviruses are not transovarially passed onto the insect progeny (EFSA PLH Panel, 2014). Most of the *B. tabaci* species complex members may transmit most, if not all, begomoviruses; however, the transmission efficiencies vary significantly among different *B. tabaci* species and sometime among different populations of the same species (EFSA PLH Panel, 2013; Rosen et al., 2015). Among some other begomoviruses – host combinations, seed transmission has been proved for some begomoviruses including TYLCV in soybean and sweet pepper; no seed transmission has been reported for any begomovirus in *Petunia* spp. or *Calibrachoa* spp. (Gomathi Devi et al., 2023). There are no other means of begomovirus transmission. Like all plant viruses that systemically infect their host, CPMMV, ToLCUV and TYLCV can be also transmitted via the vegetative propagation material. **Uncertainty on transmission** • Seed transmission of CPMMV, ToLCUV and TYLCV in *Petunia* spp. or *Calibrachoa* spp. • The efficiency of CPMMV, ToLCUV and TYLCV transmission by different biotypes/subspecies of *B. tabaci*. **Host range and distribution of host plants in the environment:** The host range of **CPMMV** include: *Agave sisalana, Arachis hypogaea* (major host), *Beta vulgaris, Blainvillea dichotoma, Browallia speciosa, Cajanus cajan, Calopogonium mucunoides, Canavalia ensiformis, Carica papaya, Centrosema* spp., *Chenopodiastrum murale, Chenopodium giganteum, Chenopodium quinoa, Chenopodium vulvaria, Cleome affinis, Crotalaria trichotoma, Cucumis sativus, Desmodium tortuosum, Glycine max* (major host), *Gomphrena globose, Hibiscus syriacus, Indigofera hirsute, Macroptilium* sp., *Macrotyloma uniflorum, Mirabilis jalapa, Mucuna pruriens, Nauclea latifolia, Nicotiana benthamiana, Nicotiana clevelandii, Nicotiana debneyi, Nicotiana glutinosa, Nicotiana megalosiphon, Penstemon hirsutus, Phaseolus lunatus, Phaseolus radiata, Phaseolus vulgaris* (major host), *Pisum sativum, Psophocarpus tetragonolobus, Rhynchosia minima, Salvia hispanica, Senna* sp., *Sesamum indicum, Solanum carolinense, Solanum lycopersicum, Solanum melongena, Stylosanthes gracile, Tephrosia villosa, Theobroma cacao, Trifolium incarnatum, Vicia faba, Vigna mungo, Vigna radiate, Vigna unguiculata* (major host), *Voandzeia subterranean* (EPPO, CABI, online; Sastry et al., 2019). **ToLCUV** is a recently characterised virus reported to infect tomato, *N. benthamiana, N. tabacum* and African nightshade (Kimathi et al., 2020). **TYLCV** has a large host range including species in many families (Amaranthaceae, Chenopodiaceae, Compositae, Convolvulaceae, Cruciferae, Euphorbiaceae, Geraniaceae, Leguminosae, Malvaceae, Orobanchaceae, Plantaginaceae, Primulaceae, Solanaceae, Umbelliferae and Urticaceae) (CABI, 2012; Papayiannis et al., 2011). Among cultivated plants it infects tomato, bean (*Phaseolus vulgaris*), **petunia (*Petunia hybrida*)** and lisianthus (*Eustoma grandiflorum*). Common weeds infected by TYLCV are *Conyza sumatrensis*, *Convolvulus* sp., *Cynanchum acutum*, *Cuscuta* sp., *Chenopodium murale*, *Datura stramonium*, *Dittrichia viscosa*, *Malva parviflora* and *Solanum nigrum* which either exhibit severe symptoms or remain asymptomatic (CABI, 2012; Jordà et al., 2001). TYLCV is expected to have a host range that includes more species especially within the Solanaceae family including also additional wild species (Devendran et al., 2022; Hančinský et al., 2021; Prajapat et al., 2013). **Uncertainty on host range** • The actual host range of TYLCV and ToLCUV. • The host status of *Petunia* spp. for CPMMV and ToLCUV and of *Calibrachoa* spp. for CPMMV, ToLCUV and TYLCV. **Ecology and biology of the vectors:** *Bemisia tabaci* is present in Uganda (EPPO GD). *Bemisia tabaci* is a highly polyphagous invasive species complex and can reach high populations on Solanaceae crops especially during warm weather conditions (Jiao, et al., 2012). **Symptoms on Petunia spp. and Calibrachoa spp**. Most common symptoms caused by **CPMMV** include mosaic and leaf mottling. Infected tomato plants show transient narrow chlorotic banding of secondary leaf veins, whereas aubergine plants exhibit mild leaf mosaic symptoms. The major legume host species of CPMMV exhibit symptoms of vein-clearing and downward rolling of the leaves, light green and yellow mosaic, stunting of plants, mottling and necrosis on the leaves, stems and pods of beans (*Arachis hypogaea, Glycine max, Phaseolus vulgaris, Vigna unguiculata*) (Brunt and Kenten, 1973; Mink and Keswani, 1987; Naidu et al., 1998; Thouvenel et al., 1982). *Petunia* spp. plants infected with **ToLCUV** and **TYLCV** are expected to exhibit typical begomovirus symptoms that are easy to be detected by an inspector such as leaf chlorosis and distortion, apical distortion and swellings of the veins on the underside of the leaf; plants infected when young may not develop flowers (Sikron et al., 1995). Upward leaf curling, yellowing and vein yellowing or yellow mosaic, and size reduction in leaves have been also described on petunia for another begomovirus, Chilli leaf curl virus (Al-Shihi et al., 2014). However, there is an asymptomatic phase of all systemic virus infections. Temperature and light intensity are expected to affect the speed of systemic infection (usually within 2 to 3 weeks) and disease severity.
Evidence that the commodity can be a pathway	Unrooted cuttings of *Petunia* spp. or *Calibrachoa* spp. can be systemically infected by the *B. tabaci*-transmitted viruses and/or infested by viruliferous whiteflies.

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 CPMMV, ToLCUV and TYLCV includes members of the Solanaceae, but also from other families. These viruses are transmitted by *B. tabaci*, and both the viruses and their vector are present in Uganda (CABI, EPPO, online). Infections of all three viruses are associated with tomato plants. However, they can also infect other cultivated plants, while weeds can also act as their reservoirs. The main pathway of entrance of these viruses from the surrounding environment in the nursery is through viruliferous *B. tabaci* adults. Defects in the insect proof structure of the production greenhouses could enable whiteflies to enter, as well as hitchhiking whiteflies on persons or materials entering the greenhouse.

Uncertainties:

- Infection (CPMMV, ToLCUV and TULCV) and infestation (*B. tabaci)* pressure in the environment of the nursery (presence and distribution of host plants in the surroundings).
- Presence of defects in the greenhouse structure.

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

Plant material (cuttings) for *Petunia* spp. and *Calibrachoa* spp. mother plants used for the production of unrooted cuttings correspond to Elite-certified material, coming from EU countries (Germany, The Netherlands) and are kept in the post-quarantine facility before released to the nursery. CPMMV, ToLCUV are not present in the EU. The certification scheme in place for *Petunia* spp. and *Calibrachoa* spp. includes TYLCV (Dossier section 3.3) and therefore it can be assumed that the starting material is pathogen-free.

Uncertainties:

None.

A.3.2.3 | Possibility of spread within the nursery

Petunia spp. and *Calibrachoa* spp. for export are produced in a separate unit with hygienic standards (double doors, clean uniforms) with no mixing with the other ornamentals. However, other plants (solanaceous and non-solanaceous) possible hosts of CPMMV, ToLCUV and TYLCV are cultivated and *B. tabaci* could be present in other greenhouses/compartments of the nursery. Viruliferous *B. tabaci* could spread these viruses between the different or within the same greenhouse/compartment. No data are provided for the identity, proportion, origin and phytosanitary status of other than *Petunia/Calibrachoa* plants produced in the same nursery. If *B. tabaci* is detected, the nursery will be under official control. CPMMV, ToLCUV and TYLCV may also spread by vegetative propagation of infected mother plants.

Uncertainties:

- The origin and the host status for CPMMV, ToLCUV and TYLCV and the phytosanitary status of other plant species (solanaceous, non-solanaceous) entering the same nursery.
- The level of physical separation (with thrips-proof netting) of the *Petunia* spp. and *Calibrachoa* spp. production units with other production units.

A.3.3 | Information from interceptions

There were no interceptions of the *B. tabaci*-transmitted virus listed above on any imported commodity from Uganda, or on *Petunia* spp./*Calibrachoa* spp. from all origins (EUROPHYT and TRACES, online). *B. tabaci* is intercepted on plant material originated from Uganda (see pest datasheet on *B. tabaci*, Section A.2).

A.3.4 | Evaluation of the risk mitigation measures

In the table below, all risk mitigation measures currently applied in Uganda are listed and an indication of their effectiveness on *B. tabaci*-transmitted viruses is provided. The description of the implemented risk mitigation measures is provided in Table 9.

No.	Risk mitigation measure	Effect (yes/No)	Implementation in Uganda
1	Growing plants in isolation	Yes	Description The unrooted cuttings to be exported from Uganda will be grown and harvested from greenhouse production facilities approved by the NPPO. The cuttings are grown in closed greenhouses (closed production). A double-door entry system is used to control temperatures in the greenhouse as well as mitigate entry of pests. *Petunia* spp. and *Calibrachoa* spp. are produced in separate units. Evaluation The insect-proof netting prevents the introduction of whiteflies from the surrounding environment. However, *B. tabaci* may be introduced through defects in the greenhouse or as hitchhikers on workers. In the Dossier, it is stated that *B. tabaci* is regularly found in nurseries. Uncertainties Presence of unnoticed defects in the greenhouse structure.
2	Dedicated hygiene measures	Yes	Description For accessing the greenhouse there is a double door system. Changing rooms and disinfection facility allow the personnel to wear dedicated boots and clothes before entering the greenhouse. There are dedicated tools used for each greenhouse unit. Each unit has a specific set of clothes including a disinfection area. Evaluation The double door system can be effective in preventing the entry of *B. tabaci* via active flying and entry and spread of CPMMV, ToLCUV and TYLCV. Changing clothes prevents also the entrance of vectors via hitchhiking. Uncertainties The strictness of the measures applied.
3	Treatment of growing media	No	Description The plants for planting from which the cuttings are harvested are grown in a soilless medium (100% pumice in hydroponic greenhouses). The growing media used in production and at the moment of export is according to ISPM 40 (FAO, 2017a) and to the NPPO Uganda requirements.
4	Quality of source plant material	Yes	Description All the intended planting materials are to be imported from mother companies in the Netherlands and Germany (Dossier section 1). These are Elite-certified materials in the form of TC plantlets or URCs for further multiplication in Uganda. Upon arrival in Uganda, the NPPO conducts documentary and identity checks at entry before dispatch to post quarantine in contained facilities at the production farms. Evaluation The probability that these viruses are present on the certified starting material is very low/ negligible. Uncertainties None.
5	Crop rotation	Yes	Description No crop rotation takes place. Specific greenhouses units are used for producing *Petunia* spp. and *Calibrachoa* spp. Evaluation No crop rotation with non-host plants takes place. In case of introduction into the greenhouse, populations of *B. tabaci* may build up since the same unit is used for production of *Petunia* spp. and *Calibrachoa* spp. Uncertainties None.
6	Disinfection of irrigation water	No	The irrigation water is treated with sodium chloride and UV irradiation (Dossier Section 1).
7	Pest monitoring and inspections	Yes	Description The presence of pests and symptoms in plants is monitored, including yellow sticky traps, on a daily basis by nurseries staff. A compiled weekly report is produced by the scouting team, which is used to decide the weekly pest control measures in the greenhouses (Dossier Section 1). Evaluation Yellow sticky traps are effective to detect the presence of the vector *B. tabaci*. Monitoring could detect virus-infected petunia plants. However, early infections cannot be detected due to the lack of symptoms. Uncertainties • The efficiency of yellow sticky traps to detect early *B. tabaci* infestations. • The efficiency of monitoring and inspection. • The symptoms on *Petunia* spp. and *Calibrachoa* spp. and the length of the latent period till the expression of symptoms.

(Continued)

No.	Risk mitigation measure	Effect (yes/No)	Implementation in Uganda
8	Treatment of crop during production	Yes	Description Fungicides, insecticides, acaricides and biological control agents are applied on weekly basis, following scouting inspections and are reported in Dossier Section 4 (Table E1.1–6). Rotation among active substances (a.s.) is adopted to prevent the development of insecticide resistance. Details on the a.s. are reported in Dossier Section 4. Evaluation The products used may have an effect on populations of *B. tabaci*. Uncertainties The level of resistance against the listed insecticides of *B. tabaci* populations in Uganda.
9	Sampling and testing	Yes	Description A detailed protocol for sampling and testing plants is described in Dossier Section 4. The sampling Protocol is implemented according to Risk-Based Estimator for Surveillance Systems (RiBESS+) (https://r4eu.efsa.europa.eu/app/ribess). A subsample per variety, per batch is sent to the accredited laboratory for further pest analyses. The testing procedures follow the PM7 diagnostic standards of EPPO (https://www.eppo.int/RESOURCES/eppo_standards/pm7_diagnostics). Evaluation CPMMV is not included in the PM7 diagnostic standards therefore plants are not expected to be tested for this virus. For begomoviruses included in the PM7, no details are given on specific methods used for virus detection and identification. Uncertainties • The efficiency of the sampling method and testing intensity to detect virus infections (if any).
10	Official supervision by NPPO	Yes	Description NPPO Uganda conducts a 3-week to monthly pest surveillance frequency to monitor pest incidence and prevalence on each plant variety and species guided by the pests relevant for the EU. NPPO Uganda enforces compliance with phytosanitary measures as provided for in the EU Directive 2016/2031. Official measures are targeted to *B. tabaci*. If whiteflies are seen on the plants, the whole production unit shall be quarantined and subjected to sampling and tested for begomoviruses. If the test is positive, the NPPO requires the nurseries/farms to destroy all the crop. Official procedures exist on how to destroy all affected such high-risk materials using incineration provided by accredited companies. Handling of such material will be supervised by the NPPO and conducted by select staff. Evaluation Official measures are targeted to *B. tabaci* and may efficiently prevent the presence of *B. tabaci*-transmitted viruses on unrooted cuttings. Uncertainties The efficiency of detecting early *B. tabaci* infestations and virus presence, especially in low infection levels

A.3.5 | Overall likelihood of pest freedom for the exported commodity (comparative)

A.3.5.1 | Comparison with other relevant commodity Risk Assessments involving *Bemisia tabaci*-transmitted virus

CPMMV, TYLCV were already assessed as relevant pests for the commodity risk assessment of *Petunia* and *Calibrachoa* from Kenya (EFSA PLH Panel, 2024). The epidemiology of TYLCUV is considered similar to TYLCV. The similarities between the dossiers from Kenya and Uganda are:

- The production system (production in greenhouse in separate units) and climatic and environmental conditions are very similar.
- The inoculum pressure in the surrounding environment is expected to be similar.
- The starting material originates in both countries from EU countries and is certified material.
- No differences in the effect of the risk mitigating measures were identified.

The only difference lies in the uncertainty regarding the processing of the samples (subsample pooling), which is likely to impact the sensitivity of the tests hence the detection of *B. tabaci*-transmitted viruses in Uganda.

The Panel considered that there are no major differences in the overall likelihood of pest freedom of the unrooted cutting from Kenya and Uganda and, therefore, the values were based on the ones from Kenya by adjusting the values to reflect the uncertainty.

A.3.6 | Elicitation outcomes of the assessment of the pest freedom for *Bemisia tabaci* -transmitted viruses

The elicited and fitted values for ***B. tabaci*** for pest infestation and pest freedom 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 *Bemisia tabaci*-transmitted virus per 10,000 unrooted cuttings.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	1					3		8		30					50
EKE	0.500	0.504	0.524	0.648	1.07	2.15	4.01	10.6	21.3	28.2	35.8	42.2	46.9	49.0	50.1

Note: The EKE results is the *BetaGeneral (0.37873, 0.82837, 0.5, 50.7)* distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infected plants the pest freedom was calculated (i.e. = 10,000 – number of infected plants per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.6.

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

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9950					9970		9992		9997					10,000
EKE results	9950	9951	9953	9958	9964	9972	9979	9989	9996	9997.8	9998.9	9999.35	9999.48	9999.50	9999.50

Note: The EKE results are the fitted values.

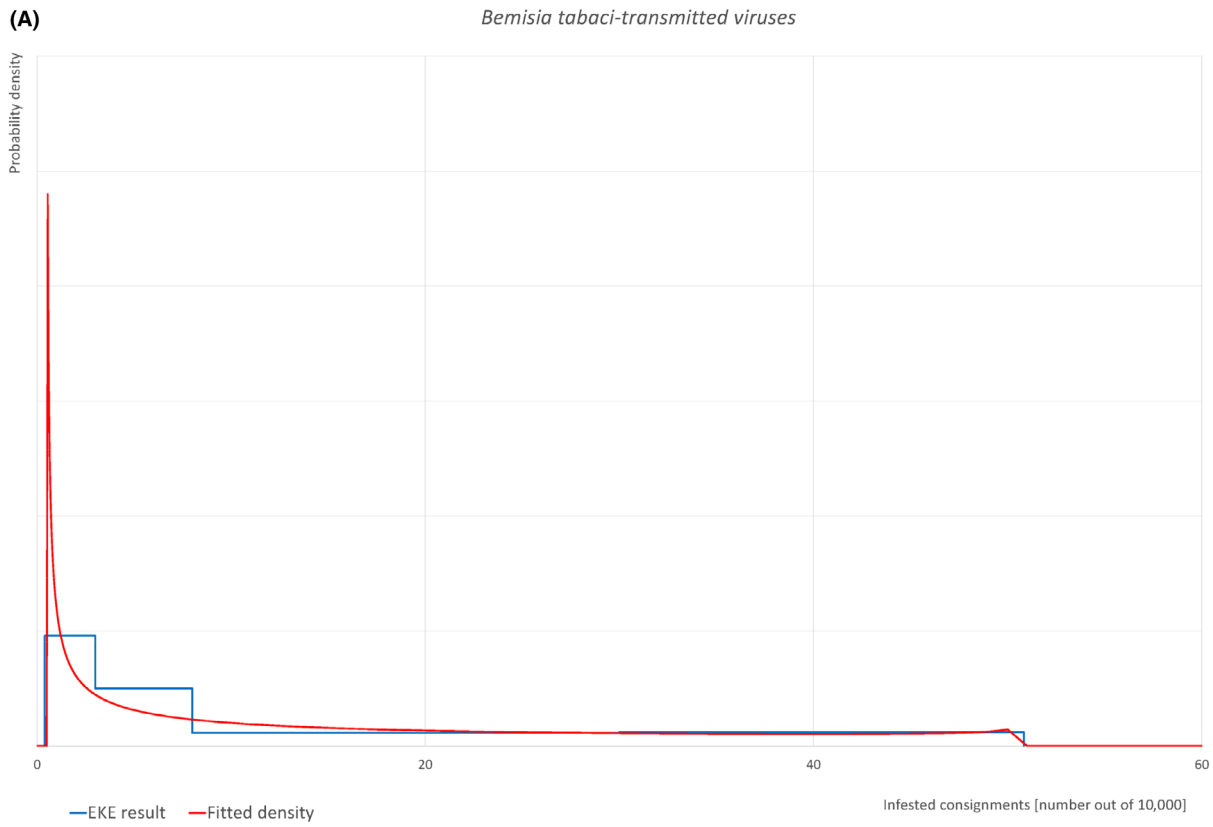

FIGURE A.3 (Continued)

