SCIENTIFIC OPINION

EFSA Journal

ADOPTED: 26 September 2019

doi: 10.2903/j.efsa.2020.5853

Pest categorisation of non-EU viruses and viroids of potato

EFSA Panel on Plant Health (EFSA PLH Panel),
Claude Bragard, Katharina Dehnen-Schmutz, Paolo Gonthier, Marie-Agnès Jacques, Josep Anton Jaques Miret, Annemarie Fejer Justesen, Alan MacLeod, Christer Sven Magnusson, Panagiotis Milonas, Juan A Navas-Cortes, Stephen Parnell, Roel Potting, Philippe Lucien Reignault, Hans-Hermann Thulke, Wopke van der Werf, Antonio Vicent Civera, Jonathan Yuen, Lucia Zappalà, Thierry Candresse, Christophe Lacomme, Bernard Bottex, Carla Oplaat, Annelien Roenhorst, Martijn Schenk and Francesco Di Serio

Abstract

Following a request from the EU Commission, the Panel on Plant Health has addressed the pest categorisation of those viruses and viroids (hereafter referred to as viruses) of *Solanum tuberosum* and other tuber-forming *Solanum* spp. (hereafter referred to as potato) which are considered to be either non-EU or of undetermined standing based on a previous EFSA opinion. These viruses belong to different families and genera and either have an established identity or produce consistent symptoms. Plants for planting is the main pathway for entry for all categorised viruses as they can all be transmitted by vegetative propagation. Several categorised viruses have a relatively wide host range and/or are vector-transmitted, increasing the potential for entry. The information currently available on geographical distribution, biology, epidemiology, impact and potential entry pathways has been evaluated with regard to the criteria to qualify as potential Union quarantine pest or as Union regulated non-quarantine pest (RNQP). Since this opinion addresses specifically the non-EU potato viruses, in general these viruses do not meet the criteria assessed by EFSA to qualify as potential Union regulated non-quarantine pests. The following viruses meet the criteria to qualify as potential Union quarantine pest: APLV, APMMV, APMoV, ChiLCV, CYSDV, PAMV, PBRSV, PVH, PVP, PVT, PYDV, PYMV, PYV, PYVV, RCVMV, SALCV, SB26/29, ToCV, ToLCNDV, ToMHaV, ToMoTV, ToSRV and ToYVSV. With the exception of the criterion regarding the potential for consequences in the EU territory, for which the Panel is unable to conclude because of lack of information, AVB, CPSbV, PaLCrV, PapMV, PVB, PVU, SB41 and TVBMV meet all the other criteria to qualify as potential Union quarantine pest. PotLV and WPMV do not qualify as potential Union quarantine pest, since they are not reported to have any impact. For most of the categorised viruses, the conclusions of the Panel have inherent uncertainties, due to the lack of quantitative data on their impact and/or absence or limited availability of information on the biology, epidemiology and geographical distribution.

Keywords: European Union, pest risk, plant health, plant pest, quarantine, potato

Requestor: European Commission

Question number: EFSA-Q-2019-00426

Correspondence: alpha@efsa.europa.eu

Panel members: Claude Bragard, Katharina Dehnen-Schmutz, Francesco Di Serio, Paolo Gonthier, Marie-Agnès Jacques, Josep Anton Jaques Miret, Annemarie Fejer Justesen, Alan MacLeod, Christer Sven Magnusson, Panagiotis Milonas, Juan A Navas-Cortes, Stephen Parnell, Roel Potting, Philippe L Reignault, Hans-Hermann Thulke, Wopke Van der Werf, Antonio Vicent Civera, Jonathan Yuen, Lucia Zappalà.

Acknowledgments: This opinion was prepared in cooperation with the National Plant Protection Organization, Netherlands Food and Consumer Product Safety Authority under the tasking grant (GP/EFSA/ALPHA/2017/04).

Suggested citation: EFSA PLH Panel (EFSA Panel on Plant Health), Bragard C, Dehnen-Schmutz K, Gonthier P, Jacques M-A, Jaques Miret JA, Justesen AF, MacLeod A, Magnusson CS, Milonas P, Navas-Cortes JA, Parnell S, Potting R, Reignault PL, Thulke H-H, van der Werf W, Vicent Civera A, Yuen J, Zappalà L, Candresse T, Lacomme C, Bottex B, Oplaat C, Roenhorst A, Schenk M and Di Serio F, 2020. Scientific Opinion on the pest categorisation of non-EU viruses and viroids of potato. EFSA Journal 2020;18(1):5853, 134 pp. https://doi.org/10.2903/j.efsa.2020.5853

ISSN: 1831-4732

Table of Contents

1. Introduction

1.1. Background and Terms of Reference as provided by the requestor

1.1.1. Background

Council Directive 2000/29/EC[1] on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community establishes the present European Union plant health regime. The Directive lays down the phytosanitary provisions and the control checks to be carried out at the place of origin on plants and plant products destined for the Union or to be moved within the Union. In the Directive's 2000/29/EC annexes, the list of harmful organisms (pests) whose introduction into or spread within the Union is prohibited, is detailed together with specific requirements for import or internal movement.

Following the evaluation of the plant health regime, the new basic plant health law, Regulation (EU) 2016/2031[2] on protective measures against pests of plants, was adopted on 26 October 2016 and will apply from 14 December 2019 onwards, repealing Directive 2000/29/EC. In line with the principles of the above mentioned legislation and the follow-up work of the secondary legislation for the listing of EU regulated pests, EFSA is requested to provide pest categorisations of the harmful organisms included in the annexes of Directive 2000/29/EC, in the cases where recent pest risk assessment/ pest categorisation is not available.

1.1.2. Terms of reference

EFSA is requested, pursuant to Article 22(5.b) and Article 29(1) of Regulation (EC) No 178/2002[3], to provide scientific opinion in the field of plant health.

EFSA is requested to prepare and deliver a pest categorisation (step 1 analysis) for each of the regulated pests included in the appendices of the annex to this mandate. The methodology and template of pest categorisation have already been developed in past mandates for the organisms listed in Annex II Part A Section II of Directive 2000/29/EC. The same methodology and outcome is expected for this work as well.

The list of the harmful organisms included in the annex to this mandate comprises 133 harmful organisms or groups. A pest categorisation is expected for these 133 pests or groups and the delivery of the work would be stepwise at regular intervals through the year as detailed below. First priority covers the harmful organisms included in Appendix 1, comprising pests from Annex II Part A Section I and Annex II Part B of Directive 2000/29/EC. The delivery of all pest categorisations for the pests included in Appendix 1 is June 2018. The second priority is the pests included in Appendix 2, comprising the group of *Cicadellidae* (non-EU) known to be vector of Pierce's disease (caused by *Xylella fastidiosa*), the group of *Tephritidae* (non-EU), the group of potato viruses and virus-like organisms, the group of viruses and virus-like organisms of *Cydonia* Mill., *Fragaria* L., *Malus* Mill., *Prunus* L., *Pyrus* L., *Ribes* L., *Rubus* L. and *Vitis* L., and the group of *Margarodes* (non-EU species). The delivery of all pest categorisations for the pests included in Appendix 2 is end 2019. The pests included in Appendix 3 cover pests of Annex I part A section I and all pest categorisations should be delivered by end 2020.

For the above mentioned groups, each covering a large number of pests, the pest categorisation will be performed for the group and not the individual harmful organisms listed under "such as" notation in the Annexes of the Directive 2000/29/EC. The criteria to be taken particularly under consideration for these cases, is the analysis of host pest combination, investigation of pathways, the damages occurring and the relevant impact.

Finally, as indicated in the text above, all references to 'non-European' should be avoided and replaced by 'non-EU' and refer to all territories with exception of the Union territories as defined in Article 1 point 3 of Regulation (EU) 2016/2031.

[1] Council Directive 2000/29/EC of 8 May 2000 on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community. OJ L 169/1, 10.7.2000, p. 1–112.

[2] Regulation (EU) 2016/2031 of the European Parliament of the Council of 26 October 2016 on protective measures against pests of plants. OJ L 317, 23.11.2016, p. 4–104.

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

1.1.2.1. Terms of Reference: Appendix 1

List of harmful organisms for which pest categorisation is requested. The list below follows the annexes of Directive 2000/29/EC.