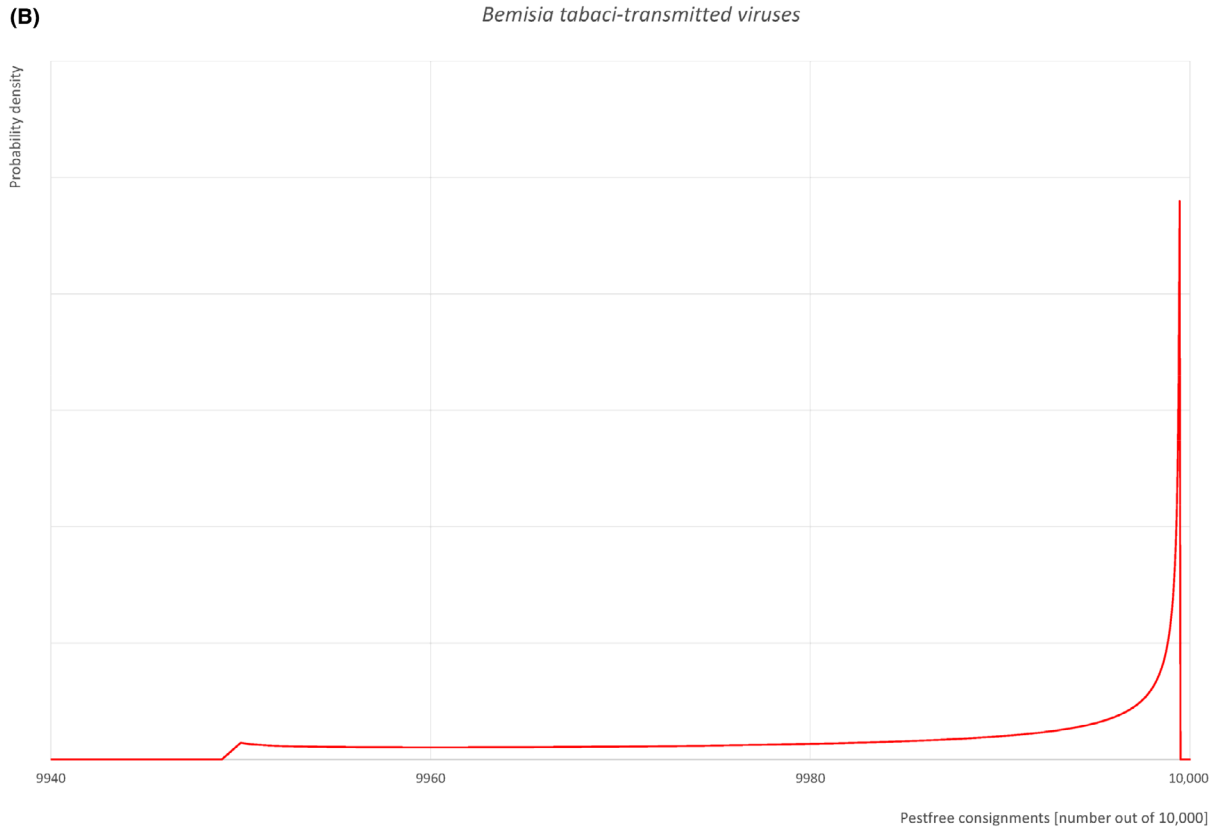

FIGURE A.3 (Continued)

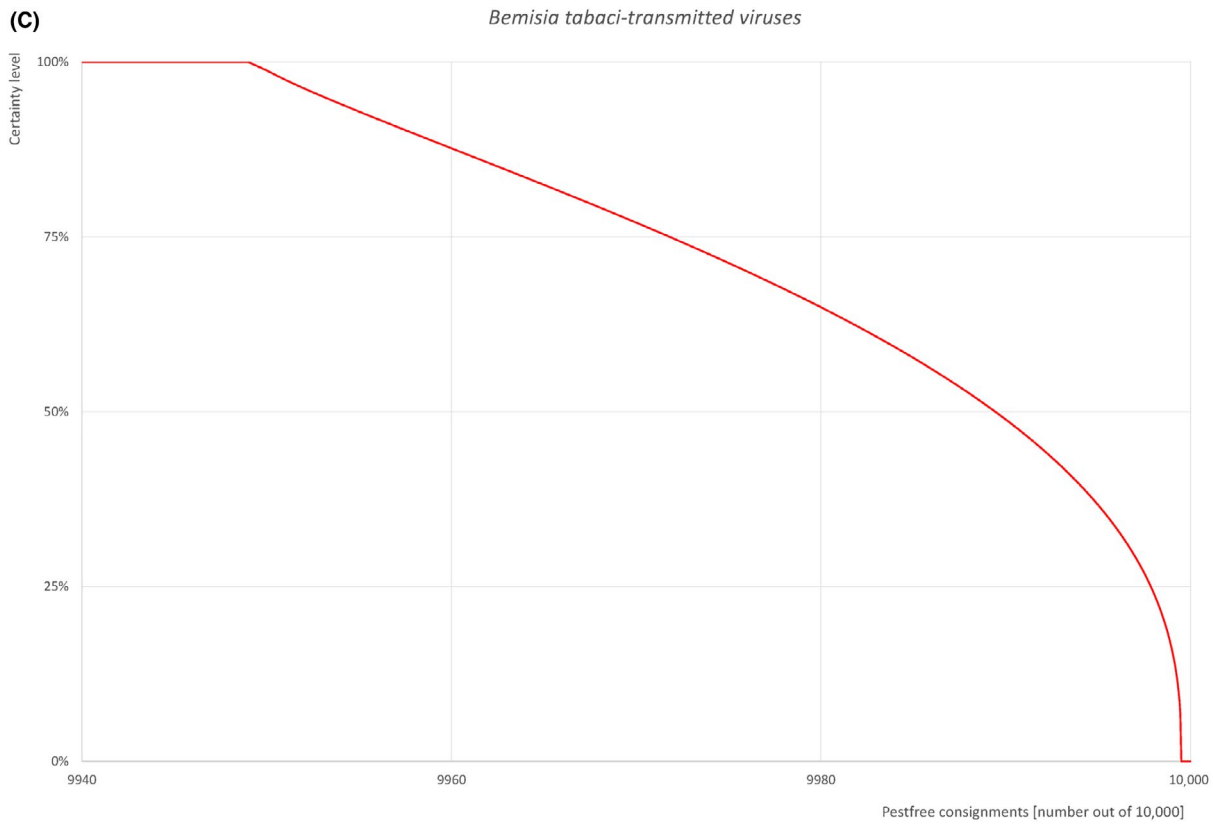

FIGURE A.3 (a) Elicited uncertainty of pest infection per 10,000 plants of specimen trees (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (b) uncertainty of the proportion of pest-free plants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

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A.4 | CONTACT-TRANSMITTED VIRUS AND VIROID (POTATO SPINDLE TUBER VIROID AND POTATO VIRUS X)

A.4.1 | Organism information

Taxonomic information	**1. Potato spindle tuber viroid (PSTVd)** **Current scientific name**: *Pospiviroid fusituberis* **Synonyms/Common names**: Potato spindle tuber pospiviroid, Potato spindle tuber viroid, PSTVd (ICTV, EPPO; online) **EPPO code**: PSTVD0 **Name used in the EU legislation**: Potato spindle tuber viroid **Group**: viroids **Family**: *Pospiviroidae* **2. Potato virus × (PVX)** **Current scientific name**: *Potexvirus ecspotati* **EPPO code**: PVX000 **Synonyms/Common names**: Potato virus X; Potato × potexvirus;PVX (ICTV, EPPO; online) **Name used in the EU legislation**: Potato virus X **Group:** virus **Order:** *Tymovirales* **Family**: *Alphaflexiviridae* **Reasons for clustering**: the above-listed virus and viroid are contact-transmitted. Although they are different intracellular infectious agents, their epidemiology shares sufficient commonalities to justify their clustering.
Regulatory status	**PSTVd**: Potato spindle tuber viroid is a regulated non-quarantine pest (RNQP) included in the Commission Implementing Regulation (EU) 2019/2072 in Annex IV (Part D, Part F, Part G and Part I). **PVX**: The non-EU isolates of Potato virus × are regulated quarantine pests included in the Commission Implementing Regulation (EU) 2019/2072 in Annex II (Part A).

(Continued)

Pest status in Uganda	**PSTVd**: Present, no details (EPPO, CABI; online). **PVX**: Present, no details (EPPO, CABI; online).		
Pest status in the EU	Not relevant for EU regulated pests.		
Host status on Petunia sp. and Calibrachoa sp.	**Virus/Viroid name**	***Petunia*/Calibrachoa host status**	**Solanaceae host plants**
	PSTVd	*Petunia* and *Calibrachoa* are natural hosts (EPPO, online; EFSA PLH Panel, 2011)	Tomato, potato, pepper, tobacco (EPPO, CABI, online)
	PVX	*Petunia* is a systemic experimental host (Esfandiari et al., 2006), therefore likely to be a natural host	Tomato, potato, pepper, tobacco (EPPO, CABI, online)
	Uncertainties: The host status of *Calibrachoa* sp. to PVX.		
PRA information	• EFSA Pest Categorisation of solanaceous pospiviroids (EFSA PLH Panel, 2011). • EFSA Pest Categorisation of non-EU viruses and viroids of potato (EFSA PLH Panel, 2020a). • EFSA Pest Categorisation of potato virus × (non-EU isolates) (EFSA PLH Panel, 2020b). • Commodity risk assessment of *Petunia* spp. and *Calibrachoa* spp. unrooted cuttings from Kenya (EFSA PLH Panel, 2024a). • Commodity risk assessment of *Petunia* spp. and *Calibrachoa* spp. unrooted cuttings from Costa Rica (EFSA PLH Panel, 2024b). • Commodity risk assessment of *Petunia* spp. and *Calibrachoa* spp. unrooted cuttings from Guatemala (EFSA PLH Panel, 2024c).		
Other relevant information for the assessment			
Biology	**Transmission** **PSTVd** can be experimentally transmitted to many plant species essentially by direct contact and cutting tools. In addition, PSTVd can be spread by vegetative propagation and transmission via seeds (Matsushita and Tsuda, 2016). However, lack of seed transmission has also been reported (Faggioli et al., 2015, Verhoeven et al., 2020) and a recent report (Verhoeven et al., 2021) suggests that the role of seed transmission in the spread of pospiviroids (including PSTVd) in pepper and tomato may have been overestimated. Horizontal transmission through infected pollen has been documented for PSTVd (Kryczyński et al., 1988, Singh et al., 1992, Yanagisawa and Matsushita 2018). It has been reported that PSTVd can be transmitted by insect vectors under specific ecological conditions (Salazar et al., 1995), however in some cases it cannot be excluded that cross-contamination (such as contact transmission) could have occurred. PSTVd has been reported to be transmitted by aphids when trans-encapsidated in particles of potato leafroll virus (Querci et al., 1997), with the virion acting as a carrier of the viroid RNA (Syller et al., 1997). **PVX** is transmitted by vegetative propagation and can be mechanically transmitted (e.g. by contaminated tools or contact). PVX is not known to be transmitted by pollen or true seeds. Different strains of PVX have been identified based on their biological properties on potato (EFSA PLH Panel, 2020b). **Uncertainty on biology** The possible role of insects in facilitating virus/viroid spread in the field. **Uncertainty of biology** **Host range and distribution of host plants in the environment** **PSTVd** has a broad host range (EPPO, online) including numerous solanaceous (tomato, pepper, potato, tobacco) and herbaceous species and ornamentals (petunia and calibrachoa are reported as natural hosts) (CABI, EPPO; online). The major host of **PVX** is potato. The virus infects more than 240 species in 16 families; the majority of hosts are in the Solanaceae including *Capsicum annuum, Capsicum* sp., *Petunia hybrida, Solanum lycopersicum, Solanum melongena, Solanum nigrum* and *Solanum phureja* (Adams et al., 2005, Esfandiari et al., 2006; EPPO, online) **Uncertainty on host range** The host status of *Calibrachoa* sp. to PVX. **Symptoms on *Petunia/Calibrachoa*** Symptoms induced by PSTVd and PVX depend on the isolate, the affected host and the environmental conditions (temperature and light conditions). PSTVd infection of solanaceous ornamental plants is usually symptomless (Verhoeven et al., 2008). In general, PSTVd symptoms in other solanaceous hosts include growth reduction and chlorosis in the upper leaves and reduced fruit size in the early stages of infection. Other types of symptoms such as rugosity and irregular ripening might also occur. Growth reduction may develop into stunting and bunchy growth, and chlorosis may become more severe, turning into reddening, purpling and/or necrosis (Verhoeven et al., 2004). PVX induces systemic mosaic symptoms on *P. hybrida*, potato (its major host) and other solanaceous species including pepper, tomato, tobacco and eggplant (Adams et al., 2005; Esfandiari et al., 2006).		
Evidence that the commodity can be a pathway	*Petunia* spp. and *Calibrachoa* spp. plants are systemic hosts of PSTVd and *Petunia* spp. of PVX; therefore, the cuttings can serve as pathways of their entrance in the EU territory.		

A.4.2 | Possibility of pest presence in the nursery

A.4.2.1 | Possibility of entry from the surrounding environment

PSTVd and PVX are present in Uganda. The natural host range of PSTVd and PVX is broad, including solanaceous crops (e.g. potato, pepper, etc.) and weed species that can act as reservoirs of both entities and may be present in the surrounding environment of the nursery. PSTVd and PVX are mechanically (contact) transmitted therefore, they can enter the nursery by staff and contaminated tools. Strict hygiene measures are in place to prevent the mechanical infection from outside the nursery. However, failures in the applied hygiene measures may allow the entry of the entities from the surrounding environment.

Uncertainties:

- Presence and distribution of host plants in the surroundings.
- Infection pressure in the surroundings.
- Strictness of application of hygiene measures.

A.4.2.2 | Possibility of entry with new plants/seeds

Plant material (cuttings) for *Petunia* spp. and *Calibrachoa* spp. mother plants used for the production of unrooted cuttings correspond to Certified Elite Material, coming from EU countries (Germany, The Netherlands). Molecular (RT-PCR) tests are used for Pospiviroids including PSTVd (potato spindle tuber viroid) and serological tests for PVX. The certification scheme in place for *Petunia* spp. and *Calibrachoa* spp. includes PSTVd and PVX (Dossier section 3.3) and therefore it can be assumed that the starting material is pathogen-free.

A.4.2.3 | Possibility of spread within the nursery

Petunia spp. and *Calibrachoa* spp. are cultivated in dedicated compartments for their cultivation with no other plant species (Dossier Section 2.1, reply 4). However, other plants (solanaceous and non-solanaceous) known hosts of PSTVd and to a lesser extent of PVX could be present in other greenhouses/compartments of the nursery (Dossier Section 2.1, reply 4). No data is provided for the identity, proportion, origin and phytosanitary status of plants other than *Petunia* spp. and *Calibrachoa* spp. produced in the same nursery. Should PSTVd and PVX be present in other plants, they could spread within the nursery during agricultural practices (e.g. by cultivation practices, handling of plants, contaminated tools, etc.). However strict hygiene measures are in place to prevent spread of PSTVd and PVX by mechanical transmission.

Uncertainties:

- The presence and incidence of the PSTVd and PVX in the nursery.
- The presence and the host status for PSTVd and PVX of other plant species (solanaceous, non-solanaceous) growing in the same nursery.
- Strictness of application of hygiene measures.

A.4.3 | Information from interceptions

There were no interceptions of the contact-transmitted virus and viroids listed above on any imported commodity from Uganda. There were several interceptions of PSTVd on *Petunia* spp. and *Calibrachoa* spp. plants imported from Israel. (EUROPHYT and TRACES, online).

A.4.4 | Evaluation of the risk mitigation measures

In the table below, all risk mitigation measures currently applied in Uganda are listed and an indication of their effectiveness on contact-transmitted viroid and virus (PSTVd and PVX) is provided. The description of the implemented risk mitigation measures is provided in Table 9.

No.	Risk mitigation measure	Effect (yes/No)	Implementation in Uganda
1	Growing plants in isolation	Yes	Description The unrooted cuttings to be exported from Uganda will be grown and harvested from greenhouse production facilities approved by the NPPO. The cuttings are grown in closed greenhouses (closed production). A double-door entry system is used to control temperatures in the greenhouse as well as mitigate entry of pests. *Petunia* spp. and *Calibrachoa* spp. are produced in separate units. Evaluation Insects may facilitate the mechanical transmission of PSTVd. The insect-proof netting prevents the introduction of insects from the surrounding environment. However, insects may be introduced through defects in the greenhouse or as hitchhiking on workers. Uncertainties Presence of unnoticed defects in the greenhouse structure.
2	Dedicated hygiene measures	Yes	Description For accessing the greenhouse there is a double door system. Changing rooms and disinfection facility allow the personnel to wear dedicated boots and clothes before entering the greenhouse. There are dedicated tools used for each greenhouse unit. Each unit has a specific set of clothes including a disinfection area. Evaluation Hygiene measures are in place to prevent mechanical transmission of contact-transmitted virus by contact and infected tools and debris. The double door system can be effective in preventing the entry of insects that may facilitate spread of PSTVd. Uncertainties The strictness of the measures applied.
3	Treatment of growing media	No	Description The plants for planting from which the cuttings are harvested are grown in a soilless medium (100% pumice in hydroponic greenhouses). The growing media used in production and at the moment of export is according to ISPM 40 (FAO, 2017a) and to the NPPO Uganda requirements.
4	Quality of source plant material	No	Description All the intended planting materials are to be imported from mother companies in the Netherlands and Germany (Dossier section 1). These are Elite-certified materials in the form of TC plantlets or URCs for further multiplication in Uganda. Upon arrival in Uganda, the NPPO conducts documentary and identity checks at entry before dispatch to post quarantine in contained facilities at the production farms. Evaluation Because mother plants are tested for PSTVd and PVX as part of the certification scheme, it is assumed that the starting material is PSTVd- and PVX-free. Uncertainties None.
5	Crop rotation	Yes	Description No crop rotation takes place. Specific greenhouses units are used for producing *Petunia* spp. and *Calibrachoa* spp. Evaluation In case of introduction into the greenhouse, due to the mechanical mode of transmission and the persistence of the viroid to infected tools, surfaces and debris, inoculum may build up, since the same unit is used for production of *Petunia* spp. and *Calibrachoa* spp. Uncertainties None.
6	Disinfection of irrigation water	No	The irrigation water is treated with sodium chloride and UV irradiation (Dossier Section 1).
7	Pest monitoring and inspections	Yes	Description The presence of pests and symptoms in plants is monitored, including yellow sticky traps, on a daily basis by nurseries staff. A compiled weekly report is produced by the scouting team., which is used to decide the weekly pest control measures in the greenhouses (Dossier Section 1). Evaluation Insect may facilitate the mechanical transmission of PSTVd, therefore the application of products against a range of insects' species may limit its spread. Uncertainties The efficiency of the applied insecticides against insects and their possible effect in viroid or virus spread.
8	Treatment of crop during production	Yes	Description Fungicides, insecticides, acaricides and biological control agents are applied on weekly basis, following scouting inspections and are reported in Dossier Section 4 (Table E1.1–6). Rotation among active substances (a.s.) is adopted to prevent the development of insecticide resistance. Details on the a.s. are reported in Dossier Section 4. Evaluation Insect may facilitate the mechanical transmission of PSTVd and PVX, therefore the application of products against a range of insects' species may limit its spread Uncertainties The efficiency of the applied insecticides against insects and their possible effect in viroid or virus spread.