Annex IIAI

(a) Insects, mites and nematodes, at all stages of their development

Aleurocantus spp.
Anthonomus bisignifer (Schenkling)
Anthonomus signatus (Say)
Aschistonyx eppoi Inouye
Carposina niponensis Walsingham
Enarmonia packardi (Zeller)
Enarmonia prunivora Walsh
Grapholita inopinata Heinrich
Hishomonus phycitis
Leucaspis japonica Ckll.
Listronotus bonariensis (Kuschel)
Numonia pyrivorella (Matsumura)
Oligonychus perditus Pritchard and Baker
Pissodes spp. (non-EU)
Scirtothrips aurantii Faure
Scirtothrips citri (Moultex)
Scolytidae spp. (non-EU)
Scrobipalpopsis solanivora Povolny
Tachypterellus quadrigibbus Say
Toxoptera citricida Kirk.
Unaspis citri Comstock

(b) Bacteria

Citrus variegated chlorosis
Erwinia stewartii (Smith) Dye
Xanthomonas campestris pv. *oryzae* (Ishiyama) Dye and pv. *oryzicola* (Fang. et al.) Dye

(c) Fungi

Alternaria alternata (Fr.) Keissler (non-EU pathogenic isolates)
Anisogramma anomala (Peck) E. Müller
Apiosporina morbosa (Schwein.) v. Arx
Ceratocystis virescens (Davidson) Moreau
Cercoseptoria pini-densiflorae (Hori and Nambu) Deighton
Cercospora angolensis Carv. and Mendes
Elsinoe spp. Bitanc. and Jenk. Mendes
Fusarium oxysporum f. sp. *albedinis* (Kilian and Maire) Gordon
Guignardia piricola (Nosa) Yamamoto
Puccinia pittieriana Hennings
Stegophora ulmea (Schweinitz: Fries) Sydow & Sydow
Venturia nashicola Tanaka and Yamamoto

(d) Virus and virus-like organisms

Beet curly top virus (non-EU isolates)
Black raspberry latent virus
Blight and blight-like
Cadang-Cadang viroid
Citrus tristeza virus (non-EU isolates)
Leprosis
Little cherry pathogen (non- EU isolates)
Naturally spreading psorosis
Palm lethal yellowing mycoplasm
Satsuma dwarf virus
Tatter leaf virus
Witches' broom (MLO)

Annex IIB

(a) Insect mites and nematodes, at all stages of their development

Anthonomus grandis (Boh.)
Cephalcia lariciphila (Klug)
Dendroctonus micans Kugelan
Gilphinia hercyniae (Hartig)
Gonipterus scutellatus Gyll.
Ips amitinus Eichhof
Ips cembrae Heer
Ips duplicatus Sahlberg
Ips sexdentatus Börner
Ips typographus Heer
Sternochetus mangiferae Fabricius

(b) Bacteria

Curtobacterium flaccumfaciens pv. flaccumfaciens (Hedges) Collins and Jones

(c) Fungi

Glomerella gossypii Edgerton
Gremmeniella abietina (Lag.) Morelet
Hypoxylon mammatum (Wahl.) J. Miller

1.1.2.2. Terms of Reference: Appendix 2

List of harmful organisms for which pest categorisation is requested per group. The list below follows the categorisation included in the annexes of Directive 2000/29/EC.

Annex IAI

(a) Insects, mites and nematodes, at all stages of their development

Group of Cicadellidae (non-EU) known to be vector of Pierce's disease (caused by *Xylella fastidiosa*), such as:

1) *Carneocephala fulgida* Nottingham
2) *Draeculacephala minerva* Ball
3) *Graphocephala atropunctata* (Signoret)

Group of Tephritidae (non-EU) such as:

1) *Anastrepha fraterculus* (Wiedemann)
2) *Anastrepha ludens* (Loew)
3) *Anastrepha obliqua* Macquart
4) *Anastrepha suspensa* (Loew)
5) *Dacus ciliatus* Loew
6) *Dacus curcurbitae* Coquillet
7) *Dacus dorsalis* Hendel
8) *Dacus tryoni* (Froggatt)
9) *Dacus tsuneonis* Miyake
10) *Dacus zonatus* Saund.
11) *Epochra canadensis* (Loew)
12) *Pardalaspis cyanescens* Bezzi
13) *Pardalaspis quinaria* Bezzi
14) *Pterandrus rosa* (Karsch)
15) *Rhacochlaena japonica* Ito
16) *Rhagoletis completa* Cresson
17) *Rhagoletis fausta* (Osten-Sacken)
18) *Rhagoletis indifferens* Curran
19) *Rhagoletis mendax* Curran
20) *Rhagoletis pomonella* Walsh
21) *Rhagoletis suavis* (Loew)

(c) Viruses and virus-like organisms

Group of potato viruses and virus-like organisms such as:

1) Andean potato latent virus
2) Andean potato mottle virus
3) Arracacha virus B, oca strain
4) Potato black ringspot virus
5) Potato virus T
6) non-EU isolates of potato viruses A, M, S, V, X and Y (including Yo, Yn and Yc) and Potato leafroll virus

Group of viruses and virus-like organisms of Cydonia Mill., Fragaria L., Malus Mill., Prunus L., Pyrus L., Ribes L.,Rubus L. and Vitis L., such as:

1) Blueberry leaf mottle virus
2) Cherry rasp leaf virus (American)
3) Peach mosaic virus (American)
4) Peach phony rickettsia
5) Peach rosette mosaic virus
6) Peach rosette mycoplasm
7) Peach X-disease mycoplasm
8) Peach yellows mycoplasm
9) Plum line pattern virus (American)
10) Raspberry leaf curl virus (American)
11) Strawberry witches' broom mycoplasma
12) Non-EU viruses and virus-like organisms of *Cydonia Mill., Fragaria L., Malus Mill., Prunus L., Pyrus L., Ribes L., Rubus L.* and *Vitis L.*

Annex IIAI

(a) Insects, mites and nematodes, at all stages of their development

Group of *Margarodes* (non-EU species) such as:

1) *Margarodes vitis* (Phillipi)
2) *Margarodes vredendalensis* de Klerk
3) *Margarodes prieskaensis* Jakubski

1.1.2.3. Terms of Reference: Appendix 3

List of harmful organisms for which pest categorisation is requested. The list below follows the annexes of Directive 2000/29/EC.

Annex IAI

(a) Insects, mites and nematodes, at all stages of their development

Acleris spp. (non-EU)
Amauromyza maculosa (Malloch)
Anomala orientalis Waterhouse
Arrhenodes minutus Drury
Choristoneura spp. (non-EU)
Conotrachelus nenuphar (Herbst)
Dendrolimus sibiricus Tschetverikov
Diabrotica barberi Smith and Lawrence
Diabrotica undecimpunctata howardi Barber
Diabrotica undecimpunctata undecimpunctata Mannerheim
Diabrotica virgifera zeae Krysan & Smith
Diaphorina citri Kuway
Heliothis zea (Boddie)
Hirschmanniella spp., other than *Hirschmanniella gracilis* (de Man) Luc and Goodey
Liriomyza sativae Blanchard
Longidorus diadecturus Eveleigh and Allen
Monochamus spp. (non-EU)
Myndus crudus Van Duzee
Nacobbus aberrans (Thorne) Thorne and Allen
Naupactus leucoloma Boheman
Premnotrypes spp. (non-EU)
Pseudopityophthorus minutissimus (Zimmermann)
Pseudopityophthorus pruinosus (Eichhoff)
Scaphoideus luteolus (Van Duzee)
Spodoptera eridania (Cramer)
Spodoptera frugiperda (Smith)
Spodoptera litura (Fabricus)
Thrips palmi Karny
Xiphinema americanum Cobb *sensu* lato (non-EU populations)
Xiphinema californicum Lamberti and Bleve-Zacheo

(b) Fungi

Ceratocystis fagacearum (Bretz) Hunt
Chrysomyxa arctostaphyli Dietel
Cronartium spp. (non-EU)
Endocronartium spp. (non-EU)
Guignardia laricina (Saw.) Yamamoto and Ito
Gymnosporangium spp. (non-EU)
Inonotus weirii (Murril) Kotlaba and Pouzar
Melampsora farlowii (Arthur) Davis
Mycosphaerella larici-leptolepis Ito et al.
Mycosphaerella populorum G. E. Thompson
Phoma andina Turkensteen
Phyllosticta solitaria Ell. and Ev.
Septoria lycopersici Speg. var. *malagutii* Ciccarone and Boerema
Thecaphora solani Barrus
Trechispora brinkmannii (Bresad.) Rogers

(c) Viruses and virus-like organisms

Tobacco ringspot virus
Tomato ringspot virus
Bean golden mosaic virus
Cowpea mild mottle virus
Lettuce infectious yellows virus
Pepper mild tigré virus
Squash leaf curl virus
Euphorbia mosaic virus
Florida tomato virus

(d) Parasitic plants

Arceuthobium spp. (non-EU)

Annex IAII

(a) Insects, mites and nematodes, at all stages of their development

Meloidogyne fallax Karssen
Popillia japonica Newman
Rhizoecus hibisci Kawai and Takagi

(b) Bacteria

Clavibacter michiganensis (Smith) Davis et al. ssp. *sepedonicus* (Spieckermann and Kotthoff) Davis et al.
Ralstonia solanacearum (Smith) Yabuuchi et al.

(c) Fungi

Melampsora medusae Thümen
Synchytrium endobioticum (Schilbersky) Percival

Annex I B

(a) Insects, mites and nematodes, at all stages of their development

Leptinotarsa decemlineata Say
Liriomyza bryoniae (Kaltenbach)

(b) Viruses and virus-like organisms

Beet necrotic yellow vein virus

1.2. Interpretation of the Terms of Reference

This scientific opinion presents the pest categorisation of non-European Union (EU) viruses and viroids (hereafter referred to as viruses) that are known to infect potato (*Solanum tuberosum* L.) and/or other tuber-forming *Solanum* spp. (hereafter referred to as potato). The selection of viruses is based on information collected from various literature sources and databases in the opinion listing and grouping potato viruses (EFSA PLH Panel, 2020).

Non-EU viruses of potato are listed in the Appendices of the Terms of Reference (ToR) to be subject to pest categorisation to determine whether they fulfil the criteria of a quarantine pest or those of a regulated non-quarantine pest for the area of the EU excluding Ceuta, Melilla and the outermost regions of Member States referred to in Article 355(1) of the Treaty on the Functioning of the European Union (TFEU), other than Madeira and the Azores.

According to the ToR, EFSA is asked to develop pest categorisations for the non-EU viruses of potato. As a first step towards this goal, the EFSA Panel on Plant Health (PLH Panel) made a list of viruses infecting tuber-forming Solanum spp. All tuber-forming Solanum spp. are included, due to inconsistencies in the use of the term 'potato' in the literature, and to the increased likelihood that viruses infecting other tuber-forming Solanum species can also infect S. tuberosum. Viruses for which only partial molecular and/or biological data are available are also considered in this opinion to include the widest possible selection of relevant viruses. Virus-like diseases of unknown aetiology or phytoplasmas are not addressed.

The following viruses and viroids have been addressed by EFSA in previous scientific opinions: beet curly top virus (EFSA PLH Panel, 2017), capsicum chlorosis virus (EFSA PLH Panel, 2012a), cherry rasp leaf virus (EFSA PLH Panel, 2013a,b, 2019a,b), chrysanthemum stunt viroid (EFSA PLH Panel, 2011, 2012b), groundnut bud necrosis virus (EFSA PLH Panel, 2012a), groundnut ringspot virus (EFSA PLH Panel, 2012a), tomato chlorotic spot virus (EFSA PLH Panel, 2012a), tomato planta macho viroid (EFSA PLH Panel, 2011), tomato ringspot virus (EFSA PLH Panel, 2013a, 2019a,b), tomato yellow leaf curl virus (EFSA PLH Panel, 2013b, 2014), tomato yellow ring virus (EFSA PLH Panel, 2012a), tomato zonate spot virus (EFSA PLH Panel, 2012a). Following exchange with the European Commission, it was decided that they will not be further considered in the present categorisation.

Potato virus A, M, S, V, X, Y, and potato leafroll virus are widely present in Europe but are not addressed in the present opinion because the mandate requests the specific analysis of their non-EU isolates. These viruses will be addressed in separate opinions. Table 1 lists the viruses that will be categorised in the present opinion.

Table 1: Non-EU viruses and viruses with an undetermined standing of potato that will be categorised in the present opinion

Non-EU	Andean potato latent virus (APLV), Andean potato mild mosaic virus (APMMV), Andean potato mottle virus (APMoV), arracacha virus B (AVB), chilli leaf curl virus (ChiLCV), Colombian potato soil-borne virus (CPSbV), papaya leaf crumple virus (PaLCrV), papaya mosaic virus (PapMV), potato black ringspot virus (PBRSV), potato latent virus (PotLV), potato virus B (PVB), potato virus H (PVH), potato virus P (PVP), potato virus T (PVT), potato virus U (PVU), Potato yellow dwarf virus (PYDV), potato yellow mosaic virus (PYMV), potato yellow vein virus (PYVV), potato yellowing virus (PYV), SB26/29, SB41, solanum apical leaf curling virus (SALCV), tobacco vein banding mosaic virus (TVBMV), tomato chlorosis virus (ToCV), tomato leaf curl New Delhi virus (ToLCNDV), tomato mosaic Havana virus (ToMHaV), tomato mottle Taino virus (ToMoTV), tomato severe rugose virus (ToSRV), tomato yellow vein streak virus (ToYVSV), wild potato mosaic virus (WPMV)
Undetermined standing	Cucurbit yellow stunting disorder virus (CYSDV), potato aucuba mosaic virus (PAMV), red clover vein mosaic virus (RCVMV),

The new Plant Health Regulation (EU) 2016/2031[4], on the protective measures against pests of plants, will be applying from December 2019. The regulatory status sections (Section 3.3) of the present opinion are still based on Council Directive 2000/29/EC, as the document was adopted in September 2019.

2. Data and methodologies

2.1. Data

2.1.1. Literature search

A literature search on viruses and viroids (hereafter referred to as viruses) of tuber-forming *Solanum* species, including *S. tuberosum* (hereafter referred to as potato), was conducted at the beginning of the categorisation in the ISI Web of Science bibliographic database. The scientific name of each pest was used as search term. Relevant papers were reviewed and further references and information were obtained from experts, as well as from citations in the reviewed papers and grey literature. The search was continued until no further information could be found or until the collected information was considered sufficient to perform the pest categorisation; consequently, the presented data for each virus are not necessarily exhaustive.

2.1.2. Database search

Information on hosts, vectors and distribution, was retrieved from the European and Mediterranean Plant Protection Organization (EPPO) Global Database (EPPO, online), CABI Crop Protection Compendium (CABI CPC), Fauna Europaea and relevant publications. The data reported in the EPPO global database were used as a starting point. CABI cpc and Fauna Europaea were used to add information. When data were too limited or missing, additional data were searched in literature.

Data about the import of commodity types that could potentially provide a pathway for the pest to enter the EU and about the area of hosts grown in the EU were obtained from EUROSTAT (Statistical Office of the European Communities).

The Europhyt database was consulted to identify interceptions of the categorised viruses. Europhyt is a web-based network run by the Directorate General for Health and Food Safety (DG SANTÉ) of the European Commission and is a subproject of PHYSAN (Phyto-Sanitary Controls) specifically concerned with plant health information. The Europhyt database manages notifications of interceptions of plants or plant products that do not comply with EU legislation, as well as notifications of plant pests detected in the territory of the Member States (MSs) and the phytosanitary measures taken to eradicate them or to avoid their spread.

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

2.2. Methodologies

The Panel performed the pest categorisation for viruses of potato, following the guiding principles and steps presented in the EFSA guidance on quantitative pest risk assessment (EFSA PLH Panel, 2018a) and in the International Standard for Phytosanitary Measures No 11 (FAO, 2013) and No 21 (FAO, 2004).

In the tables throughout the opinion, the viruses will be grouped at genus level according to the current ICTV classification (ICTV, 2018b v1).

This work was initiated following an evaluation of the EU plant health regime. Therefore, to facilitate the decision-making process, in the conclusions of the pest categorisation, the Panel addresses explicitly each criterion for a Union quarantine pest and for a Union regulated non-quarantine pest (RNQP) in accordance with Regulation (EU) 2016/2031 on protective measures against pests of plants, and includes additional information required in accordance with the specific ToR received by the European Commission. In addition, for each conclusion, the Panel provides a short description of its associated uncertainty.

Table 2 presents the Regulation (EU) 2016/2031 pest categorisation criteria on which the Panel bases its conclusions. All relevant criteria have to be met for the pest to potentially qualify either as a quarantine pest or as a RNQP. If one of the criteria is not met, the pest will not qualify. A pest that does not qualify as a quarantine pest may still qualify as a RNQP that needs to be addressed in the opinion. For the pests regulated in the protected zones only, the scope of the categorisation is the territory of the protected zone; thus, the criteria refer to the protected zone instead of the EU territory.

It should be noted that the Panel's conclusions are formulated respecting its remit and particularly with regard to the principle of separation between risk assessment and risk management (EFSA founding regulation (EU) No 178/2002); therefore, instead of determining whether the pest is likely to have an unacceptable impact, the Panel will present a summary of the observed pest impacts. Economic impacts are expressed in terms of yield and quality losses and not in monetary terms, whereas addressing social impacts is outside the remit of the Panel.

Table 2: Pest categorisation criteria under evaluation, as defined in Regulation (EU) 2016/2031 on protective measures against pests of plants (the number of the relevant sections of the pest categorisation is shown in brackets in the first column)

Criterion of pest categorisation	Criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Criterion in Regulation (EU) 2016/2031 regarding protected zone quarantine pest (articles 32–35)	Criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest
Identity of the pest (Section 3.1)	Is the identity of the pest established, or has it been shown to produce consistent symptoms and to be transmissible?	Is the identity of the pest established, or has it been shown to produce consistent symptoms and to be transmissible?	Is the identity of the pest established, or has it been shown to produce consistent symptoms and to be transmissible?
Absence/presence of the pest in the EU territory (Section 3.2)	Is the pest present in the EU territory? If present, is the pest widely distributed within the EU? Describe the pest distribution briefly!	Is the pest present in the EU territory? If not, it cannot be a protected zone quarantine organism.	Is the pest present in the EU territory? If not, it cannot be a RNQP. (A regulated non-quarantine pest must be present in the risk assessment area).
Regulatory status (Section 3.3)	If the pest is present in the EU but not widely distributed in the risk assessment area, it should be under official control or expected to be under official control in the near future.	The protected zone system aligns with the pest-free area system under the International Plant Protection Convention (IPPC). The pest satisfies the IPPC definition of a quarantine pest that is not present in the risk assessment area (i.e. protected zone).	Is the pest regulated as a quarantine pest? If currently regulated as a quarantine pest, are there grounds to consider its status could be revoked?