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No.	Risk mitigation measure	Effect (yes/No)	Implementation in Uganda
9	Sampling and testing	Yes	Description A detailed protocol for sampling and testing plants is described in Dossier Section 4. The sampling Protocol is implemented according to Risk-Based Estimator for Surveillance Systems (RiBESS+) (https://r4eu.efsa.europa.eu/app/ribess). A subsample per variety, per batch is sent to the accredited laboratory for further pest analyses. The testing procedures follow the PM7 diagnostic standards of EPPO (https://www.eppo.int/RESOURCES/eppo_standards/pm7_diagnostics). Evaluation Imported mother plants and propagated plants are tested for PSTV and PVX. PSTVd and PVX are included in the PM7 diagnostic standards of EPPO. Uncertainties • If PVX is included in the testing procedure. • The degree of compliance with the EPPO diagnostic standards for sampling and testing • If tested samples are representative/efficient to detect infections (size of bulk samples, subsamples, etc.)
10	Official supervision by NPPO	Yes	Description NPPO Uganda conducts a 3-week to monthly pest surveillance frequency to monitor pest incidence and prevalence on each plant variety and species guided by the pests relevant for the EU. NPPO Uganda enforces compliance with phytosanitary measures as provided for in the EU Directive 2016/2031. Official measures are targeted to *B. tabaci*. If whiteflies are seen on the plants, the whole production unit shall be quarantined and subjected to sampling and tested for begomoviruses. If the test is positive, the NPPO requires the nurseries/farms to destroy all the crop. Official procedures exist on how to destroy all affected such high-risk materials using incineration provided by accredited companies. Handling of such material will be supervised by the NPPO and conducted by select staff. Evaluation Most infections are asymptomatic on ornamentals. PVX can cause mosaic symptoms on *Petunia* spp. and infected plants could be visually detected. Uncertainties The intensity and the design of surveillance scheme for contact-transmitted viruses (if any).

A.4.5 | Overall likelihood of pest freedom for the exported commodity (comparative)

A.4.5.1 | Comparison with other relevant commodity Risk Assessments involving Contact-transmitted viroid and virus

PSTVd and PVX were already assessed as relevant pests for the commodity risk assessment of *Petunia* and *Calibrachoa* from Kenya (EFSA PLH Panel, 2024). The similarities between the dossiers from Kenya and Uganda are:

- The type of commodity exported: unrooted cuttings of *Petunia/Calibrachoa* spp. of similar size and age;
- The production system (production in greenhouse in separate units) and climatic and environmental conditions are very similar.
- The inoculum pressure in the surrounding environment is expected to be similar.
- The starting material originates in both countries from EU countries and is certified material.
- No regular testing is done for PVX in both countries.

No differences in the effect of risk mitigating measures were identified. The only difference lies in the uncertainty regarding the processing of the samples (subsample pooling), which is likely to impact the sensitivity of the test hence the detection of PSTVd and PVX in Uganda. Because no major differences were identified the Panel applied the results of the EKE of pest freedom of PSTVd and PVX from unrooted cuttings of Petunia/Calibrachoa spp. from Kenya (EFSA PLH Panel, 2024).

A.4.6 | Elicitation outcomes of the assessment of the pest freedom for contact-transmitted viroid and virus

The elicited and fitted values for contact-transmitted viroid and virus for pest infestation and pest freedom agreed by the Panel are shown in Tables A.7 and A.8 and in Figure A.4.

TABLE A.7 Elicited and fitted values of the uncertainty distribution of pest infestation by contact-transmitted viroid and virus per 10,000 unrooted cuttings.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0					2		10		40					100
EKE	0.000	0.003	0.018	0.127	0.532	1.64	3.67	11.6	26.7	38.1	53.0	68.7	83.8	93.5	101

Note: The EKE results is the *BetaGeneral (0.35839, 1.2841, 0, 108)* distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infected plants the pest freedom was calculated (i.e. = 10,000 – number of infected plants per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.8.

TABLE A.8 The uncertainty distribution of plants free of contact-transmitted viroid and virus per 10,000 unrooted cuttings is calculated by Table A.7.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9900					9960		9990		9998					10,000
EKE results	9899	9906	9916	9931	9947	9962	9973	9988	9996	9998	9999.47	9999.87	9999.98	10000.00	10000.00

Note: The EKE results are the fitted values.

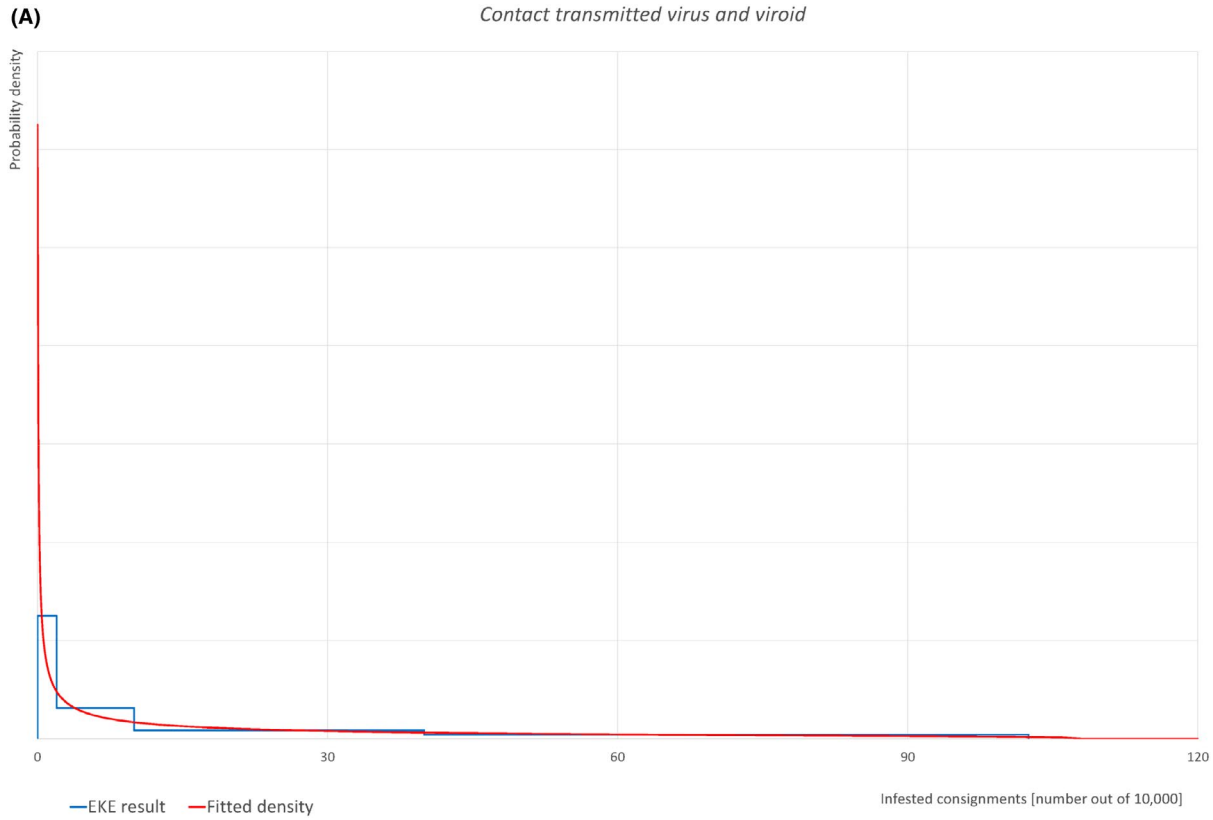
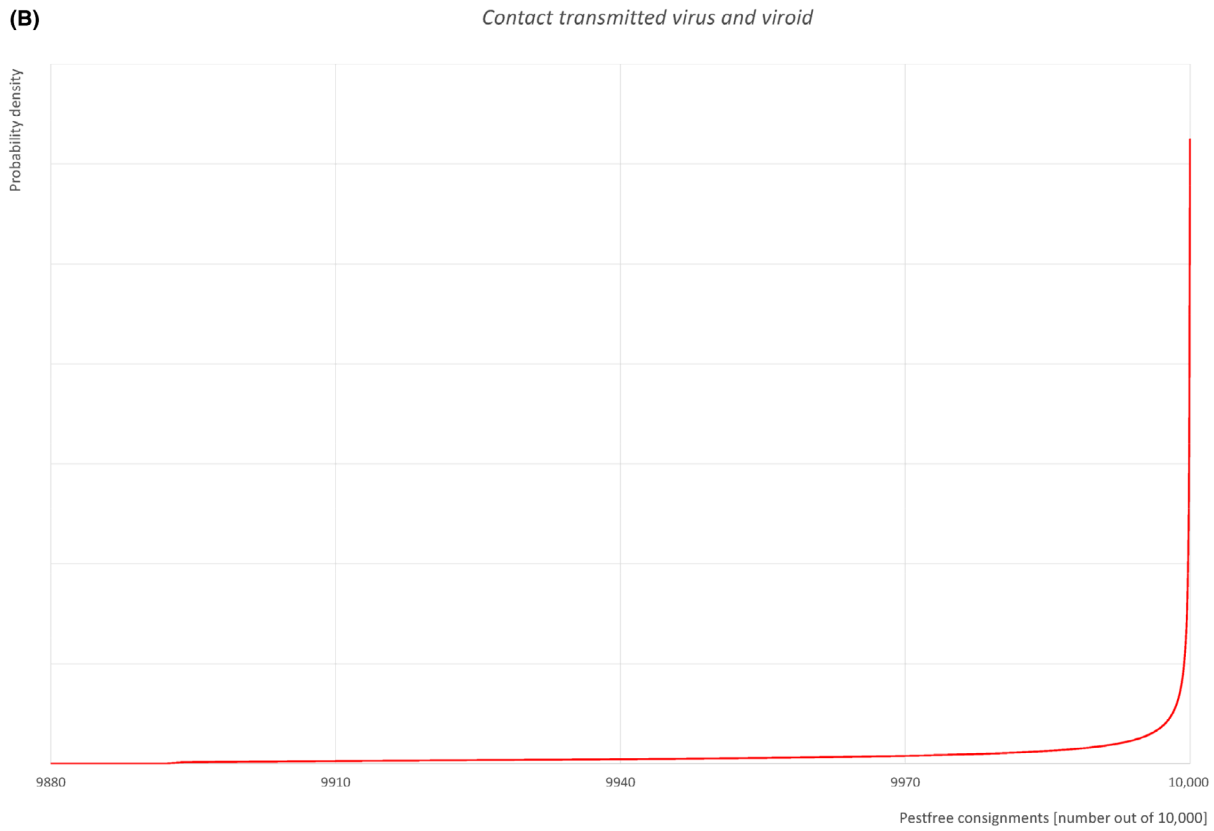


FIGURE A.4 (Continued)



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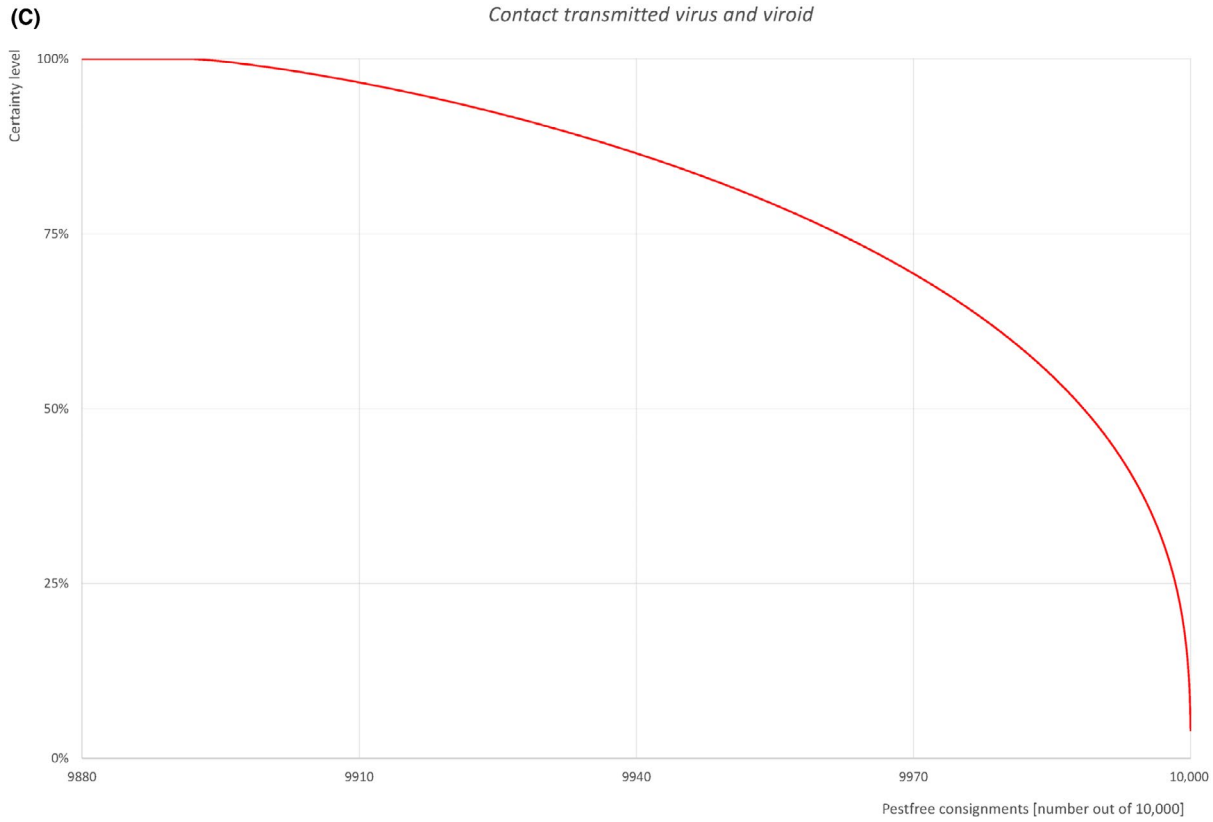

FIGURE A.4 (A) Elicited uncertainty of pest infection per 10,000 plants of specimen trees (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free plants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

A.4.7 | References

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A.5 | *NIPAECOCCUS VIRIDIS*

A.5.1 | Organism information

Taxonomic information	**Current valid scientific name**: *Nipaecoccus viridis* (Newstead) **Synonyms**: *Dactylopius perniciosus, Dactylopius vastator, Dactylopius viridis, Nipaecoccus vastator, Pseudococcus filamentosus var. corymbatus, Pseudococcus perniciosus, Pseudococcus solitarius, Pseudococcus vastator, Pseudococcus viridis, Ripersia theae, Trionymus sericeus* **EPPO code**: NIPAVI **Name used in the EU legislation**: – **Group**: Insect **Order**: Hemiptera **Family**: Pseudococcidae **Common name**: spherical mealybug, coffee mealybug, cotton mealybug, globular mealybug, hibiscus mealybug, karoo thorn mealybug, lebbeck mealybug
Regulated status	*Nipaecoccus viridis* is not regulated in the EU, neither is listed by EPPO (EPPO, online_a). *Nipaecoccus viridis* has a quarantine status in Türkiye, Bahrain, Chilli and Brazil (EPPO, online_a).
Pest status in Uganda	Present, no details (EPPO, online).
Pest status in the EU	*Nipaecoccus viridis* is absent in the EU (CABI, online; EPPO, online_b; Garcıa Morales et al., online).
Host status on Petunia and Calibrachoa	*Nipaecoccus viridis* is a polyphagous pest with a known host range that includes at least 140 plant genera in 53 families (García et al. 2016). Solanaceae host species include *Cestrum nocturnum, Datura stramonium, Solanum lycopersicum, Lycopersicon esculentum*, *Solanum melongena, Solanum nigrum, Solanum tuberosum* (Garcıa Morales et al., online). Considering the wide host range, *Petunia/Calibrachoa* are likely to be suitable hosts for *N. viridis*.

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PRA information	• EFSA Panel on Plant Health Pest categorisation of *Nipaecoccus viridis* (EFSA PLH Panel, 2023) • Scientific Opinion on the commodity risk assessment of *Petunia* spp. *and Calibrachoa* spp. unrooted cuttings from Kenya (EFSA PLH Panel, 2024)	
Other relevant information for the assessment		
Biology	*Nipaecoccus viridis* reproduce both sexually and parthenogenically. Females lay about 300–500 eggs in their lifetime (Mani and Shivaraju, 2016) and sometimes more than 1100 eggs (Bartlett, 1978). The mealybug prefers to feed and reproduce on fast growing tissues like new branches and fruits (Burrow and Diepenbrock, 2020). *Nipaecoccus viridis* is probably indigenous to the warm tropical areas of the Indian subcontinent (Franco et al., 2004) and is spread in many parts of the world, mainly in tropics and subtropics (Thomas and Leppla, 2008). The development stages of *N. viridis* are egg, three nymphal instars (for females) and four nymphal instars (for males), and adult (Mani and Shivaraju, 2016). According to Sharaf and Meyerdirk (1987), the number of instars is four for females and five for males. The first instar nymph (crawler) can be carried by wind and hitchhiking. The developmental time lasts between 19 and 20 days at 25°C and 15–19 days at 32°C (Gerson and Aplebaum, online). Males have forewings and live up to 3 days. Females are wingless and live up to 50 days (Gerson and Aplebaum, online). The mealybug can have several overlapping generations per year (Sharaf and Meyerdirk, 1987). Six to seven generations occur annually in the Jordan Valley (Gerson and Aplebaum, online). *Nipaecoccus viridis* overwinters in all developmental stages, egg, larvae and adult in cracks and crevices of the stems and branches (Gerson and Aplebaum, online; Jarjes et al., 1989).	
Symptoms	**Main type of symptoms**	*Nipaecoccus viridis* adults and larvae can damage all plant parts, such as leaves, fruits, twigs, flowers and even roots (Abdul-Rassoul, 1970; CABI, online; Gerson and Aplebaum, online; Sharaf and Meyerdirk, 1987). On citrus, feeding on twigs causes deformation. Infested trees may be stunted, and fruits may show signs of deformation, discoloration and eventually drop early.
	Presence of asymptomatic plants	Plant damage might not be obvious in early infestation or during dormancy (due to the absence of leaves), but the presence of mealybugs on the plants could be observed. Early infestation by crawler larvae is difficult to be noted.
	Confusion with other pests	*Nipaecoccus viridis* can be confused with other mealybugs. Many mealybugs are very similar to each other in overall appearance and are thus difficult to identify. For proper identification, examination of a microscopic slide of an adult female under microscope is required.
Host plant range	*Nipaecoccus viridis* attacks 53 plant families and 140 genera (Garcia Morales et al., online). Main hosts are avocado (*Persea americana*), citrus (Citrus spp.), coffee (*Coffea* spp.), cotton (*Gossypium* spp.), grapevine (*Vitis vinifera*), mango (*Mangifera indica*), pomegranate (*Punica granatum*) and tamarind (*Tamarindus* spp.) (CABI, online; Gerson and Aplebaum, online). Other host plants are fig (*Ficus carica*), Indian siris (*Albizia lebbeck*), jack fruit (*Artocarpus heterophyllus*), crape myrtle (*Lagerstroemia indica*), white mulberry (*Morus alba*), oleander (*Nerium oleander*), potato (*Solanum tuberosum*), tomato (*Solanum Lycopersicum)* rosemallows (*Hibiscus* spp.) and soybean (*Glycine max*) (CABI, online; Garcia Morales et al., online).	
What life stages could be expected on the commodity	Eggs, larvae and adults of *N. viridis* may be present on leaves of *Petunia/Calibrachoa*.	
Evidence of impact	*Nipaecoccus viridis* is an agricultural pest in Asia that attacks ornamental and fibre crops (Sharaf and Meyerdirk, 1987). It has economic impact on citrus, custard apple, grapes, guava, jackfruit, mango, pomegranate and pummelo (Mani and Shivaraju, 2016). The pest is regulated as a quarantine pest in Türkiye and in countries in Asia and South America (EPPO, online_a).	

A.5.2 | Possibility of pest presence in the nursery

A.5.2.1 | Possibility of entry from the surrounding environment

In Uganda the pest status of *N. viridis* is present (no details). Due to its polyphagy, the pest is likely to be present in the environment surrounding the nurseries producing Petunia/Calibrachoa plants. It is possible that nurseries are located in areas where the pest is present. If host plants are present in the surroundings and pest pressure is high (e.g. citrus or cotton production), introduction into the nursery is likely. Possible pathways of entry into the nursery can be by movement of infested plants, wind, human and animal dispersal (Mani and Shivaraju, 2016). The first larvae instars (crawlers) can disperse by walking and by wind or by hitchhiking on clothes of workers (Mani and Shivaraju, 2016).

Uncertainties:

- No information about the density of the population of *N. viridis* in the area surrounding the nurseries is available.
- The presence of defects in the greenhouse structure.

Taking into consideration the above evidence and uncertainties, the Panel considers that it is possible for the pest to enter the nursery from the surrounding area. The pest can be present in the surrounding areas and the transfer rate could be enhanced by wind and accidental transportation by humans.

A.5.2.2 | Possibility of entry with new plants/seeds

The propagation material used for establishing mother plants originates from Germany, and The Netherlands. The imported plants are held in post-entry quarantine facilities for 7 to 8 weeks and tested by the NPPO for several viruses before being approved for further multiplication. It is unlikely that this planting material contains *N. viridis*.

Taking into consideration the above evidence and uncertainties, the Panel considers it is possible that the pest could enter the nursery, especially at initial infestation stages.

A.5.2.3 | Possibility of spread within the nursery

Possible pathways of spreading within the nursery can be by movement of infested host plants. Larvae and adults could spread from other host plants present in the nursery by hitchhiking on clothing of nursery staff. The males can fly, but only to limited distances (Chong et al., 2015).

Uncertainties:

- Presence of other host plant species in the nursery producing *Petunia/Calibrachoa* cuttings.

Taking into consideration the above evidence and uncertainties, the Panel considers that the transfer of the pest within the nursery is possible. Spread within the nursery could be enhanced by movement of infested plants, by wind, soil, human and animal dispersal.

A.5.3 | Information from interceptions

There were no interceptions of *N. viridis* on any imported commodity from Uganda, or on *Petunia* spp./*Calibrachoa* spp. from all origins (EUROPHYT and TRACES, online).

A.5.4 | Evaluation of the risk mitigation measures

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

No.	Risk mitigation measure	Effect (Yes/No)	Implementation in Uganda
1	Growing plants in isolation	Yes	Description The unrooted cuttings to be exported from Uganda will be grown and harvested from greenhouse production facilities approved by the NPPO. The cuttings are grown in closed greenhouses (closed production). A double-door entry system is used to control temperatures in the greenhouse as well as mitigate entry of pests. *Petunia* spp. and *Calibrachoa* spp. are produced in separate units. Evaluation The thrips-proof netting prevents the introduction of whiteflies from the surrounding environment. However, *N. viridis* adults may be introduced through defects in the greenhouse. Uncertainties Presence of unnoticed defects in the greenhouse structure.
2	Dedicated hygiene measures	Yes	Description For accessing the greenhouse there is a double door system. Changing rooms and disinfection facility allow the personnel to wear dedicated boots and clothes before entering the greenhouse. There are dedicated tools used for each greenhouse unit. Each unit has a specific set of clothes including a disinfection area. Evaluation The measures prevent the entrance and spread in the nursery of hitchhiking crawlers of *N. viridis*. Uncertainties It is not known if there is an additional change and disinfection area before entering the *Petunia/Calibrachoa* spp. production units.

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No.	Risk mitigation measure	Effect (Yes/No)	Implementation in Uganda
3	Treatment of growing media	No	Description The plants for planting from which the cuttings are harvested are grown in a soilless medium (100% pumice in hydroponic greenhouses). The growing media used in production and at the moment of export is according to ISPM 40 (FAO, 2017a) and to the NPPO Uganda requirements. Evaluation The probability that *N. viridis* is present on the certified starting material is very low/negligible. Uncertainties None.
4	Quality of source plant material	No	Description All the intended planting materials are to be imported from mother companies in the Netherlands and Germany (Dossier section 1). These are Elite-certified materials in the form of TC plantlets or URCs for further multiplication in Uganda. Upon arrival in Uganda, the NPPO conducts documentary and identity checks at entry before dispatch to post quarantine in contained facilities at the production farms.
5	Crop rotation	Yes	Description No crop rotation takes place. Specific greenhouses units are used for producing *Petunia* spp. and *Calibrachoa* spp. Evaluation No crop rotation with non-host plants takes place. In case of introduction into the greenhouse, populations of *N. viridis* may build up since the same unit is used for production of *Petunia* spp. and *Calibrachoa* spp. Uncertainties None.
6	Disinfection of irrigation water	No	The irrigation water is treated with sodium chloride and UV irradiation (Dossier Section 1).
7	Pest monitoring and inspections	Yes	Description The presence of pests and symptoms in plants is monitored, including yellow sticky traps, on a daily basis by nurseries staff. A compiled weekly report is produced by the scouting team, which is used to decide the weekly pest control measures in the greenhouses (Dossier Section 1). Evaluation Populations of *N. viridis* are monitored through sticky traps and the presence of the pest in the nursery may be detected at an early stage. Early infestation of *N. viridis* in the crop may be difficult to detect. Uncertainties The efficiency of detecting the early infestations of *N. viridis*.
8	Treatment of crop during production	Yes	Description Fungicides, insecticides, acaricides and biological control agents are applied on weekly basis, following scouting inspections and are reported in Dossier Section 4 (Table E1.1–6). Rotation among active substances (a.s.) is adopted to prevent the development of insecticide resistance. Details on the a.s. are reported in Dossier Section 4. Evaluation The products used may have an effect on populations of *N. viridis*. Uncertainties The level of resistance against the listed insecticides of *N. viridis* opulations in Uganda.
9	Sampling and testing	Yes	Description A detailed protocol for sampling and testing plants is described in Dossier Section 4. The sampling Protocol is implemented according to Risk-Based Estimator for Surveillance Systems (RiBESS+) (https://r4eu.efsa.europa.eu/app/ribess). A subsample per variety, per batch is sent to the accredited laboratory for further pest analyses. The testing procedures follow the PM7 diagnostic standards of EPPO (https://www.eppo.int/RESOURCES/eppo_standards/pm7_diagnostics). Evaluation Sampling for virus testing may detect the presence of *N. viridis*. Uncertainties The efficiency of detecting the early infestations of *N. viridis*.
10	Official supervision by NPPO	Yes	Description NPPO Uganda conducts a 3-week to monthly pest surveillance frequency to monitor pest incidence and prevalence on each plant variety and species guided by the pests relevant for the EU. NPPO Uganda enforces compliance with phytosanitary measures as provided for in the EU Directive 2016/2031.

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No.	Risk mitigation measure	Effect (Yes/No)	Implementation in Uganda
			Official measures are targeted to *B. tabaci*. If whiteflies are seen on the plants, the whole production unit shall be quarantined and subjected to sampling and tested for begomoviruses. If the test is positive, the NPPO requires the nurseries/farms to destroy all the crop. Official procedures exist on how to destroy all affected such high-risk materials using incineration provided by accredited companies. Handling of such material will be supervised by the NPPO and conducted by select staff. Evaluation Official measures are targeted to *N. viridis* and may efficiently prevent the presence of *B. tabaci* on unrooted cuttings designated for export to the EU. Uncertainties The efficiency of detecting the early infestations of *N. viridis*.

A.5.5 | Overall likelihood of pest freedom for the exported commodity (comparative)

A.5.5.1 | Comparison with other relevant commodity Risk Assessments involving *Nipaecoccus viridis*

Nipaeococcus viridis was already assessed as relevant pests for the commodity risk assessment of Petunia and Calibrachoa from Kenya (EFSA PLH Panel, 2024). The similarities between the dossiers from Kenya and Uganda are:

- The type of commodity exported: unrooted cuttings of *Petunia/Calibrachoa* spp. of similar size and age;
- The production system (production in greenhouse in separate units) and climatic and environmental conditions are very similar.
- The pest pressure in the surrounding environment is expected to be similar.
- The starting material originates in both countries from EU countries and is certified material.
- No differences in the effect of the risk mitigating measures were identified.

Because no differences were identified the Panel applied the results of the EKE of pest freedom of *N. viridis* from unrooted cuttings of *Petunia/Calibrachoa* spp. from Kenya (EFSA PLH Panel, 2024).

A.5.6. | Elicitation outcomes of the assessment of the pest freedom for *Nipaecoccus viridis*

The elicited and fitted values for *N. viridis* for pest infestation and pest freedom agreed by the Panel are shown in Tables A.9 and A.10 and in Figure A.5.

TABLE A.9 Elicited and fitted values of the uncertainty distribution of pest infestation by *Nipaecoccus viridis* per 10,000 unrooted cuttings.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0					2		4		8					20
EKE	0.084	0.197	0.381	0.744	1.24	1.89	2.59	4.22	6.36	7.79	9.68	11.9	14.7	17.1	20.0

Note: The EKE results is the *BetaGeneral (1.0764, 6.8505, 0, 40)* distribution fitted with @Risk version 7.6.

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

TABLE A.10 The uncertainty distribution of plants free of *Nipaecoccus viridis* per 10,000 unrooted cuttings is calculated by Table A.9.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9980					9992		9996		9998					10,000
EKE results	9980	9983	9985	9988	9990	9992	9994	9996	9997	9998.1	9998.8	9999.3	9999.6	9999.8	9999.9

Note: The EKE results are the fitted values.

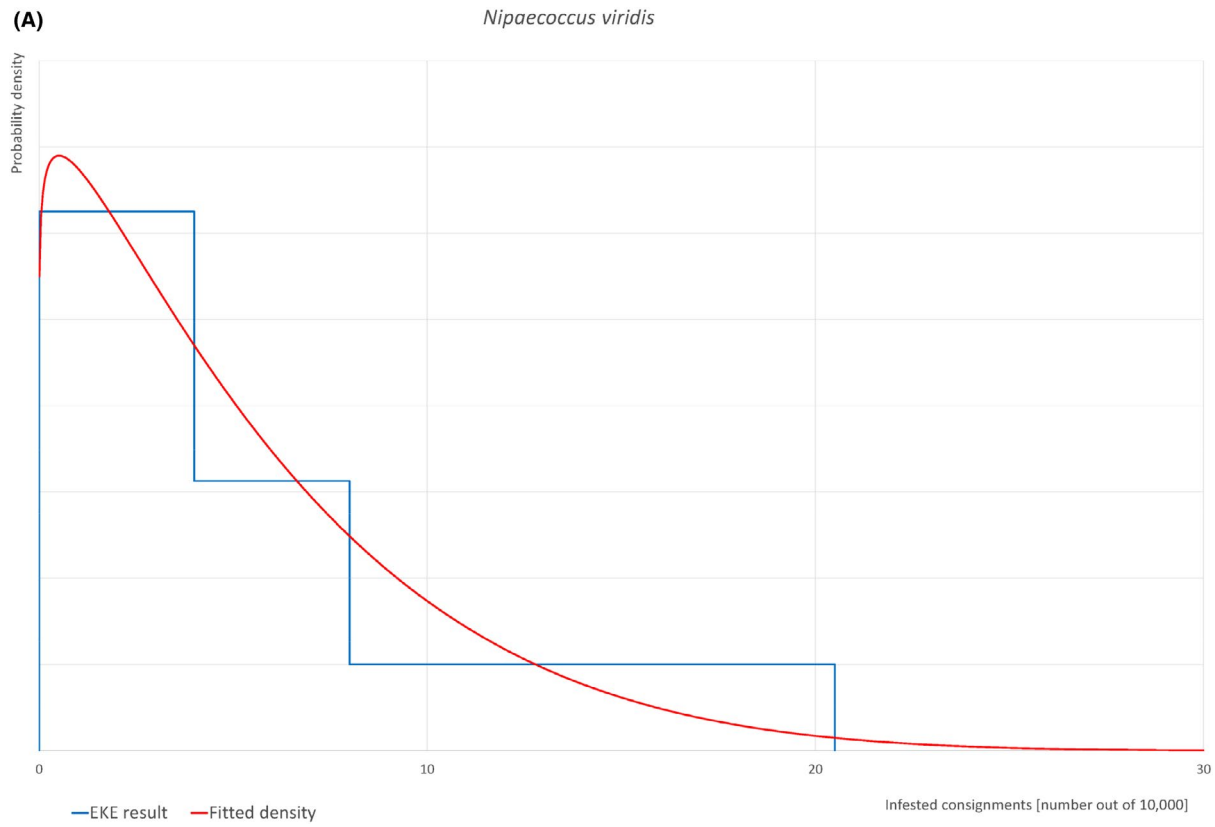

FIGURE A.5 (Continued)

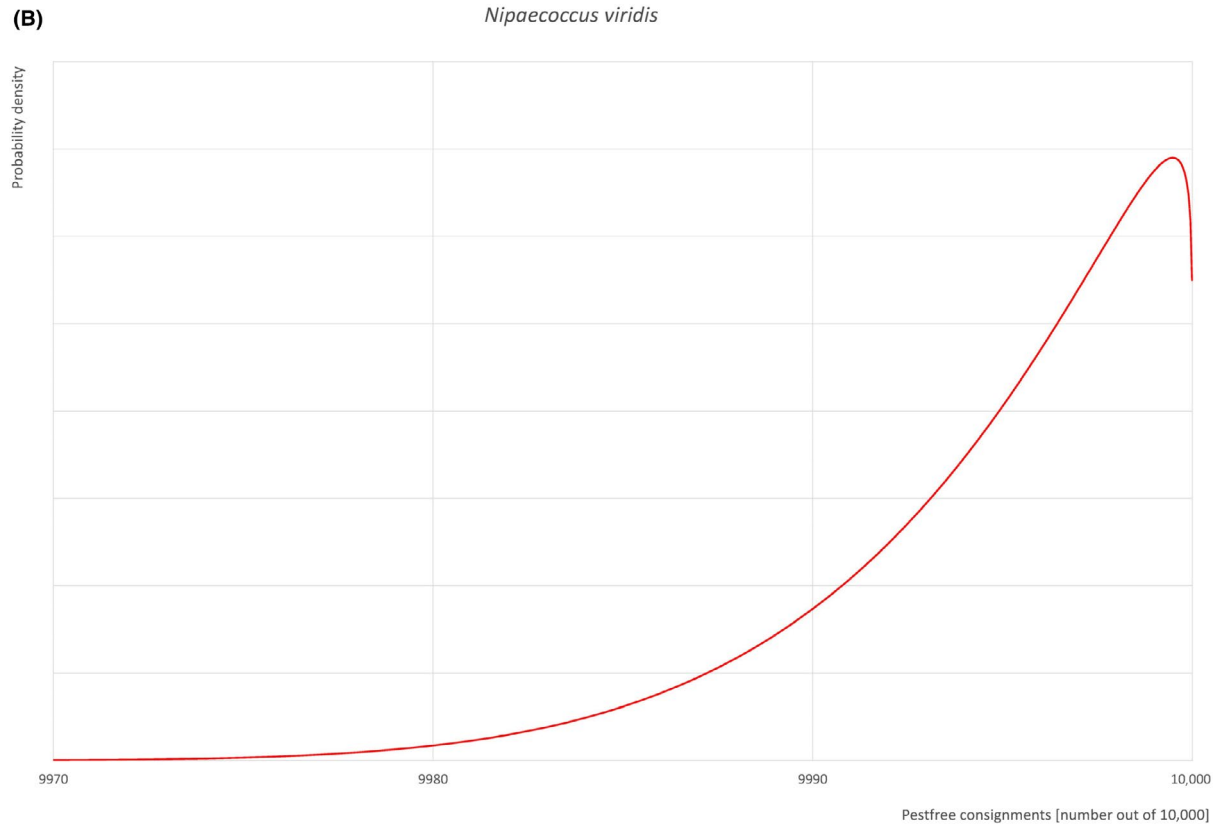

FIGURE A.5 (Continued)

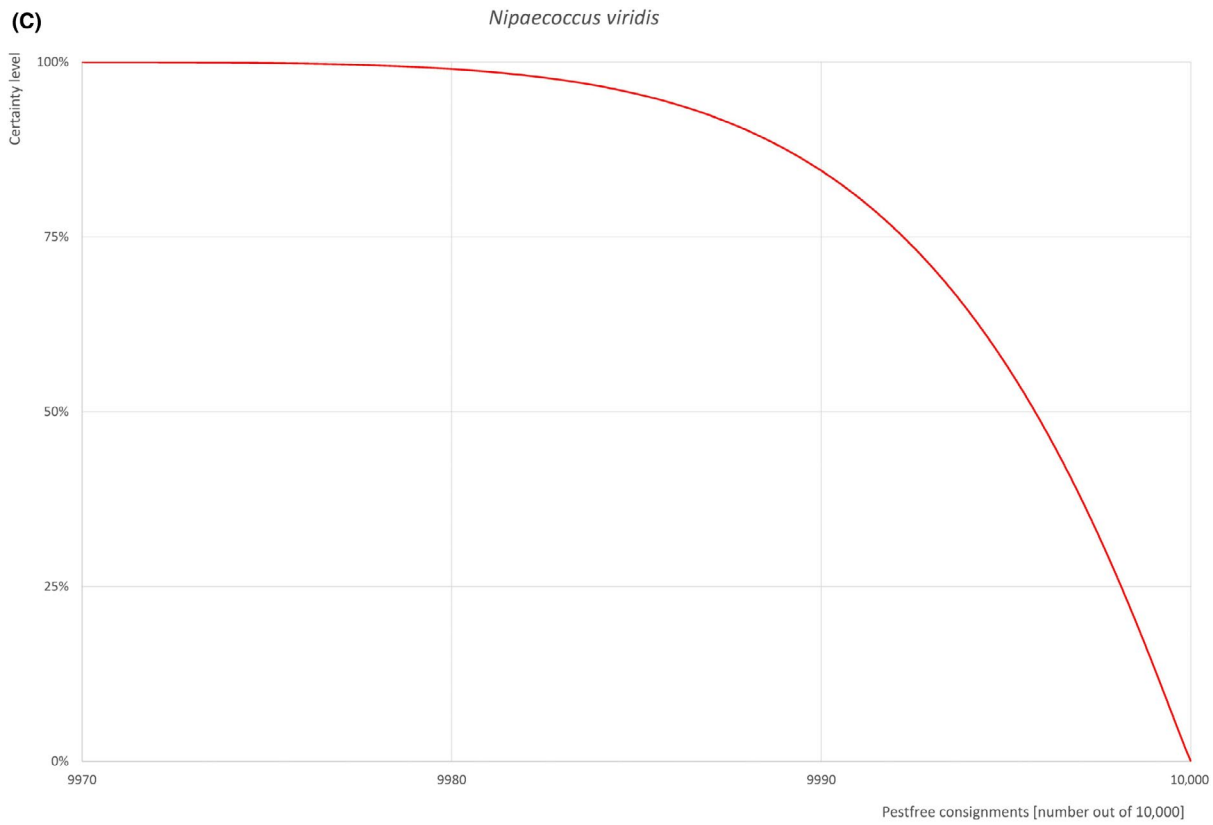

FIGURE A.5 (A) Elicited uncertainty of pest infection per 10,000 plants of specimen trees (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free plants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