Criterion of pest categorisation	Criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Criterion in Regulation (EU) 2016/2031 regarding protected zone quarantine pest (articles 32–35)	Criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Is the pest able to enter into, become established in, and spread within, the EU territory? If yes, briefly list the pathways!	Is the pest able to enter into, become established in, and spread within, the protected zone areas? Is entry by natural spread from EU areas where the pest is present possible?	Is spread mainly via specific plants for planting, rather than via natural spread or via movement of plant products or other objects? Clearly state if plants for planting is the main pathway!
Potential for consequences in the EU territory (Section 3.5)	Would the pests' introduction have an economic or environmental impact on the EU territory?	Would the pests' introduction have an economic or environmental impact on the protected zone areas?	Does the presence of the pest on plants for planting have an economic impact as regards the intended use of those plants for planting?
Available measures (Section 3.6)	Are there measures available to prevent the entry into, establishment within or spread of the pest within the EU such that the risk becomes mitigated?	Are there measures available to prevent the entry into, establishment within or spread of the pest within the protected zone areas such that the risk becomes mitigated? Is it possible to eradicate the pest in a restricted area within 24 months (or a period longer than 24 months where the biology of the organism so justifies) after the presence of the pest was confirmed in the protected zone?	Are there measures available to prevent pest presence on plants for planting such that the risk becomes mitigated?
Conclusion of pest categorisation (Section 4)	A statement as to whether (1) all criteria assessed by EFSA above for consideration as a potential quarantine pest were met and (2) if not, which one(s) were not met.	A statement as to whether (1) all criteria assessed by EFSA above for consideration as potential protected zone quarantine pest were met, and (2) if not, which one(s) were not met.	A statement as to whether (1) all criteria assessed by EFSA above for consideration as a potential RNQP were met, and (2) if not, which one(s) were not met.

The Panel will not indicate in its conclusions of the pest categorisation whether to continue the risk assessment process, but following the agreed two-step approach, will continue only if requested by the risk managers. However, during the categorisation process, experts may identify key elements and knowledge gaps that could contribute significant uncertainty to a future assessment of risk. It would be useful to identify and highlight such gaps so that potential future requests can specifically target the major elements of uncertainty, perhaps suggesting specific scenarios to examine.

2.3. Nomenclature

Virus nomenclature is reported using the latest release of the official classification by the International Committee on Taxonomy of Viruses (ICTV, Release 2018b.v1, https://talk.ictvonline.org/taxonomy/). Virus names are not italicised throughout this opinion, corresponding to ICTV instructions. The integration of the genus within the name of the species is currently not consistently adopted by ICTV working groups and, therefore, the Panel decided to use the species names without genus names.

3. Pest categorisation

3.1. Identity and biology of the pests

3.1.1. Identity and taxonomy

Is the identity of the pests established, or have they been shown to produce consistent symptoms and to be transmissible? (Yes or No)

Yes. The categorised viruses are recognised as species in the official ICTV classification, except PYV, SALCV, SB26/SB29, and SB41. For PYV the available information allows a tentative classification. SALCV, SB26/SB29 and SB41 produced consistent symptoms and have been shown to be transmissible, but further studies are needed to clarify their identity.

Table 3 reports the information on the identity of the categorised viruses. Most viruses are included in the official ICTV classification and, therefore, are considered to have an established identity. Four viruses have not been classified officially. The available information for PYV, including molecular and/or biological data, allows a tentative classification as novel ilarvirus. For SALCV, SB26/SB29 and SB41, very limited information is available and further studies are needed to clarify their identity. However, these three viruses produced consistent symptoms and have been shown to be transmissible.

Table 3: Identity of the categorised viruses and viroids. The identity of all viruses is established, or they have been shown to produce consistent symptoms and to be transmissible. Viruses are listed according to the genus to which they have been assigned by the ICTV

Genus, Virus	Acronym	Is the identity of the pests established, or have they been shown to produce consistent symptoms and to be transmissible?	Rationale
Begomovirus			
Chilli leaf curl virus	ChiLCV	Yes	Approved species, family *Geminiviridae*
Papaya leaf crumple virus	PaLCrV	Yes	Approved species, family *Geminiviridae*
Potato yellow mosaic virus	PYMV	Yes	Approved species, family *Geminiviridae*
Tomato leaf curl New Delhi virus	ToLCNDV	Yes	Approved species, family *Geminiviridae*
Tomato mosaic Havana virus	ToMHaV	Yes	Approved species, family *Geminiviridae*
Tomato mottle Taino virus	ToMoTV	Yes	Approved species, family *Geminiviridae*
Tomato severe rugose virus	ToSRV	Yes	Approved species, family *Geminiviridae*
Tomato yellow vein streak virus	ToYVSV	Yes	Approved species, family *Geminiviridae*
Carlavirus			
Potato latent virus	PotLV	Yes	Approved species, family *Betaflexiviridae*
Potato virus H	PVH	Yes	Approved species, family *Betaflexiviridae*
Potato virus P	PVP	Yes	Approved species, family *Betaflexiviridae*
Red clover vein mosaic virus	RCVMV	Yes	Approved species, family *Betaflexiviridae*
Cheravirus			
Arracacha virus B	AVB	Yes	Approved species, family *Secoviridae*

Genus, Virus	Acronym	Is the identity of the pests established, or have they been shown to produce consistent symptoms and to be transmissible?	Rationale
Comovirus			
Andean potato mottle virus	APMoV	Yes	Approved species, family *Comovirinae*
Crinivirus			
Cucurbit yellow stunting disorder virus	CYSDV	Yes	Approved species, family *Closteroviridae*
Potato yellow vein virus	PYVV	Yes	Approved species, family *Closteroviridae*
Tomato chlorosis virus	ToCV	Yes	Approved species, family *Closteroviridae*
Ilarvirus			
Potato yellowing virus	PYV	Yes	Tentative species in genus *Ilarvirus*, family *Bromoviridae* (Valkonen et al., 1992; Silvestre et al., 2011)
Nepovirus			
Potato black ringspot virus	PBRSV	Yes	Approved species, family *Secoviridae*
Potato virus B	PVB	Yes	Approved species, family *Secoviridae*
Potato virus U	PVU	Yes	Approved species, family *Secoviridae*
Nucleorhabdovirus			
Potato yellow dwarf virus	PYDV	Yes	Approved species, family *Rhabdoviridae*
Pomovirus			
Colombian potato soil-borne virus	CPSbV	Yes	Approved species, family *Virgaviridae*
Potexvirus			
Papaya mosaic virus	PapMV	Yes	Approved species, family *Alphaflexiviridae*
Potato aucuba mosaic virus	PAMV	Yes	Approved species, family *Alphaflexiviridae*
Potyvirus			
Tobacco vein banding mosaic virus	TVBMV	Yes	Approved species, family *Potyviridae*
Wild potato mosaic virus	WPMV	Yes	Approved species, family *Potyviridae*
Tepovirus			
Potato virus T	PVT	Yes	Approved species, family *Betaflexiviridae*
Tymovirus			
Andean potato latent virus	APLV	Yes	Approved species, family *Tymoviridea*
Andean potato mild mosaic virus	APMMV	Yes	Approved species, family *Tymoviridea*
Unassigned			
Solanum apical leaf curling virus	SALCV	Yes	The identity is not established, but the virus has been shown to be transmissible and to produce consistent symptoms (Hooker et al., 1983, 1985)

Genus, Virus	Acronym	Is the identity of the pests established, or have they been shown to produce consistent symptoms and to be transmissible?	Rationale
SB26/29	SB26/29	Yes	The identity is not established, but the virus has been shown to be transmissible and to produce consistent symptoms (Tenorio et al., 2003)
SB41	SB41	Yes	The identity is not established, but the virus has been shown to be transmissible and to produce consistent symptoms (Salazar, 2006)

3.1.2. Biology of the pests

All viruses considered in the present categorisation are transmitted by vegetative propagation (via tubers). Some of them can be transmitted mechanically, e.g. by contaminated tools and wounds. Pollen transmission in potato has only been shown for arracacha virus B (Jones, 1982; Card et al., 2007) and potato virus T (Salazar and Harrison, 1978b; Jones, 1982). Table 4 lists any evidence on transmission of viruses through seeds and vectors with the associated reasoning and/or uncertainties.