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A.6 | *RALSTONIA SOLANACEARUM* SPECIES COMPLEX (*R. SOLANACEARUM*, *R. PSEUDOSOLANACEARUM*)

A.6.1 | Organism information

Taxonomic information	**1. Current valid scientific name**: *Ralstonia solanacearum (Smith, 1896) Yabuuchi* et al., *1996 emend. Safni* et al., *2014 (Phylotype II)* **EPPO code**: RALSSL **Name used in the EU legislation**: *Ralstonia solanacearum* (Smith) Yabuuchi et al. emend. Safni et al. [RALSSL] **2. Current valid scientific name:** *Ralstonia pseudosolanacearum Safni* et al., *2014 (Phylotypes I and III)* **EPPO code:** RALSPS **Name used in the EU legislation**: *Ralstonia pseudosolanacearum* Safni et al. [RALSPS] **Group**: Bacteria **Order**: Burkholderiales **Family**: Burkholderiaceae **Common name**: – **Reason for clustering**: *Ralstonia solanacearum* (Smith) Yabuuchi et al. (1995) is a species complex (RSSC) that comprises four phylotypes (Fegan & Prior, 2005), reclassified in three distinct species, including *R. solanacearum* (Smith, 1896) Yabuuchi et al., 1996 emend. Safni et al., 2014 (Phylotype II) and *R. pseudosolanacearum* Safni et al., 2014 (Phylotypes I and III). Thus, the two species share biological and epidemiological traits to justify their clustering (EPPO datasheet, 2025).		
Regulated status	*Ralstonia solanacearum (Smith)* Yabuuchi et al. emend. Safni et al. [RALSSL] is listed in Annex II/B of Commission Implementing Regulation (EU) 2019/2072. *Ralstonia pseudosolanacearum*, Safni et al. [RALSPS] is listed in Annex II/A of Commission Implementing Regulation (EU) 2019/2072.		
Pest status in Uganda	*Ralstonia solanacearum* and *R. pseudosolanacearum* according to EPPO, CABI (online) are present and widespread in Uganda (phylotypes I, II, III of the *R. solanacearum* complex).		
Pest status in the EU	Not relevant for EU Quarantine pest		
Host status on Petunia and Calibrachoa spp.	**Bacterium name**	***Petunia/Calibrachoa* host status**	**Solanaceae host plants**
	Ralstonia solanacearum	*Petunia hybrida* and *Calibrachoa* spp. are listed as host plants (CABI 2020).	*Capsicum* spp., *Solanum* spp., *Datura stramonium*
	Ralstonia Pseudosolanacearum	Experimental host	*Capsicum* spp., *Solanum* spp.
	Ralstonia solanacearum and *R. pseudosolanacearum* have a wide host range including solanaceous host plants (potato, tomato, pepper and eggplant), and therefore the Panel assumes that *Petunia/Calibrachoa* spp. could also be a host for *R. pseudosolanacearum*. Uncertainties: The host status of *Petunia/Calibrachoa* for *R. pseudosolanacearum*		

(Continued)

PRA information	• Scientific Opinion on the pest categorisation of *Ralstonia solanacearum* species complex (EFSA PLH Panel, 2019). • Scientific Opinion on the commodity risk assessment of *Petunia* spp. *and Calibrachoa* spp. unrooted cuttings from Kenya (EFSA PLH Panel, 2024).
Other relevant information for the assessment	
Biology	**Transmission** *Ralstonia solanacearum* and *R. pseudosolanacearum* are soil-borne bacteria. They are transmitted by contaminated soil, irrigation water, tools and infected plant materials. Bacteria enter the plants usually by root injuries. They can also infect plants via stem injuries. Disease severity generally increases if the bacteria are found in association with root nematodes. **Host range and distribution of host plants in the environment:** *Ralstonia solanacearum* and *R. pseudosolanacearum* infect numerous cultivated solanaceous and non-solanaceous plants and are present on numerous wild host plants species. **Ecology and biology of the vectors:** Transmission does not involve any vector. Entry into plants is usually through root and stem injuries from where the bacteria move by colonisation of the xylem. Blocking of the vessels by bacterial biofilm is the major cause of wilting. **Symptoms on *Petunia/Calibrachoa*:** Bacteria cause wilting of the whole plant when the infection occurs at the root level. It can cause a hypersensitive reaction on resistant cultivars. Plants can also be infected without (evident) external signs or symptoms. Laboratory tests are necessary and available to detect infected plants.
Evidence that the commodity can be a pathway	Unrooted cuttings of *Petunia* and *Calibrachoa* can be systemically infected. The bacteria colonise the xylem vessels.

A.6.2 | Possibility of pest presence in the nursery

A.6.2.1 | Possibility of entry from the surrounding environment

The natural host range of *Ralstonia solanacearum* complex includes many host plant species which could be present in the surrounding environment of the nurseries producing unrooted cuttings of *Petunia/Calibrachoa*. The main pathway of entrance of the bacteria from the surrounding environment in the nursery is through infested soil and irrigation water. Failure in the water disinfection system of the production greenhouses could enable bacteria to enter, as well as hitchhiking bacteria on persons or material entering the greenhouse.

Uncertainties:

- Unnoticed failures in the water treatment and storage system.
- Inclusion of *Ralstonia* in the routine testing.

A.6.2.2 | Possibility of entry with new plants/seeds

Foundation stock used to establish mother plants for unrooted cuttings production originate from Netherland and Germany. *R. solanacearum* and *R. pseudosolanacearum* are present in Germany in Netherland and Germany. In all countries a certification scheme is in place for *Petunia/Calibrachoa*. No tests are reported to be performed for *Ralstonia*. Propagation material is not reported to be tested for bacterial infection, however it is unlikely that the imported certified (Elite) material from the EU is infected with *Ralstonia*.

Uncertainties:

None.

A.6.2.3 | Possibility of spread within the nursery

Ralstonia spp. could be present on other host plants in the nursery. Bacteria are efficiently transmitted by tools during pruning and cutting production. There is no information on the presence of other host plants (e.g. *Pelargonium* spp. and rose) of *R. solanacearum* and *R. pseudosolanacearum* in the nurseries. However, the hygiene measures in place in production sites can prevent the spread of *Ralstonia* spp. within the nursery.

Uncertainties:

- Failure in the application strict hygiene measures.

A.6.3 | Information from interceptions

There were three interceptions of *R. solanacearum* on potato (*Solanum tuberosum*) imported from Uganda. There were no interceptions of *R. solanacearum* on *Petunia* spp./*Calibrachoa* spp. from all origins (EUROPHYT and TRACES, online).

A.6.4 | Evaluation of the risk mitigation measures

In the table below, all risk mitigation measures currently applied in Uganda are listed and an indication of their effectiveness on *R. solanacearum* species complex is provided. The description of the implemented risk mitigation measures is provided in Table 9.

No.	Risk mitigation measure	Effect (Yes/No)	Implementation in Uganda
1	Growing plants in isolation	Yes	Description The unrooted cuttings to be exported from Uganda will be grown and harvested from greenhouse production facilities approved by the NPPO. The cuttings are grown in closed greenhouses (closed production). A double-door entry system is used to control temperatures in the greenhouse as well as mitigate entry of pests. *Petunia* spp. and *Calibrachoa* spp. are produced in separate units. Evaluation The isolated greenhouses with polythene roof and sidewalls fitted with insect proof nets as well as double door prevent passive introduction of *R. solanacearum* and *R. pseudosolanacearum* by air movements. Uncertainties Presence of unnoticed defects in the greenhouse structure.
2	Dedicated hygiene measures	Yes	Description For accessing the greenhouse there is a double door system. Changing rooms and disinfection facility allow the personnel to wear dedicated boots and clothes before entering the greenhouse. There are dedicated tools used for each greenhouse unit. Each unit has a specific set of clothes including a disinfection area. Evaluation Hygienic procedures described prevent the introduction of bacteria from the surrounding environment via contaminated clothes and tools. Disinfection of pruning tools prevents the spread of bacteria within the greenhouse in case of the introduction of *Ralstonia*. Uncertainties None.
3	Treatment of growing media	No	Description The plants for planting from which the cuttings are harvested are grown in a soilless medium (100% pumice in hydroponic greenhouses). The growing media used in production and at the moment of export is according to ISPM 40 (FAO, 2017a) and to the NPPO Uganda requirements. Evaluation Sterilisation by steam is reported to be efficient to reduce bacterial populations in volcanic pumice. Uncertainties It is not known if the heat treatment is applied homogeneously to all the substrates.
4	Quality of source plant material	Yes	Description All the intended planting materials are to be imported from mother companies in the Netherlands and Germany (Dossier Section 1). These are Elite-certified materials in the form of TC plantlets or URCs for further multiplication in Uganda. Upon arrival in Uganda, the NPPO conducts documentary and identity checks at entry before dispatch to post quarantine in contained facilities at the production farms. Evaluation Propagation material is not reported to be tested for bacterial infection; however, it is unlikely that the imported certified (Elite) material from the EU is infected with *Ralstonia*. Uncertainties None.
5	Crop rotation	No	Description No crop rotation takes place. Specific greenhouses units are used for producing *Petunia* spp. and *Calibrachoa* spp.
6	Disinfection of irrigation water	Yes	The irrigation water is treated with sodium chloride and UV irradiation (Dossier Section 1). Evaluation *Ralstonia solanacearum* and *R. pseudosolanacearum* may enter from the surrounding environment. Irrigation water is one the main pathways for the introduction of *R. solanacearum* and *R. pseudosolanacearum* in the facilities. The disinfection of irrigation water is effective in eliminating the presence of *Ralstonia* in the irrigation water. There is no information if irrigation water is tested for the presence of *Ralstonia*. Uncertainties • Unnoticed failures in the water treatment and storage system. • Inclusion of *Ralstonia* in the weekly testing.

(Continued)

No.	Risk mitigation measure	Effect (Yes/No)	Implementation in Uganda
7	Pest monitoring and inspections	Yes	Description The presence of pests and symptoms in plants is monitored, including yellow sticky traps, on a daily basis by nurseries staff. A compiled weekly report is produced by the scouting team, which is used to decide the weekly pest control measures in the greenhouses (Dossier Section 1). Evaluation Monitoring tests for the presence of *R. solanacearum* and *R. pseudosolanacearum* are poorly described. Visual inspection of the crop could detect symptoms of *Ralstonia*, however due to the long latent period some infections may go undetected. Uncertainties • The efficiency of monitoring and inspection. • The length of the latent period necessary to the expression of symptoms.
8	Treatment of crop during production	No	Description Fungicides, insecticides, acaricides and biological control agents are applied on weekly basis, following scouting inspections and are reported in Dossier Section 4 (Table E1.1–6). Rotation among active substances (a.s.) is adopted to prevent the development of insecticide resistance. Details on the a.s. are reported in Dossier Section 4.
9	Sampling and testing	Yes	Description A detailed protocol for sampling and testing plants is described in Dossier Section 4. The sampling Protocol is implemented according to Risk-Based Estimator for Surveillance Systems (RiBESS+) (https://r4eu.efsa.europa.eu/app/ribess). A subsample per variety, per batch is sent to the accredited laboratory for further pest analyses. The testing procedures follow the PM7 diagnostic standards of EPPO (https://www.eppo.int/RESOURCES/eppo_standards/pm7_diagnostics). Evaluation Plants for planting are regularly tested during production. When production of *Petunia* and *Calibrachoa* begins, plants will be routinely tested, including for *R. solanacearum* species complex. Uncertainties None
10	Official supervision by NPPO	Yes	Description NPPO Uganda conducts a 3-week to monthly pest surveillance frequency to monitor pest incidence and prevalence on each plant variety and species guided by the pests relevant for the EU. NPPO Uganda enforces compliance with phytosanitary measures as provided for in the EU Directive 2016/2031. Official measures are targeted to *B. tabaci*. If whiteflies are seen on the plants, the whole production unit shall be quarantined and subjected to sampling and tested for begomoviruses. If the test is positive, the NPPO requires the nurseries/farms to destroy all the crop. Official procedures exist on how to destroy all affected such high-risk materials using incineration provided by accredited companies. Handling of such material will be supervised by the NPPO and conducted by select staff. Evaluation Plants for planting are regularly tested during production. When production of *Petunia* and *Calibrachoa* begins, plants will be routinely tested, including for *R. solanacearum* species complex. Uncertainties None.

A.6.5 | Overall likelihood of pest freedom for the exported commodity (comparative)

A.6.5.1 | Comparison with other relevant commodity Risk Assessments involving ***Ralstonia solanacearum*** species complex

Ralstonia solanacearum species complex was already assessed as relevant pests for the commodity risk assessment of *Petunia* spp. and *Calibrachoa* spp. from Kenya (EFSA PLH Panel, 2024). The similarities between the dossiers from Kenya and Uganda are:

- The type of commodity exported: unrooted cuttings of *Petunia/Calibrachoa* spp. of similar size and age.
- The production system (production in greenhouse in separate units) and climatic and environmental conditions are very similar compared to Kenya.
- The pest pressure in the surrounding environment is expected to be similar.
- The starting material originates in both countries from EU countries and is certified material.
- No differences in the effect of the risk mitigating measures were identified.

Because no differences were identified the Panel applied the results of the EKE of pest freedom of *R. solanacearum* species complex from unrooted cuttings of *Petunia/Calibrachoa* spp. from Kenya (EFSA PLH Panel, 2024).

A.6.6 | Elicitation outcomes of the assessment of the pest freedom for *Ralstonia solanacearum* species complex

The elicited and fitted values for ***R. solanacearum*** species complex for pest infestation and pest freedom agreed by the Panel are shown in Tables A.11 and A.12 and in Figure A.6.

TABLE A.11 Elicited and fitted values of the uncertainty distribution of pest infestation by *Ralstonia solanacearum* species complex per 10,000 unrooted cuttings.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	1					3		6		10					100
EKE	0.501	0.723	1.03	1.57	2.24	3.06	3.92	5.86	8.42	10.2	12.5	15.5	19.4	23.2	28.2

Note: The EKE results is the *BetaGeneral (1.4156, 1963.6, 0.265, 10,000)* distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infected plants the pest freedom was calculated (i.e. = 10,000 – number of infected plants per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.12.

TABLE A.12 The uncertainty distribution of plants free of *Ralstonia solanacearum* species complex per 10,000 unrooted cuttings is calculated by Table A.11

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9900					9990		9994		9997					10,000
EKE results	9972	9977	9981	9985	9987	9990	9992	9994	9996	9997	9997.8	9998.4	9999.0	9999.3	9999.5

Note: The EKE results are the fitted values.

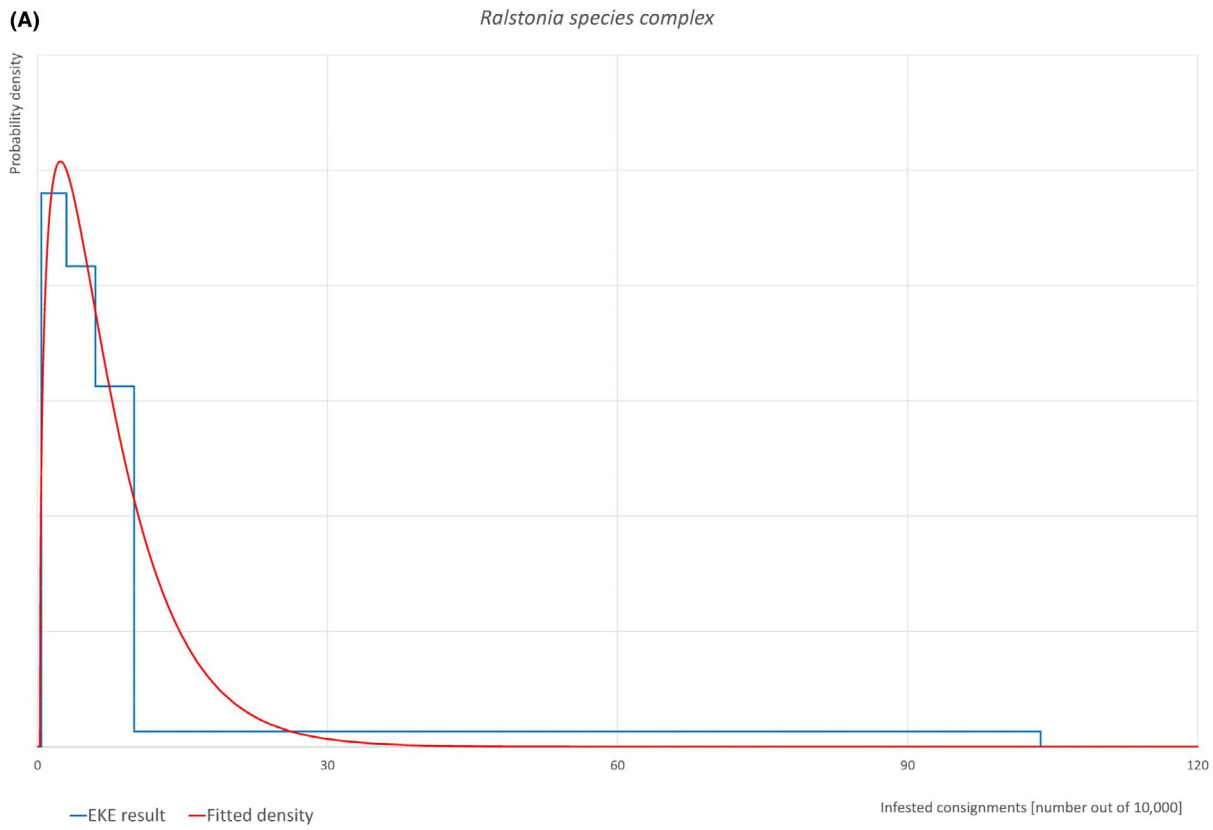

FIGURE A.6 (Continued)

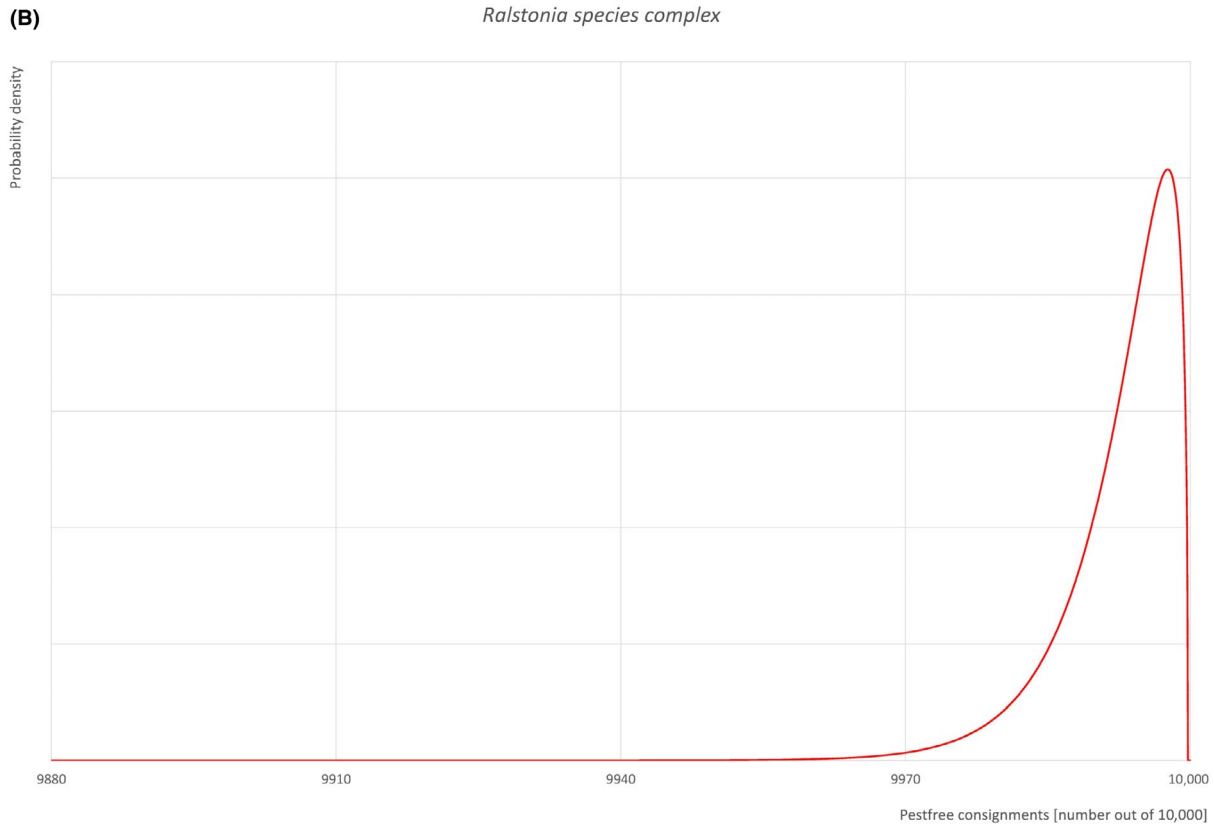

FIGURE A.6 (Continued)

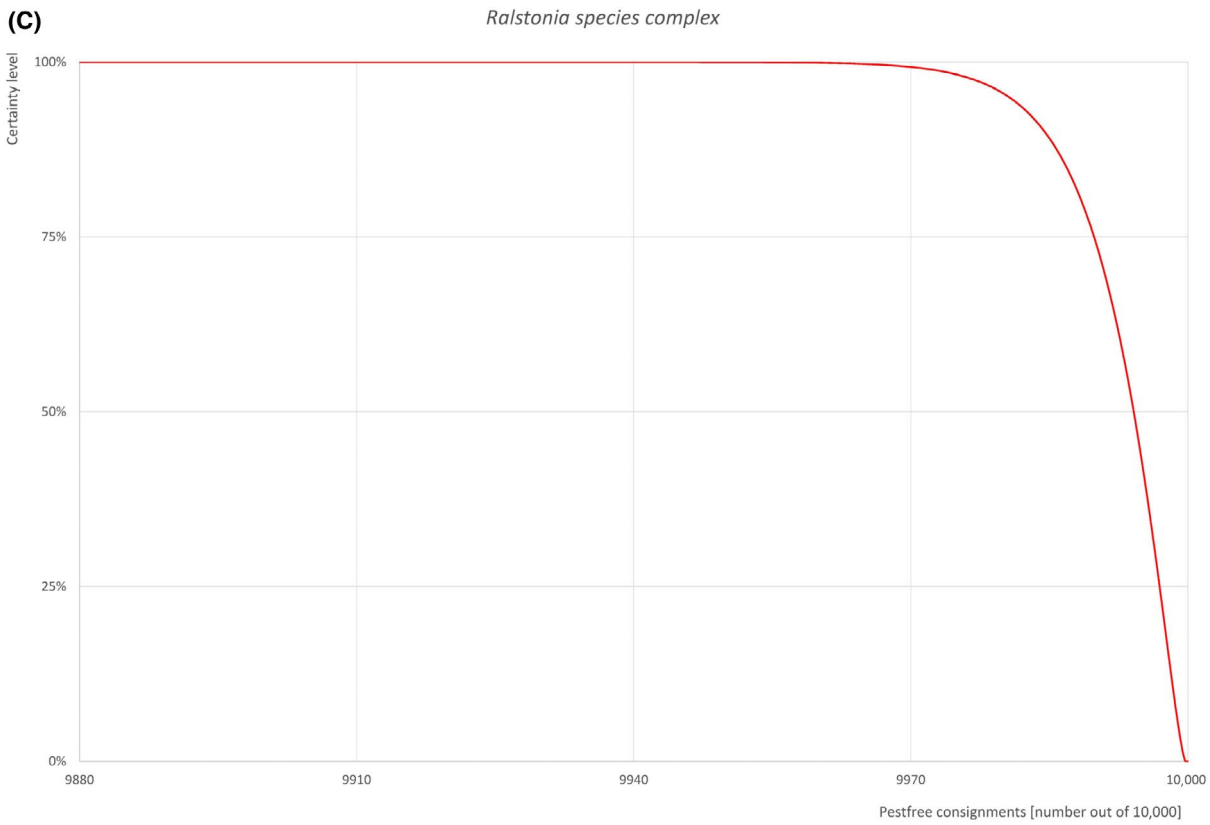

FIGURE A.6 (A) Elicited uncertainty of pest infection per 10,000 plants of specimen trees (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free plants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

A.6.7 | References

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A.7 | *SCIRTOTHRIPS DORSALIS*

A.7.1 | Organism information

Taxonomic information	**Current valid scientific name**: *Scirtothrips dorsalis* Hood **Synonyms**: *Anaphothrips andreae*, *Anaphothrips dorsalis*, *Anaphothrips fragariae*, *Heliothrips minutissimus*, *Neophysopus fragariae*, *Scirtothrips andreae*, *Scirtothrips dorsalis padmae*, *Scirtothrips fragariae*, *Scirtothrips minutissimus*, *Scirtothrips padmae* **EPPO code**: SCITDO **Name used in the EU legislation**: *Scirtothrips dorsalis* Hood [SCITDO] **Group**: Insect **Order**: Thysanoptera **Family**: Thripidae **Common name**: Assam thrips, chilli thrips, flower thrips, strawberry thrips, yellow tea thrips, castor thrips
Regulated status	The pest is listed in Annex II/A of Regulation (EU) 2019/2072 as *Scirtothrips dorsalis* Hood [SCITDO].
Pest status in Uganda	Present, no details (EPPO, online).
Pest status in the EU	Not relevant for EU Quarantine pest.
Host status on *Petunia* and *Calibrachoa*	*Petunia* × *hybrida* is indicated to be host of *S. dorsalis* (EPPO GD, online).
PRA information	• CSL Pest Risk Analysis for *Scirtothrips dorsalis* (MacLeod and Collins, 2006) • Pest Risk Assessment *Scirtothrips dorsalis* (Vierbergen and van der Gaag, 2009) • Scientific Opinion on the pest categorisation of *Scirtothrips dorsalis* (EFSA PLH Panel, 2014) • Scientific Opinion on the commodity risk assessment of *Petunia* spp. *and Calibrachoa* spp. unrooted cuttings from Kenya (EFSA PLH Panel, 2024)
Other relevant information for the assessment	
Biology	*Scirtothrips dorsalis* can have up to 8 generations annually in temperate regions and up to 18 generations in warm subtropical and tropical areas (Kumar et al., 2013). The stages of the life cycle include egg, first and second instar larva, prepupa, pupa and adult (Kumar et al., 2013). They can be found on all the aboveground plant parts (Kumar et al., 2014). Temperature range for development is from 9.7°C to 32°C, with 265 degree-days required for development from egg to adult (Tatara, 1994). The adult can live for 13–15 days (Kumar et al., 2013). Females can lay between 60 to 200 eggs in their lifetime (Seal and Klassen, 2012). Females develop from fertilised and males from unfertilised eggs (Kumar et al., 2013). The eggs are inserted into soft plant tissues and hatching larvae appear between two to 7 days (Kumar et al., 2014). Larvae and adults tend to gather near the mid-vein or near the damaged part of leaf tissue. Pupae are found in the leaf litter, on the axils of the leaves, in curled leaves or under the calyx of flowers and fruits (Kumar et al., 2013; MacLeod and Collins, 2006). The pest cannot overwinter, if the temperature remains below −4°C for 5 or more days (Nietschke et al., 2008). Adults fly actively for short distances and are transported passively by wind currents, which enables long-distance spread (EFSA PLH Panel, 2014). *Scirtothrips dorsalis* is a vector of plant viruses including peanut necrosis virus (PBNV), groundnut bud necrosis virus (GBNV), watermelon silver mottle virus (WsMoV), capsicum chlorosis virus (CaCV) and melon yellow spot virus (MYSV) (Kumar et al., 2013).

(Continued)

Symptoms	**Main type of symptoms**	The pest damages young leaves, buds, tender stems and fruits by puncturing tender tissues with their stylets and extracting the contents of individual epidermal cells leading to necrosis of tissue (Kumar et al., 2013; 2014). Main symptoms are: • 'sandy paper lines' on the epidermis of the leaves, • leaf crinkling and upwards leaf curling, • leaf size reduction, • discoloration of buds, flowers and young fruits, • silvering of the leaf surface, • linear thickenings of the leaf lamina, • brown frass markings on the leaves and fruits, • fruits develop corky tissues, • grey to black markings on fruits, • fruit distortion and early senescence of leaves, • defoliation
	Presence of asymptomatic plants	• Eggs and early stages of infestation may be difficult to detect • There are no baits/pheromones reported
	Confusion with other pests	Due to small size and morphological similarities within the genus, the identification of *S. dorsalis*, using traditional taxonomic keys, is difficult. The most precise identification of the pest is combination of molecular and morphological methods (Kumar et al., 2013). Sometimes, infested plants appear similar to plant damaged by broad mites (Kumar et al., 2013)
Host plant range	*Scirtothrips dorsalis* is a polyphagous pest with over 225 host plant species (see section 3.4.1 of EFSA (2014)	
What life stages could be expected on the commodity	All life stages, besides pupae, of *S. dorsalis* (eggs, larvae and adults) could be present on the leaves of *Petunia/Calibrachoa* unrooted cuttings.	

A.7.2 | Possibility of pest presence in the nursery

A.7.2.1 | Possibility of entry from the surrounding environment

In Uganda *S. dorsalis* is reported as present, no details (EPPO). Given the wide host range of this pest, it is possible that local populations of *S. dorsalis* are present in the neighbouring environment of the greenhouses with *Petunia/Calibrachoa* plants destined for the production of unrooted cuttings for the export. There is no evidence that the nurseries are located in a pest-free area for *S. dorsalis*, so the Panel assumes that *S. dorsalis* can be present in the production areas of *Petunia/Calibrachoa* destined for export to the EU.

Petunia/Calibrachoa plants destined for export to the EU are grown in a protected environment (i.e. greenhouse). Introduction of thrips into a greenhouse is possible through holes in the netting or roof of the greenhouse structure by flying or passive wind transfer through an open door or as a hitchhiker on clothing of nursery staff, however hygienic procedures are in place to prevent this. The success rate of one of these events is likely to occur in case of a high (local) density of *S. dorsalis* in the neighbouring environment of the greenhouse.

Uncertainties

- There is no surveillance information on the presence and population pressure of *S. dorsalis* in the area where the greenhouse is located.
- The proximity of the greenhouses to possible sources of populations of *S. dorsalis* is unknown.
- The presence of defects in the greenhouse structure

A.7.2.2 | Possibility of entry with new plants/seeds

The probability that *S. dorsalis* is present on the starting material is very low/negligible as the imported material is certified (elite) and is kept in the post-quarantine facility before released to the nursery.

A.7.2.3 | Possibility of spread within the nursery

Scirtothrips dorsalis can be present on other host plants (perennials, bedding plants and succulents that are mainly intended to be exported to the EU, but not for the local markets) in other production units of the nursery. When present, hitchhiking life stages of the mealybugs can spread from infested host plants within the nursery. *Petunia* for export are produced in a separate unit with hygienic standards (double doors, clean uniforms) with no mixing with the other ornamentals.

Uncertainties

- Specific host plants of *S. dorsalis* other than *Petunia* spp. that are grown in the nursery.
- Presence of defects within the greenhouse compartments.

A.7.3 | Information from interceptions

There were six interceptions of insects of the Tripidae family on plants imported from Uganda, without further classification at species level. There were no interceptions indicating *S. dorsalis* as harmful organism. There were no interceptions of *S. dorsalis* on *Petunia* spp./*Calibrachoa* spp. from all origins (EUROPHYT and TRACES, online).

A.7.4 | Evaluation of the risk mitigation measures

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

A.7.5 | Overall likelihood of pest freedom for the exported commodity (comparative)

A.7.5.1 | Comparison with other relevant commodity Risk Assessments involving ***Scirtothrips dorsalis***

Scirtothips dorsalis was already assessed as relevant pests for the commodity risk assessment of Petunia and Calibrachoa from Kenya (EFSA PLH Panel, 2024). The similarities between the dossiers from Kenya and Uganda are:

- The type of commodity exported: unrooted cuttings of *Petunia/Calibrachoa* spp. of similar size and age.
- The production system (production in greenhouse in separate units) and climatic and environmental conditions are very similar compared to Kenya.
- The pest pressure in the surrounding environment is expected to be similar.
- The starting material originates in both countries from EU countries and is certified material.
- No differences in the effect of the risk mitigating measures were identified.

Because no differences were identified the Panel applied the results of the EKE of pest freedom of *S. dorsalis* from unrooted cuttings of *Petunia*/*Calibrachoa* spp. from Kenya (EFSA PLH Panel, 2024).

A.7.6 | Elicitation outcomes of the assessment of the pest freedom for *Scirtothrips dorsalis*

The elicited and fitted values for *S. dorsalis* for pest infestation and pest freedom agreed by the Panel are shown in Tables A.13 and A.14 and in Figure A.7.

TABLE A.13 Elicited and fitted values of the uncertainty distribution of pest infestation by *Scirtothrips dorsalis* per 10,000 unrooted cuttings.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	1					7		15		25					60
EKE	1.04	1.47	2.13	3.39	5.06	7.18	9.43	14.6	21.2	25.5	31.1	37.6	45.4	52.2	60.1

Note: The EKE results is the *BetaGeneral (1.1458, 5.7476, 0.7, 104.5)* distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infected plants the pest freedom was calculated (i.e. = 10,000 – number of infected plants per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.14.

TABLE A.14 The uncertainty distribution of plants free of *Scirtothrips dorsalis* per 10,000 unrooted cuttings is calculated by Table A.13.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9940					9975		9985		9993					9999
EKE results	9940	9948	9955	9962	9969	9975	9979	9985	9991	9993	9995	9997	9997.9	9998.5	9999.0

Note: The EKE results are the fitted values.

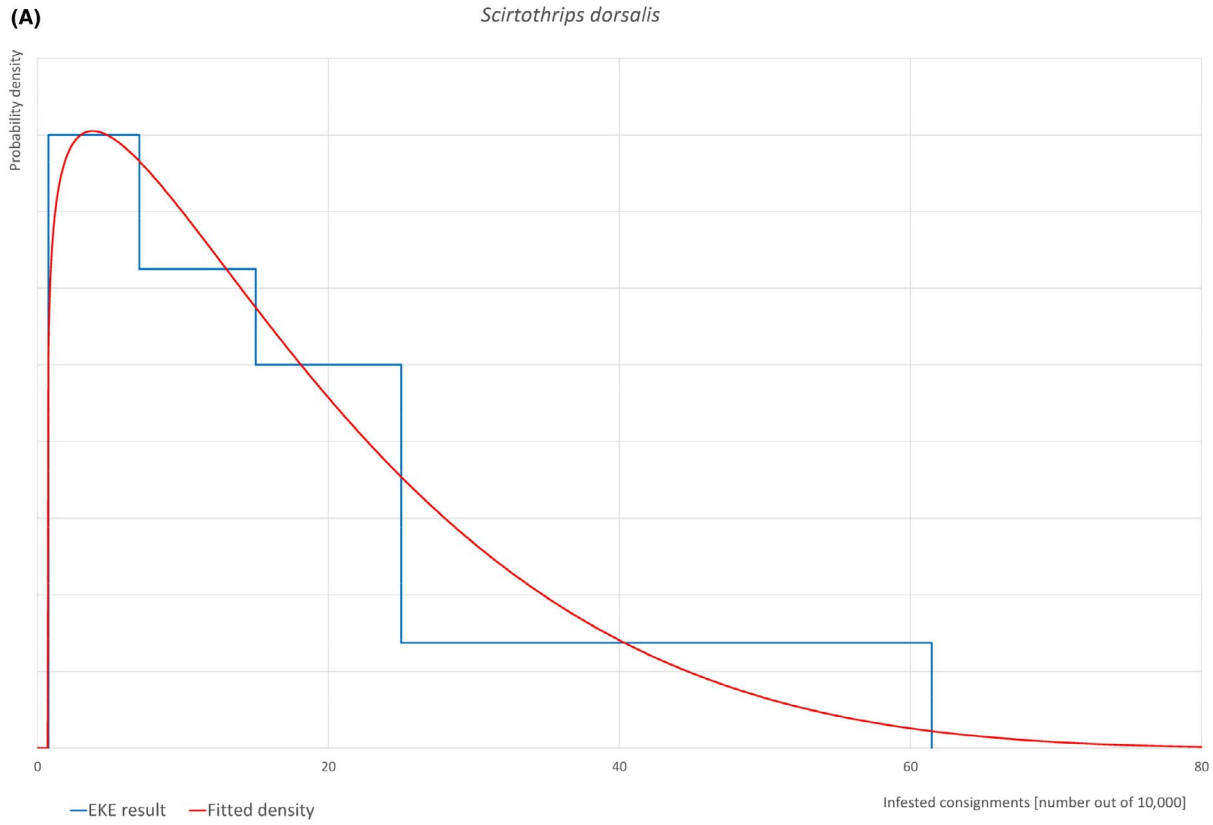

FIGURE A.7 (Continued)

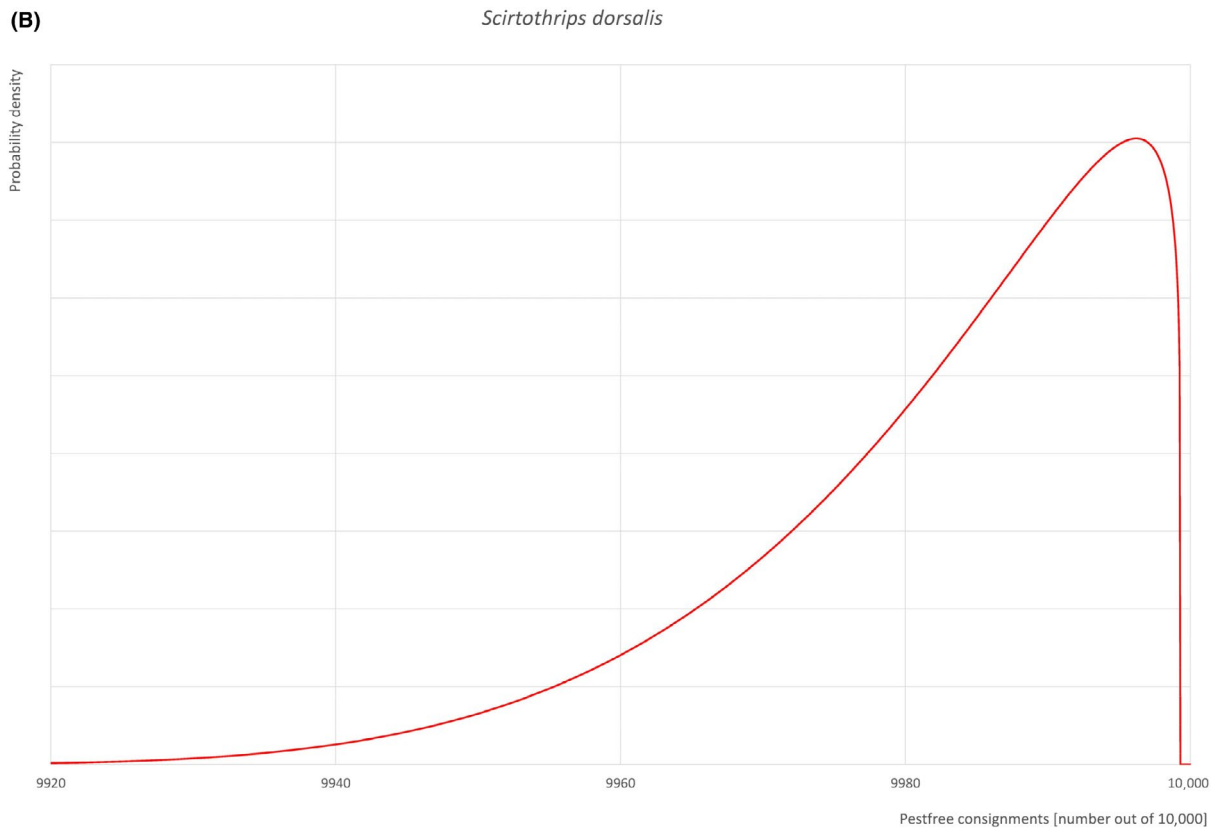

FIGURE A.7 (Continued)