Table 4: Seed- and vector-mediated transmission status of the categorised viruses. Viruses are listed according to the genus to which they have been assigned by the ICTV

Genus, Acronym	Seed transmission	Rationale and/or uncertainty	Vector transmission	Rationale and/or uncertainty
Begomovirus				
ChiLCV	No	Not reported. Begomoviruses are phloem-limited viruses and therefore generally considered not seed-transmitted, with a few possible exceptions (Mink, 1993; Bos, 1999)	Yes	Reported to be persistently transmitted by *Bemisia tabaci* (Senanayake et al., 2012; Rosen et al., 2015)
PaLCrV	No	Not reported. Begomoviruses are phloem-limited viruses and therefore generally considered not seed-transmitted, with a few possible exceptions (Mink, 1993; Bos, 1999)	Yes	Reported to be persistently transmitted by *Bemisia tabaci* (Saxena et al., 1998; Rosen et al., 2015; Varun et al., 2017)
PYMV	No	Not reported. Begomoviruses are phloem-limited viruses and therefore generally considered not seed-transmitted, with a few possible exceptions (Mink, 1993; Bos, 1999)	Yes	Reported to be persistently transmitted by *Bemisia tabaci* (Morales et al., 2001; Rosen et al., 2015)
ToLCNDV	Cannot be excluded	Not reported in potato, but one study reported a ToLCNDV strain to be seed transmitted in chayote (*Sechium edule*) (Sangeetha et al., 2018)	Yes	Reported to be persistently transmitted by *Bemisia tabaci* (Rosen et al., 2015; Ruiz et al., 2017)
ToMHaV	No	Not reported. Begomoviruses are phloem-limited viruses and therefore generally considered not seed-transmitted, with a few possible exceptions (Mink, 1993; Bos, 1999)	Yes	Reported to be persistently transmitted by *Bemisia tabaci* (Rosen et al., 2015; Moriones et al., 2017)

Genus, Acronym	Seed transmission	Rationale and/or uncertainty	Vector transmission	Rationale and/or uncertainty
ToMoTV	No	Not reported. Begomoviruses are phloem-limited viruses and therefore generally considered not seed-transmitted, with a few possible exceptions (Mink, 1993; Bos, 1999)	Yes	Reported to be persistently transmitted by *Bemisia tabaci* (Ramos et al., 1997; Cordero et al., 2003; Rosen et al., 2015)
ToSRV	No	Not reported. Begomoviruses are phloem-limited viruses and therefore generally considered not seed-transmitted, with a few possible exceptions (Mink, 1993; Bos, 1999)	Yes	Reported to be persistently transmitted by *Bemisia tabaci* (Macedo et al., 2015; Rosen et al., 2015)
ToYVSV	No	Not reported. Begomoviruses are phloem-limited viruses and therefore generally considered not seed-transmitted, with a few possible exceptions (Mink, 1993; Bos, 1999)	Yes	Reported to be persistently transmitted by *Bemisia tabaci* (Ribeiro et al., 2006; Rosen et al., 2015)
Carlavirus				
PotLV	Cannot be excluded	Not reported, but RCVMV, another carlavirus, is seed-transmitted (see references below)	Yes	Reported to be non-persistently transmitted by *Myzus persicae* (Brattey et al., 2002; Pirone and Perry, 2002)
PVH	Cannot be excluded	Not reported, but RCVMV, another carlavirus, is seed-transmitted (see references below).	Cannot be excluded	Not reported, but other carlaviruses are non-persistently transmitted by aphids (ICTV 2011) (Matthews, 1991)
PVP	Cannot be excluded	Not reported, but RCVMV, another carlavirus, is seed-transmitted (see references below)	Cannot be excluded	Not reported, but other non-persistently carlaviruses are transmitted by aphids (ICTV 2011; Matthews, 1991)
RCVMV	Cannot be excluded	Not reported in potato but seed transmission is reported in *Trifolium pratense* and *Vicia faba* and *Pisum sativum* (Sander, 1959; Kraft et al., 1998)	Yes	Reported to be non-persistently transmitted by several aphid species including *Myzus persicae* (Weber and Hampton, 1980; Fletcher et al., 2016)
Cheravirus				
AVB	Yes	Reported in potato (Jones, 1982)	Cannot be excluded	Not reported, but CRLV, another cheravirus, is transmitted by nematode vectors (see references below)
Comovirus				
APMoV	Cannot be excluded	Reported not to be seed transmitted in potato (Fribourg et al., 1979) but seed transmission is reported for other comoviruses (ICTV, 2012)	Cannot be excluded	Not reported (Fribourg et al., 1979), but other comoviruses are transmitted by beetles (Gergerich and Scott, 1996)
Crinivirus				
CYSDV	No	Not reported and seed transmission is not reported for	Yes	Reported to be semi-persistently transmitted by *Bemisia tabaci* (Tzanetakis

Genus, Acronym	Seed transmission	Rationale and/or uncertainty	Vector transmission	Rationale and/or uncertainty
		other criniviruses (ICTV, 2012; Wintermantel et al., 2016)		et al., 2013; Wintermantel et al., 2016).
PYVV	No	Not reported and seed transmission is not reported for other criniviruses (Mink, 1993; ICTV, 2012)	Yes	Reported to be semi-persistently transmitted by *Trialeurodes vaporariorum* (Salazar et al., 2000; Tzanetakis et al., 2013; Cuadros et al., 2017)
ToCV	No	Not reported and seed transmission is not reported for other criniviruses (Mink, 1993; ICTV, 2012)	Yes	Reported to be semi-persistently transmitted by *Bemisia tabaci*, *Trialeurodes abutiloneus* and *Trialeurodes vaporariorum* (Navas-Castillo et al., 2000; Tzanetakis et al., 2013; Shi et al., 2018)
Ilarvirus				
PYV	Cannot be excluded	Not reported in potato, but reported in *Solanum brevidens* (Valkonen et al., 1992).	Yes	Reported to be non-persistently transmitted by *Myzus persicae* (Valkonen et al., 1992)
Nepovirus				
PBRSV	Yes	Reported in potato (Jones, 1982)	Cannot be excluded	Not reported, but other nepoviruses are often transmitted by nematodes (ICTV, 2012)
PVB	Cannot be excluded	Not reported, but seed transmission is reported for several other nepoviruses (Lister and Murant, 1967)	Cannot be excluded	Not reported, but other nepoviruses are often transmitted by nematodes (ICTV, 2012)
PVU	Cannot be excluded	Not reported in potato, but reported in *Chenopodium amaranticolor* and *Chenopodium quinoa* (Jones et al., 1983)	Cannot be excluded	Not reported, but other nepoviruses are often transmitted by nematodes (ICTV, 2012)
Nucleorhabdovirus				
PYDV	Cannot be excluded	Not reported in potato. Reported not seed-transmitted in *Nicotiana rustica* (Black, 1970), but seed transmission is reported for maize mosaic virus, another nucleorhabdovirus (Mink, 1993)	Yes	Reported to be persistently transmitted by *Aceratagallia sanguinolenta* and *Agallia constricta* (Black, 1934, 1943; Jackson et al., 2018)
Pomovirus				
CPSbV	No	Seed transmission is not reported for pomoviruses (Mink, 1993; ICTV, 2012)	Cannot be excluded	Not reported, but other pomoviruses are transmitted by *Spongospora subterranea* (ICTV, 2012; Gil et al., 2016)
Potexvirus				
PapMV	Cannot be excluded	Not reported, but seed transmission is reported for several other potexviruses (Mink, 1993)	Yes	Reported to be transmitted by several aphid species including *Myzus persicae* (Namba and Kawanish, 1966; Higa and Namba, 1971). PAMV, another potexvirus, only transmitted

Genus, Acronym	Seed transmission	Rationale and/or uncertainty	Vector transmission	Rationale and/or uncertainty
				by *Myzus persicae* in the presence of a potyvirus.
PAMV	Cannot be excluded	Not reported, but seed transmission is reported for several other potexviruses (Mink, 1993)	Yes	Reported to be transmitted in a non-persistent manner by *Myzus persicae* in the presence of a potyvirus providing a helper protein (Manoussopoulos, 2000, 2001; Pirone and Perry, 2002).
Potyvirus				
TVBMV	Cannot be excluded	Reported not to be seed transmitted in *Datura stramonium*, *Nicotiana tabacum* cv White Burley and *Solanum lycopersicum* (Roggero et al., 2000), but seed transmission is reported for other potvyiruses (Revers and Garcia, 2015).	Cannot be excluded	Not reported, but other potyviruses are reported to be transmitted by aphids (Revers and Garcia, 2015)
WPMV	Cannot be excluded	Not reported, but seed transmission is reported for other potyviruses (Revers and Garcia, 2015)	Yes	Reported to be non-persistently transmitted by *Myzus persicae* (Jones and Fribourg, 1979; Jeffries, 1998).
Tepovirus				
PVT	Yes	Reported in potato (Salazar and Harrison, 1978b; Jones, 1982)	No	Not reported. Reported not to be transmitted by *Myzus persicae* or *Macrosiphum euphorbiae* (Salazar and Harrison, 1978b). PVT does not have the nucleic acid binding protein generally seen in vector-transmitted *Betaflexiviridae*. (ICTV 2012)
Tymovirus				
APLV	Yes	Reported in potato (Fribourg et al., 1977b)	Yes	Reported to be transmitted by *Epitrix* sp. (Jones and Fribourg, 1977).
APMMV	Cannot be excluded	Not reported, but formerly considered as an isolate (APLV-Hu) of APLV, for which seed transmission in potato is reported (Kreuze et al., 2013).	Cannot be excluded	Not reported, but formerly considered as an isolate (APLV-Hu) of APLV, which is transmitted by *Epitrix* sp. (Kreuze et al., 2013).
Unassigned				
SALCV	Transmission mechanism(s) cannot be evaluated. No information is available on the natural transmission and no close relative is known which could be used to propose an evaluation.			
SB26/29	Seed transmission cannot be evaluated. No information is available on the transmission by seeds of SB26/29 and no close relative is known which could be used to propose an evaluation.		Yes	Reported to be transmitted by *Russelliana solanicola* (Tenorio et al., 2003).
SB41	Transmission mechanism(s) cannot be evaluated. No information is available on the natural transmission and no close relative is known which could be used to propose an evaluation.			