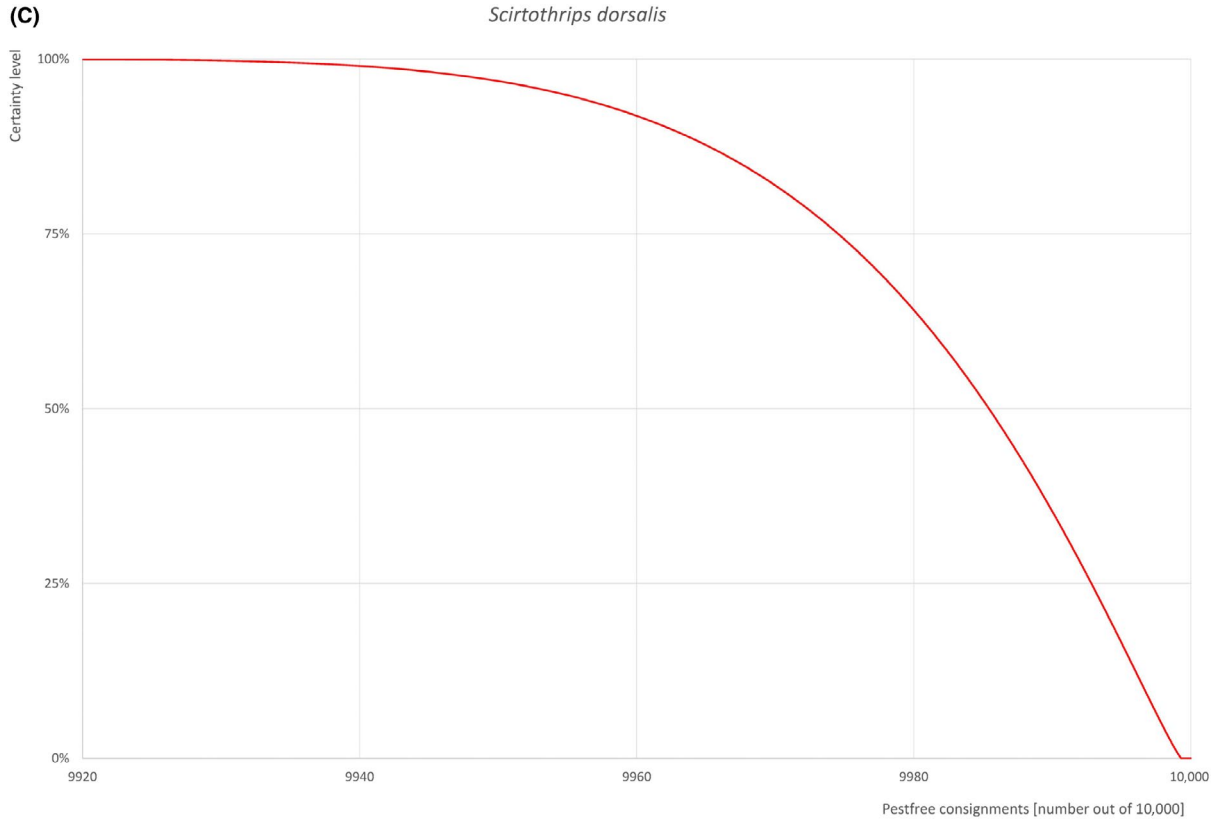

FIGURE A.7 (A) Elicited uncertainty of pest infection per 10,000 plants of specimen trees (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free plants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

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A.8 | TOMATO SPOTTED WILT VIRUS

A.8.1 | Organism information

Taxonomic information	**Current valid scientific name**: ***Orthotospovirus tomatomaculae*** **Synonyms**: Tomato spotted wilt virus, TSWV, Tomato spotted wilt orthotospovirus; Tomato spotted wilt tospovirus **EPPO code**: TSWV00 **Name used in the EU legislation**: Tomato spotted wilt tospovirus [TSWV00] **Group:** Virus **Order:** *Bunyavirales* **Family**: *Tospoviridae* **Common names**: bronze leaf of tomato; kromnek virus; spotted wilt of tomato; yellow spot of pineapple; tomato bronze leaf virus (ICTV, EPPO; online)
Regulatory status	Tomato spotted wilt virus (TSWV) is regulated as RNQPs in vegetable propagating and planting material of *Capsicum annuum* L., *Lactuca sativa* L., *Solanum lycopersicum* L., *Solanum melongena* L. in Commission Implementing Regulation (EU) 2019/2072, ANNEX IV, Part I. TSWV is also a regulated non-quarantine pest (RNQP) of *Begonia* × *hiemalis* Fotsch, *Capsicum annuum* L., *Chrysanthemum* L., *Gerbera* L., *Impatiens* L. New Guinea Hybrids, *Pelargonium* L. plants for planting for ornamental purposes in Commission Implementing Regulation (EU) 2019/2072, ANNEX IV, Part D.
Pest status in Uganda	TSWV is present in Uganda (CABI online)
Pest status in the EU	Present (EPPO, online)
Host status on Petunia spp. and Calibrachoa spp.	TSWV (EPPO Bulletin 2020) infect petunia, tomato, pepper and potato in nature. There are no records that *Calibrachoa* sp. is a host of TSWV. Uncertainties: The host status of *Calibrachoa* sp. to TSWV. The ability of TSWV to systemically infect *Petunia* sp. and *Calibrachoa* sp.
PRA information	Scientific Opinion on the risk to plant health posed by Tomato spotted wilt virus to the EU territory with identification and evaluation of risk reduction options (Health (PLH), 2012).
Other relevant information for the assessment	
Biology	**Transmission** TSWV is transmitted by thrips species (Thysanoptera: Thripidae) in a circulative, propagative manner by which the virus persists through the various developmental stages of the insect. *Frankliniella occidentalis* is the most efficient vector of TSWV for its spread in ornamental and vegetable crops. TSWV can be also very efficiently transmitted by *Thrips tabaci* populations (Chatzivassiliou, et al., 2002; Mortazavi et al., 2014, 2015). Transmission parameters have been studied in detail for TSWV in the vector *F. occidentalis*. Only thrips that acquire the virus as larvae (L1 and L2) can transmit TSWV. The first instar larvae (L1) is the most efficient at acquiring the virus which can be then transmitted by second instar larvae (L2) and adults after a latent period that is negatively correlated with temperature. The minimum acquisition access period and inoculation access period range from 5 min to 1 day with increasing frequency of transmission when the feeding period is extended. Following acquisition, TSWV is retained for the entire lifespan of the thrips, but it is not transovarially passed onto the insect progeny. TSWV is better spread by flying adult thrips than crawling larvae (Wijkamp and Peters 1993; Ullman et al., 1993; Wijkamp et al., 1993, 1995, 1996).

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	As all plant viruses that systemically infect their host, TSWV can be also transmitted via the vegetative propagation material and generally are considered not to be seed-transmitted (EFSA, 2012). **Uncertainty on biology** The vector ability of additional thrips species and biotypes for TSWV. **Host range and distribution of host plants in the environment** **TSWV** is one of the most successful plant pathogens in terms of worldwide distribution and an ever-expanding host range (Scholthof et al., 2011; Rybicki, 2015). Its host range includes 1300 species dicotyledonous and monocotyledonous angiosperms belonging to at least 85 families but mainly infecting species in the Asteraceae and Solanaceae families (Parella et al., 2013). The natural crop-hosts of TSWV include most of the major horticultural crops such as tomato, pepper, tobacco, legumes and many ornamentals (Parella et al., 2013). TSWV also infects many weed species which may contribute significantly to its epidemiology as virus reservoirs (Chatzivassiliou et al., 2001). **Uncertainty on host range** The host range of TSWV is continuously growing therefore it remains unknown. The host status of *Calibrachoa* sp. to TSWV. **Ecology and biology of the vectors** *Frankiniella occidentalis* is present in Uganda (EPPO GD; CABI; online) where it is widespread in tomato and pepper crops (Ssemwogerere et al., 2023). *Frankliniella occidentalis* is a highly polyphagous invasive species and a highly efficient vector of TSWV and can reach high populations on ornamentals and vegetables belonging to the Solanaceae family especially during warm weather conditions. The entire life cycle from oviposition to adult emergence can take 8 days in hot weather to 44 days in cool weather (Rob et al., 1988). *Thrips tabaci* is also present in Uganda (EPPO GD; CABI; online) and also widespread in tomato and pepper crops (Ssemwogerere et al., 2023). This thrips species presents a high variability in TSWV transmission among different populations or biotypes depending on their reproductive strategy and host origin (Chatzivassiliou et al., 1999, 2002; Loredo Varela and Fail, 2022). However, populations of the species have been reported as very efficient vectors of TSWV (Chatzivassiliou et al., 2002; Mortazavi et al., 2015). *Thrips tabaci* infests and thrives on a high number of species including also major solanaceous hosts (Loredo Varela and Fail, 2022). **Uncertainty on ecology and biology of the vectors** The presence and distribution of other vector species of TSWV **Symptoms on *Petunia/Calibrachoa*** TSWV-infected petunia plants exhibit necrotic spots on the inoculated leaves with no systemic infection (Daughtrey et al., 1997; DPVnet). Symptoms usually appear within a few days after feeding of a viruliferous thrips. These spots are not easy to detect by an inspector, especially in high densities of the plant canopy. In addition, these symptoms might be confused in between the different tospoviruses but also with those caused by some fungal or bacterial diseases. Therefore, further testing is needed for confirmation of TSWV infection (Daughtrey et al., 1997). **Uncertainties on symptoms on *Petunia/Calibrachoa*** The host status of *Calibrachoa* sp. to TSWV. The ability of TSWV to systemically infect some *Petunia* sp. and *Calibrachoa* sp. varieties.
Evidence that the commodity can be a pathway	Unrooted cuttings of *Petunia* spp. and *Calibrachoa* spp. can be infected by TSWV and/or infested by viruliferous thrips.

A.8.2 | Possibility of pest presence in the nursery

A.8.2.1 | Possibility of entry from the surrounding environment

TSWV is present in Uganda. It is transmitted by thrips (*F. occidentalis* and *T. tabaci*), which are also present in Uganda and widespread in field-grown crops such as pepper and tomato. TSWV has a large host range, including many vegetables, ornamentals and weeds. Therefore, hosts and vectors are expected to be present and possibly widespread in Uganda. The main pathway of entrance of TSWV from the surrounding environment in the nursery is through viruliferous thrips. Defects in the insect proof structure of the production greenhouses could enable thrips to enter, as well as hitchhikers on persons or materials entering the greenhouse. Therefore, it is possible that TSWV may enter from the nursery from the surrounding environment.

Uncertainties:

- Presence of defects in the greenhouse structure.
- Presence and distribution of host plants in the surroundings.
- Infection (virus) and infestation (thrips vectors) pressure in the surroundings.
- The ability of thrips to enter via the 'pad and fan' cooling system.

A.8.2.2 | Possibility of entry with new plants/seeds

Plant material (unrooted cuttings without soil or tissue culture material) for *Petunia* sp. and *Calibrachoa* sp. mother plants used for the production of unrooted cuttings originate from the Netherlands and Germany (https://iribov.com/department

s-and-serv/naktuinbouw-elite-certification/) (http://www.brandkamp.de/en/). TSWV is widespread in the EU (EPPO GD). Only 'Elite planting material' is imported and upon arrival it is quarantined in a special area. The certification scheme in place for *Petunia* spp. and *Calibrachoa* spp. and the testing during quarantine in Uganda includes TSWV (Dossier section 3.3).

Uncertainties:

None.

A.8.2.3 | Possibility of spread within the nursery

Petunia spp. and *Calibrachoa* spp. are cultivated in separated units dedicated for their cultivation without mixing with other crop/plants (Uganda Reply point 4). However, other plants (solanaceous and non-solanaceous) known hosts of TSWV and its thrips vectors are cultivated are produced in other greenhouses/compartments of the nursery (Uganda Reply point 4). No data is provided for the identity, proportion, origin and phytosanitary status of plants other than *Petunia* spp. and *Calibrachoa* spp. produced in the same nursery. *Frankliniella occidentalis* is the most efficient vector of TSWV occurring in greenhouses and a major pest of ornamentals, feeding in almost any flower plant (Daughtrey et al., 1997; CABI). Viruliferous thrips could spread TSWV between the different or within the same greenhouse/compartment. TSWV may also spread by vegetative propagation of infected mother plants. There are strict hygiene conditions inside the nursery. However, thrips due to their minute size are more difficult to observe and easier to escape these conditions than other insects.

Uncertainties:

- The presence and incidence of TSWV and thrips vectors in the nursery.
- The presence and the host status for TSWV of other plant species (solanaceous, non-solanaceous) growing in the same nursery.

A.8.3 | Information from interceptions

There were no interceptions of tomato spotted wilt virus (TSWV00) on different commodities imported into the EU from Uganda (EUROPHYT and TRACES, online).

A.8.4 | Evaluation of the risk mitigation measures

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

No.	Risk mitigation measure	Effect (Yes/No)	Implementation in Uganda
1	Growing plants in isolation	Yes	Description The unrooted cuttings to be exported from Uganda will be grown and harvested from greenhouse production facilities approved by the NPPO. The cuttings are grown in closed greenhouses (closed production). A double-door entry system is used to control temperatures in the greenhouse as well as mitigate entry of pests. *Petunia* spp. and *Calibrachoa* spp. are produced in separate units. Evaluation The thrips-proof netting prevents the introduction of thrips from the surrounding environment. However, thrip adults may be introduced through defects in the greenhouse netting or as hitchhikers on workers. Uncertainties Presence of unnoticed defects in the greenhouse structure
2	Dedicated hygiene measures	Yes	Description For accessing the greenhouse there is a double door system. Changing rooms and disinfection facility allow the personnel to wear dedicated boots and clothes before entering the greenhouse. There are dedicated tools used for each greenhouse unit. Each unit has a specific set of clothes including a disinfection area. Evaluation The double door system with the expeller fan at the door can be effective in preventing the entry of thrips vectors via active flying and spread of TSWV. Changing clothes prevents also the entrance of thrips vectors via hitchhiking. Uncertainties The strictness of the measures applied.

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No.	Risk mitigation measure	Effect (Yes/No)	Implementation in Uganda
3	Treatment of growing media	Yes	Description The plants for planting from which the cuttings are harvested are grown in a soilless medium (100% pumice in hydroponic greenhouses). The growing media used in production and at the moment of export is according to ISPM 40 (FAO, 2017a) and to the NPPO Uganda requirements. Evaluation The use of new/sterilised growing media may kill thrips pupating in debris in the soil. Uncertainties None.
4	Quality of source plant material	Yes	Description All the intended planting materials are to be imported from mother companies in the Netherlands and Germany (Dossier section 1). These are Elite-certified materials in the form of TC plantlets or URCs for further multiplication in Uganda. Upon arrival in Uganda, the NPPO conducts documentary and identity checks at entry before dispatch to post quarantine in contained facilities at the production farms. Evaluation The probability that TSWV is present on the certified starting material is very low/negligible. Uncertainties None.
5	Crop rotation	Yes	Description No crop rotation takes place. Specific greenhouses units are used for producing Petunia spp. and Calibrachoa spp. Evaluation In case of introduction into the greenhouse, populations of thrips may build up since the same unit is used for production of *Petunia* spp./*Calibrachoa* spp. Uncertainties None.
6	Disinfection of irrigation water	No	Description The irrigation water is treated with sodium chloride and UV irradiation (Dossier Section 1).
7	Pest monitoring and inspections	Yes	Description The presence of pests and symptoms in plants is monitored, including yellow sticky traps, on a daily basis by nurseries staff. A compiled weekly report is produced by the scouting team., which is used to decide the weekly pest control measures in the greenhouses (Dossier Section 1). Evaluation Yellow and blue sticky traps are effective to detect the presence of flying *Frankliniella occidentalis* and *Thrips tabaci* adults. Sticky traps cannot detect the larvae of thrips, therefore they cannot detect early infestations. Local lesions caused by TSWV on petunia are difficult to detect, especially in plants with dense canopy. Uncertainties • The efficiency of yellow sticky traps to detect early thrips infestations. • The efficiency of monitoring and inspection. • The length of the latent period till the expression of TSWV symptoms.
8	Treatment of crop during production	Yes	Description Fungicides, insecticides, acaricides and biological control agents are applied on weekly basis, following scouting inspections and are reported in Dossier Section 1: 4 (Table E1.1–6). Rotation among active substances (a.s.) is adopted to prevent the development of insecticide resistance. Details on the a.s. are reported in Dossier Section 1: 4. Evaluation The products used may have an effect against thrips vectors of TSWV. However, some transmission may occur before/during the lethal thrips feedings. *Frankliniella occidentalis* is known for having developed resistance to some insecticides. According to the Dossier Section 1, only a few thrips are occasionally observed on the sticky traps suggesting that the measures are efficient. Uncertainties The efficacy and timing of the plant protection products used against thrips
9	Sampling and testing	Yes	Description A detailed protocol for sampling and testing plants is described in Dossier Section 4. The sampling protocol is implemented according to Risk-Based Estimator for Surveillance Systems (RiBESS+) (https://r4eu.efsa.europa.eu/app/ribess). A subsample per variety, per batch is sent to the accredited laboratory for further pest analyses. The testing procedures follow the PM7 diagnostic standards of EPPO (https://www.eppo.int/RESOURCES/eppo_standards/pm7_diagnostics). Evaluation Imported mother plants and propagated plants are tested for TSWV and this virus is included in the PM7 diagnostic standards of EPPO therefore *Petunia* spp. and *Calibrachoa* spp. are expected to be tested.

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No.	Risk mitigation measure	Effect (Yes/No)	Implementation in Uganda
			Uncertainties • The degree of compliance with the EPPO diagnostic standards for sampling and testing • If tested samples are representative/efficient to detect infections (size of bulk samples, subsamples, etc.) • The efficiency of the sampling method and testing intensity to detect local lesions caused by TSWV on *Petunia* spp. and *Calibrachoa* spp. especially in low infection levels
10	Official supervision by NPPO	Yes	Description NPPO Uganda conducts a 3-week to monthly pest surveillance frequency to monitor pest incidence and prevalence on each plant variety and species guided by the pests relevant for the EU. NPPO Uganda enforces compliance with phytosanitary measures as provided for in the EU Directive 2016/2031. Evaluation Thrips and especially their larvae are minute insects and TSWV infections are local on *Petunia* sp. therefore both are very difficult to be detected especially in low infection/infection levels. Uncertainties The efficiency of detecting early thrips infestations and TSWV local lesions, especially in low infection levels

A.8.5 | Overall likelihood of pest freedom for the exported commodity (comparative)

A.8.5.1 | Comparison with other relevant commodity Risk Assessments involving TSWV

TSWV was already assessed as relevant pests for the commodity risk assessment of *Petunia* and *Calibrachoa* from Kenya (EFSA PLH Panel, 2024). The similarities between the dossiers from Kenya and Uganda are:

- The type of commodity exported: unrooted cuttings of *Petunia/Calibrachoa* spp. of similar size and age.
- The production system (production in greenhouse in separate units) and climatic and environmental conditions are similar.
- The inoculum pressure in the surrounding environment is expected to be similar.
- The starting material originates in both countries from EU countries and is certified material.
- No differences in the effect of the risk mitigating measures were identified.