3.1.3. Intraspecific diversity

Viruses generally exist as quasispecies, which means that they accumulate as a cluster of closely related sequence variants in a single host (Andino and Domingo, 2015). This is likely due to competition among the genomic variants that are generated as a consequence of the error-prone viral replication (higher in RNA than in DNA viruses) and the ensuing selection of the fittest variants in a given environment (Domingo et al., 2012). This quasispecies nature, which also applies to viroids (Codoner et al., 2006; Di Serio et al., 2017), implicates that a certain level of intraspecific diversity is expected for all RNA viruses. This genetic variability may have consequences for the reliability of detection methods, especially when they are targeting less conserved genomic regions.

For several viruses categorised in this opinion, information on their genetic variability is available, but studies showing a relation between specific virus populations or variants and biological properties (e.g. host range, transmissibility, pathogenicity) are rare. For recently discovered viruses (including those identified by high-throughput sequencing (HTS)), data on genomic diversity and biological properties are often not available.

The recent advances in the availability of molecular data have generated new taxonomical insights. The demarcation of species based on genetic variability might complicate the interpretation of species geographical distribution data. For example, in the case of APLV and the recently separated APMMV (formerly APLV-Hu strain; Kreuze et al., 2013), it is not always possible to determine to which of the two species historical publications refer to. For AVB, it is also difficult to interpret distribution data, because two strains are distinguished, i.e. AVB-T (type strain) and AVB-O (oca strain), of which only the O-strain is known to infect potato (Jones, 1981; Jones and Kenten, 1981, 1983).

In conclusion, the quasispecies nature of viruses and viroids causes uncertainties about the reliability of detection methods, and there is some uncertainty about interpretation of older data on e.g. biological characteristics and geographical distribution as a consequence of advances in virus taxonomy.

3.1.4. Detection and identification of the pests

Are detection and identification methods available for the pests?

Yes, all viruses in this opinion can be detected by molecular and/or serological and/or biological methods. For SALCV, SB26/29 and SB41, the uncertainties are particularly high since there is no information on the specificity of the bioassays and alternative methods are not available.

Table 5 reports on the availability of detection methods for the categorised viruses and indicates the uncertainties. For all viruses, except SALCV, SB26/29 and SB41, molecular and/or serological detection methods are available.

Virus detection and identification is complicated by several recurrent uncertainties. ICTV lists species demarcation criteria, but it is not always clear whether these are met in diagnostic tests. Furthermore, in the absence or near absence of information on genetic variability, it is not possible to guarantee that the test will detect all variants of a species. On the contrary, more generic tests may detect closely related viruses in addition to the target species. This implies that the reliability of a test depends on its validation for the intended use. For initial screening, it is important to prevent false-negative results, which means that the following performance characteristics are most relevant: analytical sensitivity, inclusivity of analytical specificity (coverage of the intra-species variability) and selectivity (matrix effects). For identification, it is important to prevent false positives and, therefore, the possible occurrence of cross reactions should be determined, i.e. the exclusivity of the analytical specificity (the resolution should be sufficient to discriminate between related species).

The Panel notes that EPPO is currently developing a standard for post-entry quarantine testing for potato.

Table 5: Availability of detection and identification methods of the categorised viruses

Genus, Acronym	Method available?	Key reference	Rationale and/or uncertainty[(1)]
Begomovirus			
ChiLCV	Yes	(Khan et al., 2013; Al-Shihi et al., 2014)	Genus-specific molecular detection, identification by sequencing
PaLCrV	Yes	(Rojas et al., 1993; Jaidi et al., 2015)	Genus-specific molecular detection, identification by sequencing
PYMV	Yes	(Deng et al., 1994; Wyatt and Brown, 1996; Li et al., 2004)	Genus-specific molecular detection, identification by sequencing
ToLCNDV	Yes	(Deng et al., 1994; Wyatt and Brown, 1996; Li et al., 2004)	ELISA detection reagent set commercially available. Genus-specific molecular detection, identification by sequencing
ToMHaV	Yes	(Rojas et al., 1993; Deng et al., 1994; Monger et al., 2008)	Genus-specific molecular detection, identification by sequencing. Specific primers are also available, but there is uncertainty on their inclusivity
ToMoTV	Yes	(Deng et al., 1994; Wyatt and Brown, 1996; Li et al., 2004)	Genus-specific molecular detection, identification by sequencing
ToSRV	Yes	(Deng et al., 1994; Wyatt and Brown, 1996; Li et al., 2004)	Genus-specific molecular detection, identification by sequencing
ToYVSV	Yes	(Rojas et al., 1993; Ribeiro et al., 2006)	Genus-specific molecular detection, identification by sequencing
Carlavirus			
PotLV	Yes	(Nie et al., 2008)	ELISA detection reagent set commercially available. Genus-specific molecular detection, identification by sequencing
PVH	Yes	(Li et al., 2013)	Specific primers are available, but there is uncertainty on their inclusivity
PVP	Yes	(Massa et al., 2006; Nisbet et al., 2006)	Absence of a proven protocol. Antiserum not commercially available, but genomic sequence is available for the design of diagnostic primers
RCVMV	Yes	(Fletcher et al., 2016; Al-Shahwan et al., 2017)	Specific primers are available, but there is uncertainty on their inclusivity
Cheravirus			
AVB	Yes	(Schroeder and Weidemann, 1990; Tang, 2016)	ELISA detection reagent set commercially available. Specific primers are available, but there is uncertainty on their inclusivity
Comovirus			
APMoV	Yes	(Salazar and Harrison, 1978c)	ELISA detection reagent set commercially available
Crinivirus			
CYSDV	Yes	(Boubourakas et al., 2006; Orfanidou et al., 2019)	Specific primers are available, but there is uncertainty on their inclusivity
PYVV	Yes	(Lopez et al., 2006)	Specific primers are available, but there is uncertainty on their inclusivity
ToCV	Yes	(EPPO diagnostic protocol PM 7/118 (1), 2013)	No uncertainty
Ilarvirus			
PYV	Yes	(Untiveros et al., 2010; Tang, 2016)	Genus-specific molecular detection, identification by sequencing

Genus, Acronym	Method available?	Key reference	Rationale and/or uncertainty(1)
Nepovirus			
PBRSV	Yes	(Wei and Clover, 2008)	ELISA detection reagent set commercially available
PVB	Yes	(Wei and Clover, 2008; De Souza et al., 2017)	Genus-specific molecular detection, identification by sequencing. Genomic sequence is available for the design of diagnostic primers
PVU	Yes	(Adams et al., 2018b)	Genomic sequence is available for the design of diagnostic primers
Nucleorhabdovirus			
PYDV	Yes	(Ghosh et al., 2008)	Genomic sequence is available for the design of diagnostic primers
Pomovirus			
CPSbV	Yes	(Gil et al., 2016)	Genomic sequence is available for the design of diagnostic primers
Potexvirus			
PapMV	Yes	(van der Vlugt and Berendsen, 2002)	ELISA detection reagent set commercially available. Detection of other viruses in the genus using a generic RT-PCR which is not tested for PapMV
PAMV	Yes	(van der Vlugt and Berendsen, 2002)	ELISA detection reagent set commercially available. Genus-specific molecular detection, identification by sequencing
Potyvirus			
TVBMV	Yes	(Chen et al., 2001; Wang et al., 2017)	ELISA detection reagent set commercially available. Genus-specific molecular detection, identification by sequencing
WPMV	Yes	(Spetz and Valkonen, 2003; Spetz et al., 2003)	Genomic sequence is available for the design of diagnostic primers
Tepovirus			
PVT	Yes	(Russo et al., 2009)	ELISA detection reagent set commercially available. Genomic sequence is available for the design of diagnostic primers
Tymovirus			
APLV	Yes	(EPPO diagnostic protocol PM7/132(1), 2018)	No uncertainty
APMMV	Yes	(EPPO diagnostic protocol PM7/132(1), 2018)	No uncertainty
Unassigned			
SALCV	Yes	(Hooker and Salazar, 1983; Hooker et al., 1985)	Bioassay and serological test are reported, uncertainty whether the antiserum is still available. No molecular method is available
SB26/29	Yes	(Tenorio et al., 2003)	Bioassay reported. No other method available
SB41	Yes	(Salazar, 2006)	Bioassay reported. No other method available

(1): No uncertainty: available methods are considered robust.

3.2. Pests distribution

3.2.1. Pests distribution outside the EU

Table 6 reports the distribution of the categorised viruses outside the EU based on data retrieved up to 9 April 2019. Available distribution maps are provided in the Appendices A.1 to A.22.

Table 6: Distribution of the categorised viruses outside the EU

Genus, Acronym	Distribution[(1)]	Distribution map
Begomovirus		
ChiLCV	**Literature:** Asia: India, Pakistan, Oman (Senanayake et al., 2012; Al-Shihi et al., 2014) **NCBI GenBank**: Asia: Sri Lanka	Not available
PaLCrV	**Literature:** Africa: South Africa (Varun et al., 2017) America: Caribbean islands, Costa Rica, Hawaii, Florida, Mexico (Noa-Carrazana et al., 2006; Varun et al., 2017) Asia: India, Indonesia, Malaysia, Philippines (Jaidi et al., 2015; Varun et al., 2017) Oceania: Australia (Varun et al., 2017) **NCBI GenBank:** Asia: Pakistan	Not available
PYMV	**CABI cpc:** America: Grenada **Literature:** America: Guadeloupe, Trinidad, Puerto Rico, Martinique, Venezuela (Roberts et al., 1986; Urbino et al., 2004; Romay et al., 2016) **NCBI GenBank:** America: Dominican Republic, Colombia	CABI map, Appendix A.1.
ToLCNDV	**EPPO global database:** Africa: Morocco, Seychelles, Tunisia Asia: Bangladesh, India, Indonesia, Pakistan, Philippines, Sri Lanka, Taiwan, Thailand **CABI cpc**: Asia: Iran	EPPO map, Appendix A.2
ToMHaV	**EPPO global database:** America: Cuba, Honduras, Jamaica, Nicaragua **NCBI GenBank**: America: Guatemala	EPPO map, Appendix A.3
ToMoTV	**EPPO global database:** America: Cuba	EPPO map, Appendix A.4
ToSRV	**CABI cpc**: America: Brazil	CABI map, Appendix A.5
ToYVSV	**EPPO global database:** America: Brazil, Uruguay **NCBI:** America: Argentina, Bolivia, Chili	EPPO map, Appendix A.6
Carlavirus		
PotLV	**EPPO global database:** America: United States of America **NCBI GenBank**: America: Canada	EPPO map, Appendix A.7

Genus, Acronym	Distribution[1]	Distribution map
PVH	**EPPO global database:** Asia: Bangladesh, China	EPPO map, Appendix A.8
PVP	**Literature** America: Argentina, Brazil (Massa et al., 2006; Nisbet et al., 2006)	Not available
RCVMV	**CABI cpc:** America: Canada, United States of America **Literature:** Asia: Saudi Arabia (Al-Shahwan et al., 2017) Oceania: New Zealand (Fletcher et al., 2016)	CABI map, Appendix A.9
Cheravirus		
AVB	**EPPO global database:** America: Bolivia, Peru	EPPO map for AVB oca strain, Appendix A.10
Comovirus		
APMoV	**EPPO global database:** America: Bolivia, Brazil, Chile, Colombia, Ecuador, Honduras, Nicaragua, Peru **CABI cpc:** America: Argentina, Costa Rica **Literature:** America: United States of America, Mexico (Valverde, 1995)	EPPO map, Appendix A.11
Crinivirus		
CYSDV	**EPPO global database:** Africa: Egypt, Morocco, Sudan, Tunisia America: Mexico, United States of America Asia: China, Iran, Israel, Jordan, Lebanon, Saudi Arabia, Syria, United Arab Emirates Europe (non-EU): Turkey **Literature:** America: Florida (Polston et al., 2008) **NCBI GenBank:** America: Guatemala	EPPO map, Appendix A.12
PYVV	**EPPO global database:** America: Colombia, Ecuador, Peru, Venezuela	EPPO map, Appendix A.13
ToCV	**EPPO global database:** Africa: Mauritius, Mayotte, Morocco, Nigeria, Réunion, South Africa, Sudan, Tunisia America: Brazil, Costa Rica, Cuba, Mexico, Puerto Rico, United States of America, Uruguay Asia: China, Israel, Japan, Jordan, Korea Republic, Lebanon, Saudi Arabia, Taiwan Europe (non-EU): Turkey **CABI cpc:** Africa: Canary Islands	EPPO map, Appendix A.14
Ilarvirus		
PYV	**EPPO global database**: America: Chile, Ecuador, Peru **CABI cpc:** America: Bolivia	EPPO map, Appendix A.15
Nepovirus		
PBRSV	**EPPO global database:** America: Peru	EPPO map, Appendix A.16

Genus, Acronym	Distribution[1]	Distribution map
	NCBI GenBank: Oceania: New Zealand	
PVB	**Literature**: America: Peru (De Souza et al., 2017)	Not available
PVU	**Literature**: America: Peru (Adams et al., 2018b)	Not available
Nucleorhabdoviruss		
PYDV	**EPPO global database:** America: United States of America **CABI cpc:** Asia: Saudi Arabia	EPPO map, Appendix A.17
Pomovirus		
CPSbV	**Literature:** America: Colombia (Gil et al., 2016)	Not available
Potexvirus		
PapMV	**EPPO global database:** Africa: Tanzania America: Dominica, Saint Vincent and the Grenadines, Trinidad and Tobago, United States of America, Venezuela Oceania: Guam **CABI cpc**: Asia: India, Philippines America: Brazil, Mexico	EPPO map, Appendix A.18
PAMV	**CABI cpc:** Oceania: New Zealand **Literature:** Probably distributed worldwide, but not common (Loebenstein et al., 2001) Asia: China (Wu et al., 2018) America: United States of America (Susaimuthu et al., 2007) **NCBI GenBank:** Asia: Bangladesh, India, Japan	CABI map, Appendix A.19
Potyvirus		
TVBMV	**Literature:** Asia: China (Geng et al., 2014), Japan (INRA, 2013), Taiwan (Yuan et al., 2012) America: United States of America (Reddick et al., 1992)	Not available
WPMV	**Literature:** America: Peru (Jones and Fribourg, 1979)	Not available
Tepovirus		
PVT	**EPPO global database:** America: Bolivia, Brazil, Peru **NCBI GenBank:** America: Chile	EPPO map, Appendix A.20
Tymovirus		
APLV	**EPPO global database:** America: Argentina, Bolivia, Chile, Colombia, Ecuador, Peru	EPPO map, Appendix A.21

Genus, Acronym	Distribution[1]	Distribution map
APMMV	**EPPO global database:** America: Bolivia, Peru	EPPO map, Appendix A.22
Unassigned		
SALCV	**Literature:** America: Peru (Hooker and Salazar, 1983)	Not available
SB26/29	**Literature:** America: Peru (Tenorio et al., 2003)	Not available
SB41	**Literature:** America: Andes region (Salazar, 2006)	Not available

(1): Based on the information in the EPPO global database and by adding the countries reported in CABI cpc, from literature and NCBI GenBank. Therefore, global distribution data are not necessarily exhaustive and can be wider.

3.2.2. Pests distribution in the EU

Are the pests present in the EU territory? If present, are the pests widely distributed within the EU?

Yes. CYSDV, PAMV, ToCV, ToLCNDV, and RCVMV are reported with a limited distribution in the EU.

No. APLV, APMMV, APMoV, AVB, ChiLCV, CPSbV, PaLCrV, PapMV, PBRSV, PotLV, PVB, PVH, PVP, PVT, PVU, PYDV, PYMV, PYVV, PYV, SB26/29, SB41, SALCV, TVBMV, ToMHaV, ToMoTV, ToSRV, ToYVSV, and WPMV are not reported in the EU.

Non-EU viruses are defined by their current absence or limited presence in the EU. As such, viruses that occur outside the EU and have a limited presence in the EU (reported in one or a few member states (MSs)) are considered as non-EU. For non-EU viruses with limited presence in the EU, Table 7 reports the distribution in the EU retrieved up to 9 April 2019.

CYSDV, PAMV, RCVMV ToCV and ToLCNDV are reported from several EU MSs (Table 7). CYSDV is reported in five EU MSs, with restricted distribution (Spain, Portugal, Greece), few occurrences (Italy), without details (Greece) and widespread (Cyprus) status. The presence in Cyprus is based on a report from 2005 (Papayiannis et al., 2005), and the current status is not known. PAMV was reported with a worldwide distribution in the 1970s on potato cultivars that are no longer used (Kassanis and Govier, 1972; Loebenstein et al., 2001). PAMV was reported on *Solanum jasminoides* in a nursery in United Kingdom (Fox et al., 2016). Apart from this report, there is no recent information on the distribution of PAMV and it may therefore no longer be present in the EU. RCVMV is reported in five EU MSs without further details. ToCV is reported in ten EU MSs with restricted distribution, few occurrences or without details, and in some MSs, eradication is ongoing. ToLCNDV is reported in three EU MSs, with restricted distribution, few occurrences or without details.