The only difference lies in the uncertainty regarding the processing of the samples (subsample pooling), which is likely to impact the sensitivity of the test hence the detection of TSWV in Uganda. However, the non-systemic infection of the petunia plants (local necrotic lesion) do not favour the incidence of viruliferous thrips populations and TSWV spread in the nursery.

Because no major differences were identified the Panel applied the results and reasoning of the Expert Knowledge Elicitation (EKE) of pest freedom of Torthotospoviruses (including TSWV) from unrooted cuttings of Petunia/Calibrachoa spp. from Kenya (EFSA PLH Panel, 2024).

A.8.6 | Elicitation outcomes of the assessment of the pest freedom for tomato spotted wilt virus

The elicited and fitted values for tomato spotted wild virus for pest infestation and pest freedom agreed by the Panel are shown in Tables A.15 and A.16 and in Figures A.8.

TABLE A.15 Elicited and fitted values of the uncertainty distribution of pest infestation by TSWV per 10,000 unrooted cuttings.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Elicited values	0					3		6		25					50
EKE	0.001	0.009	0.044	0.217	0.701	1.77	3.43	8.81	17.5	23.3	30.4	37.4	43.7	47.5	50.1

Note: The EKE results is the *BetaGeneral (0.43705, 1.1956, 0, 52.5)* distribution fitted with @Risk version 7.6.

Based on the numbers of estimated infected plants the pest freedom was calculated (i.e. = 10,000 – number of infected plants per 10,000). The fitted values of the uncertainty distribution of the pest freedom are shown in Table A.16.

TABLE A.16 The uncertainty distribution of plants free of TSWV per 10,000 unrooted cuttings is calculated by Table A.15.

Percentile	1%	2.5%	5%	10%	17%	25%	33%	50%	67%	75%	83%	90%	95%	97.5%	99%
Values	9950					9975		9994		9997					10,000
EKE results	9950	9953	9956	9963	9970	9977	9983	9991	9997	9998	9999.30	9999.78	9999.96	9999.99	10000.00

Note: The EKE results are the fitted values.

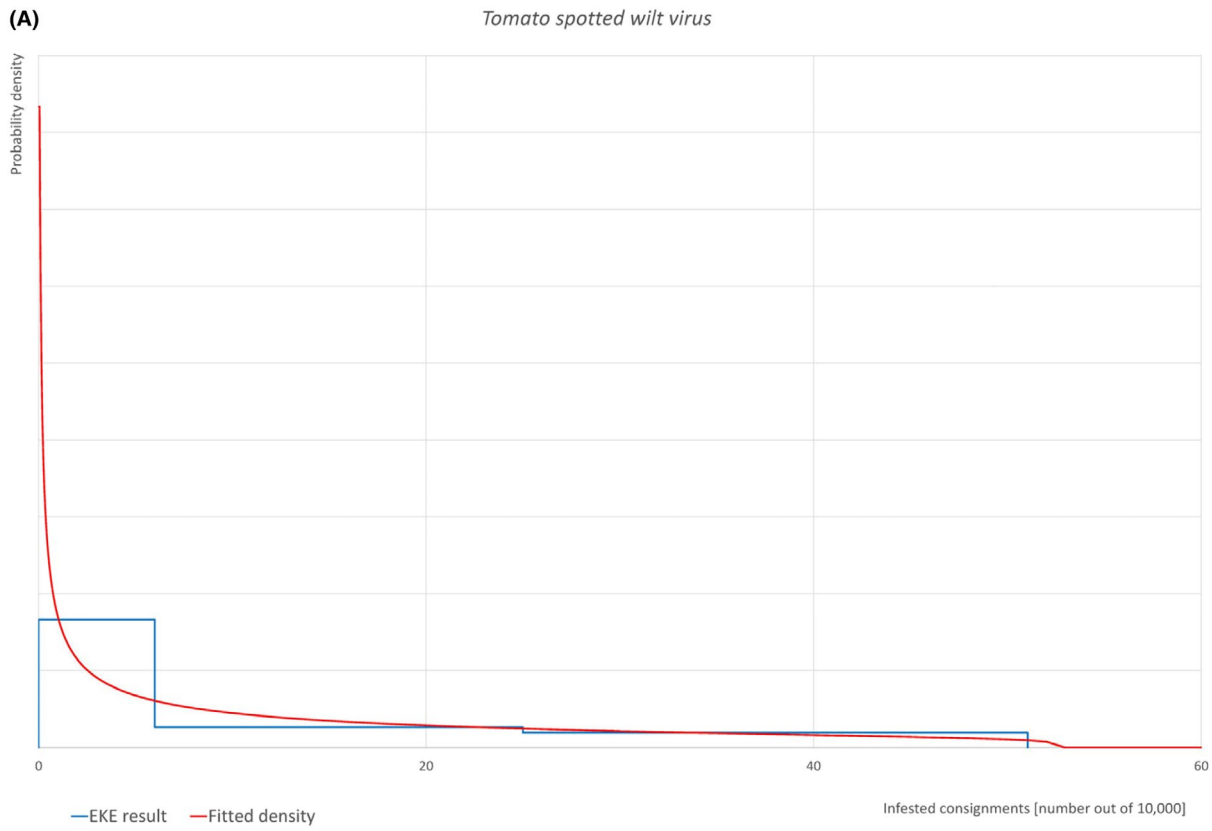

FIGURE A.8 (Continued)

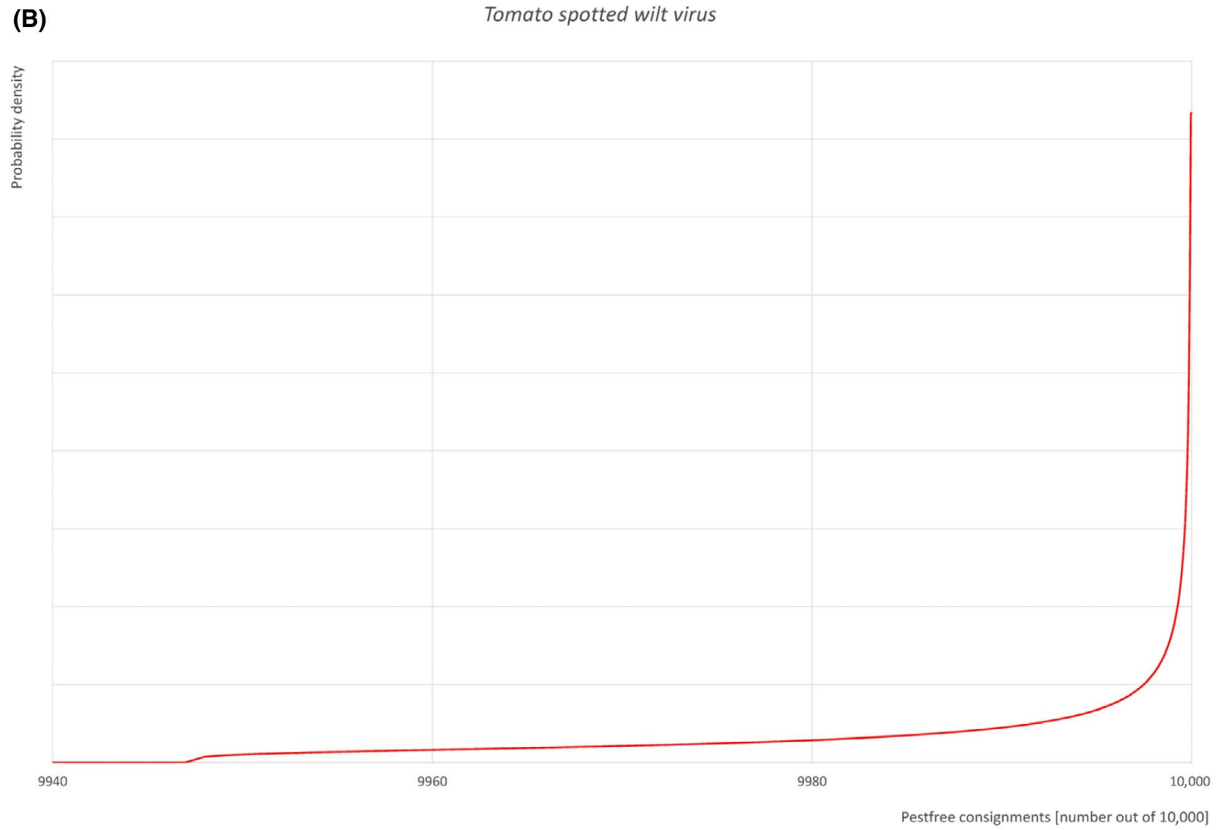

FIGURE A.8 (Continued)

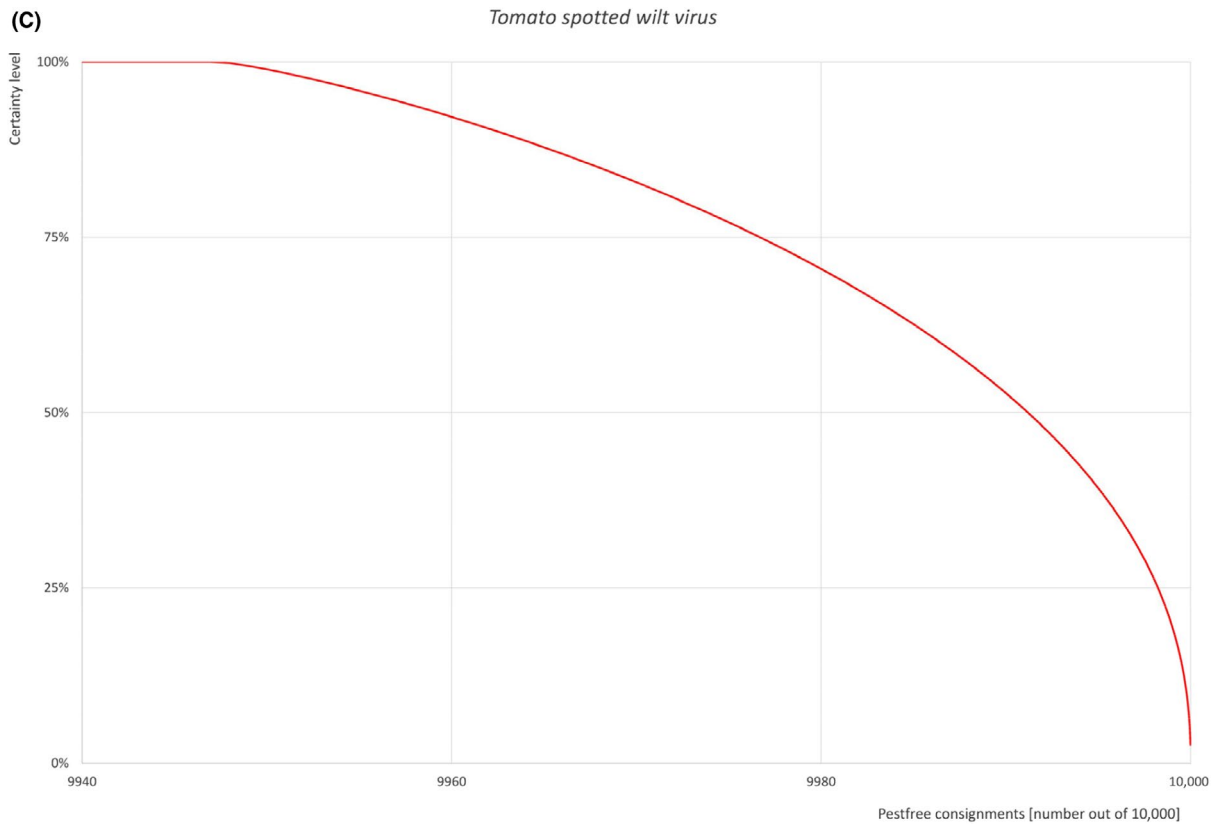

FIGURE A.8 (A) Elicited uncertainty of pest infection per 10,000 plants of unrooted cuttings (histogram in blue – vertical blue line indicates the elicited percentile in the following order: 1%, 25%, 50%, 75%, 99%) and distributional fit (red line); (B) uncertainty of the proportion of pest-free plants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

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APPENDIX B

Web of Science All Databases Search String 17/9/2024

In the table below the search string used in Web of Science is reported. In total, 43 papers were retrieved. Titles and abstracts were screened, and 17 pests were added to the list of pests (Appendix D).

Web of Science All databases	TOPIC: "*Calibrachoa* spp." OR "million bells" AND TOPIC: "pathogen*" OR "pathogenic bacteria" OR fung* OR oomycet* OR myce* OR bacteri* OR virus* OR viroid* OR insect$ OR mite$ OR phytoplasm* OR arthropod* OR nematod* OR disease$ OR infecti* OR damag* OR symptom* OR pest$ OR vector OR hostplant$ OR "host plant$" OR host OR "root lesion$" OR decline$ OR infestation$ OR damage$ OR symptom$ OR dieback* OR "die back*" OR malaise OR aphid$ OR curculio OR thrip$ OR cicad$ OR miner$ OR borer$ OR weevil$ OR "plant bug$" OR spittlebug$ OR moth$ OR mealybug$ OR cutworm$ OR pillbug$ OR "root feeder$" OR caterpillar$ OR "foliar feeder$" OR virosis OR viruses OR blight$ OR wilt$ OR wilted OR canker OR scab$ OR rot OR rots OR "rotten" OR "damping off" OR "damping-off" OR blister$ OR smut OR "mould" OR "mold" OR "damping syndrome$" OR mildew OR scald$ OR "root knot" OR "root-knot" OR rootkit OR cyst$ OR "dagger" OR "plant parasitic" OR "parasitic plant" OR "plant$parasitic" OR "root feeding" OR "root$feeding" OR "acari" OR "host$" OR "gall" OR "gall$" OR "whitefly" OR "whitefl*" OR "aleyrodidae" OR "thysanoptera" OR "moths" OR "scale" OR "scale$" OR "thripidae" OR "leafhoppers" OR "leafhopper$" OR "plant pathogens" OR "fungal" OR "aphididae" NOT TOPIC: "heavy metal$" OR "pollut*" OR "weather" OR "propert*" OR probes OR "spectr*" OR "antioxidant$" OR "transformation" OR "Secondary plant metabolite$" OR metabolite$ OR Postharvest OR Pollin* OR Ethylene OR Thinning OR fertil* OR Mulching OR Nutrient$ OR "human virus" OR "animal disease$" OR "plant extracts" OR "immunological" OR "purified fraction" OR "traditional medicine" OR "medicine" OR mammal$ OR bird$ OR "human disease$" OR "*cancer*" OR "*therapeutic*" OR "*psoriasis*" OR "blood" OR "medicinal ethnobotany" OR "Nitrogen-fixing" OR "patients" OR "Probiotic drugs" OR "Antioxidant" OR "Anti-Inflammatory" OR "plasma levels" OR "ethnomedicinal" OR "traditional uses of medicinal plants" OR "Antitumor" OR "Neuroprotective" OR "Hypoglycemic" OR "ozone sensitivity" NOT TOPIC: "*Aculops lycopersici*" OR "*Aphis gossypii*" OR "*Aulacorthum solani*" OR "*Bactrocera latifrons*" OR "*Bemisia tabaci*" OR "*Brephidium exilis*" OR "*Epilachna vigintioctomaculata*" OR "*Frankliniella occidentalis*" OR "*Heliothis virescens*" OR "*Liriomyza sativae*" OR "*Liriomyza trifolii*" OR "*Macrosiphum euphorbiae*" OR "*Myzus persicae*" OR "*Oligonychus pratensis*" OR "*Phthorimaea operculella*" OR "*Tetranychus urticae*" OR "*Trialeurodes vaporariorum*" OR "*Heterodera glycines*" OR "*Acidovorax konjaci*" OR "Alfalfa mosaic virus" OR "Andean potato latent virus" OR "Andean potato mottle virus" OR "Arabis mosaic virus" OR "Arracacha virus B" OR "Bell pepper mottle virus" OR "Calibrachoa spp. mottle virus" OR "Chili Pepper Mild Mottle Virus" OR "Citrus exocortis viroid" OR "Columnea latent viroid" OR "Cucumber mosaic virus" OR "Hosta virus X" OR "Peach rosette mosaic virus" OR "Pepper chat fruit viroid" OR "Potato black ringspot virus" OR "Potato spindle tuber viroid" OR "Potato virus X" OR "Potato virus Y" OR "Potato yellow dwarf nucleorhabdovirus" OR "Tobacco mild green mosaic virus" OR "Tobacco mosaic virus" OR "Tobacco streak virus" OR "Tomato apical stunt viroid" OR "Tomato chlorotic dwarf viroid" OR "Tomato mosaic virus" OR "Tomato planta macho viroid" OR "Tomato spotted wilt virus" OR "*Alternaria porri*" OR "*Botrytis cinerea*" OR "*Botrytis paeoniae*" OR "*Euoidium longipes*" OR "*Nigrospora oryzae*" OR "*Phytophthora capsici*" OR "*Phytophthora cinnamomi*" OR "*Phytophthora citrophthora*" OR "*Phytophthora drechsleri*" OR "*Phytophthora infestans*" OR "*Phytophthora nicotianae*" OR "*Podosphaera xanthii*" OR "*Pseudoidium neolycopersici*" OR "*Sclerotinia sclerotiorum*" OR "*Stagonosporopsis andigena*" OR "*Thielaviopsis basicola*" OR "*Verticillium dahliae*" OR "*Phytophthora tropicalis*"

APPENDIX C

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

No.	Pest name	EPPO Code	Group	Pest present in the Uganda	Pest present in the EU	EU regulatory status	Justification for inclusion in this list
1	*Ferrisia virgata*	PSECVI	Insects	Yes	Limited		The host status of *Petunia* is uncertain
2	*Paracoccus marginatus*	PACOMA	Insects	Yes	No		The host status of *Petunia* is uncertain
3	*Spodoptera frugiperda*	LAPHFR	Insects	Yes	EU- Regulated pest	Quarantine pest (Annex II A)	The host status of *Petunia* is uncertain
4	*Thaumatotibia leucotreta*	ARGPLE	Insects	Yes	EU-Regulated pest	Quarantine pest (Annex II A)	The host status of *Petunia* is uncertain
5	*Thrips hawaiiensis*	THRIHA	Insects	Yes	Limited		The host status of *Petunia* is uncertain
6	*Ipomovirus lycopersici* (tomato mild mottle virus)	TOMMOV	Viruses and viroids	No	EU- Regulated pest	Quarantine pest (Annex II A)	Pest status in Uganda is uncertain
7	*Orthotospovirus tomatanuli* (tomato yellow ring virus)	TYRSV0	Viruses and viroids	No	Not assessed		Pest status in Uganda is uncertain
8	*Trialeurodes ricini*	TRIARI	Insects	Yes	No		The host status of *Petunia* is uncertain
9	*Urentius hystricellus*	URENHY	Insects	Yes	No		The host status of *Petunia* is uncertain

APPENDIX D

Excel file with the pest list of *Petunia* and *Calibrachoa* species

Appendix D can be found in the online version of this output in the 'supporting information section'.