In summary, when the categorised viruses are reported as present in EU MSs, the Panel considered their overall distribution in the EU limited and to be under official control. They therefore fulfil the definition of non-EU viruses used in the present categorisation efforts.

Table 7: Virus distribution in the EU

Genus Acronym[1]	Reported in EU MSs[2]
Begomovirus	
ToLCNDV	EPPO global database: Present, few occurrences: Greece[4] Present, restricted distribution: Estonia[4], Italy (Sicilia), Spain Present, no details: Italy (Sardegna)

Genus Acronym[1]	Reported in EU MSs[2]
Carlavirus	
RCVMV[3]	**CABI cpc:** Present: Germany, Lithuania, Netherlands **Literature**: Italy, United Kingdom (Freeman, 2008)
Crinivirus	
CYSDV[3]	EPPO global database: Present, widespread: Cyprus Present, few occurrences: Italy Present, restricted distribution: Greece, Portugal, Spain Present, no details: Greece (Kriti)
ToCV	EPPO global database: Transient, under eradication: Netherlands, United Kingdom Present, few occurrences: Hungary, Spain Present, restricted distribution: Cyprus, France, Greece, Italy, Portugal, Spain Present, no details: Italy
Potexvirus	
PAMV[3]	**Literature:** Probably distributed worldwide, but not common (Loebenstein et al., 2001), United Kingdom (Fox et al., 2016)

(1): Categorised viruses which are not reported in the EU are not listed in this table.
(2): Countries listed in EPPO global database, and only additional countries from CABI cpc, literature and/or NCBI GenBank reported.
(3): Viruses with undetermined standing.
(4): Data retrieved from the EPPO global database on 25 July 2019.

3.3. Regulatory status

3.3.1. Council Directive 2000/29/EC

Table 8 reports on the categorised viruses that are specifically listed in Council Directive 2000/29/EC. The other categorised viruses are considered as regulated in Annex IAI as 'potato viruses and virus-like organisms'. In addition, several viruses are also covered by regulation in Annex IAI because they are transmitted by *Bemisia tabaci* (all categorised begomoviruses and the criniviruses CYSDV and ToCV, see Table 4).

Table 8: Categorised viruses which are specifically mentioned in Council Directive 2000/29/EC

Annex I, Part A	**Harmful organisms whose introduction into, and spread within, all member states shall be banned**
Section I	**Harmful organisms not known to occur in any part of the community and relevant for the entire community**
(d)	**Viruses and virus-like organisms**
2.	Potato viruses and virus-like organisms such as: (a) Andean potato latent virus (b) Andean potato mottle virus (c) Arracacha virus B, oca strain (d) Potato black ringspot virus (f) Potato virus T
6.	Viruses transmitted by *Bemisia tabaci* Genn., such as: (a) Bean golden mosaic virus (b) Cowpea mild mottle virus (c) Lettuce infectious yellows virus (d) Pepper mild tigré virus (e) Squash leaf curl virus (f) Euphorbia mosaic virus (g) Florida tomato virus

3.3.2. Legislation addressing potato

Table 9 reports on the articles in Council Directive 2000/29/EC which address potato or tuber-forming species of *Solanum* L. Several categorised viruses may also infect other hosts; references to the corresponding legislation are reported in Table 10 (see Section 3.4.1).

Table 9: Overview of the regulation in Annexes III, IV and V of Council Directive 2000/29/EC that applies to potato or tuber-forming *Solanum* species

Annex III, Part A	**Plants, plant products and other objects the introduction of which shall be prohibited in all Member States**	
	Description	**Country of origin**
10.	Tubers of *Solanum tuberosum* L., seed potatoes	Third countries other than Switzerland
11.	Plants of stolon- or tuber-forming species of *Solanum* L. or their hybrids, intended for planting, other than those tubers of *Solanum tuberosum* L. as specified under Annex III A (10)	Third countries
12.	Tubers of species of *Solanum* L., and their hybrids, other than those specified in points 10 and 11	Without prejudice to the special requirements applicable to the potato tubers listed in Annex IV, Part A Section I, third countries other than Algeria, Egypt, Israel, Libya, Morocco, Syria, Switzerland, Tunisia and Turkey, and other than European third countries which are either recognised as being free from *Clavibacter michiganensis* ssp. *sepedonicus* (Spieckermann and Kotthoff) Davis et al., in accordance with the procedure referred to in Article 18(2), or in which provisions recognised as equivalent to the Community provisions on combating *Clavibacter michiganensis* ssp. *sepedonicus* (Spieckermann and Kotthoff) Davis et al. in accordance with the procedure referred to in Article 18(2), have been complied with
Annex IV, Part A	**Special requirements which shall be laid down by all member states for the introduction and movement of plants, plant products and other objects into and within all Member States**	
Section I	**Plants, plant products and other objects originating outside the Community**	
	Plants, plant products and other objects	**Special requirements**
25.1	Tubers of *Solanum tuberosum* L., originating in countries where *Synchytrium endobioticum* (Schilbersky) Percival is known to occur	Without prejudice to the prohibitions applicable to the tubers listed in Annex III(A) (10), (11) and (12), official statement that: (a) the tubers originate in areas known to be free from *Synchytrium endobioticum* (Schilbersky) Percival (all races other than Race 1, the common European race), and no symptoms of *Synchytrium endobioticum* (Schilbersky) Percival have been observed either at the place of production or in its immediate vicinity since the beginning of an adequate period; or (b) provisions recognised as equivalent to the Community provisions on combating *Synchytrium endobioticum* (Schilbersky) Percival in accordance with the procedure referred to in Article 18(2) have been complied with, in the country of origin
25.2.	Tubers of *Solanum tuberosum* L.	Without prejudice to the provisions listed in Annex (A) (10), (11) and (12) and Annex IV(A) (I) (25.1), official statement that: (a) the tubers originate in countries known to be free from *Clavibacter michiganensis* ssp. *sepedonicus* (Spieckermann and Kotthoff) Davis et al.;

		or (b) provisions recognised as equivalent to the Community provisions on combating *Clavibacter michiganensis* ssp. *sepedonicus* (Spieckermann and Kotthoff) Davis et al. in accordance with the procedure referred to in Article 18(2), have been complied with, in the country of origin
25.3.	Tubers of *Solanum tuberosum* L., other than early potatoes, originating in countries where Potato spindle tuber viroid is known to occur	Without prejudice to the provisions applicable to the tubers listed in Annex III(A) (10), (11) and (12) and Annex IV(A)(I) (25.1) and (25.2), suppression of the faculty of germination
25.4.	Tubers of *Solanum tuberosum* L., intended for planting	Without prejudice to the provisions applicable to the tubers listed in Annex III(A)(10), (11) and (12) and Annex IV(A)(I) (25.1), (25.2) and (25.3), official statement that the tubers originate from a field known to be free from *Globodera rostochiensis* (Wollenweber) Behrens and *Globodera pallida* (Stone) Behrens and (aa) either, the tubers originate in areas in which *Ralstonia solanacearum* (Smith) Yabuuchi et al. is known not to occur; or (bb) in areas where *Ralstonia solanacearum* (Smith) Yabuuchi et al. is known to occur, the tubers originate from a place of production found free from *Ralstonia solanacearum* (Smith) Yabuuchi et al., or considered to be free thereof, as a consequence of the implementation of an appropriate procedure aiming at eradicating *Ralstonia solanacearum* (Smith) Yabuuchi et al. which shall be determined in accordance with the procedure referred to in Article 18(2) and (cc) either the tubers originate in areas where *Meloidogyne chitwoodi* Golden et al. (all populations) and *Meloidogyne fallax* Karssen are known not to occur; or (dd) in areas where *Meloidogyne chitwoodi* Golden et al. (all populations) and *Meloidogyne fallax* Karssen are known to occur, — either the tubers originate from a place of production which has been found free from *Meloidogyne chitwoodi* Golden et al. (all populations), and *Meloidogyne fallax* Karssen based on an annual survey of host crops by visual inspection of host plants at appropriate times and by visual inspection both externally and by cutting of tubers after harvest from potato crops grown at the place of production, or — the tubers after harvest have been randomly sampled and, either checked for the presence of symptoms after an appropriate method to induce symptoms, or laboratory tested, as well as inspected visually both externally and by cutting the tubers, at appropriate times and in all cases at the time of closing of the packages or containers before marketing according to the provisions on closing in Council Directive 66/403/EEC of 14 June 1996 on the marketing of seed potatoes (1) and no symptoms of *Meloidogyne chitwoodi* Golden et al. (all populations) and *Meloidogyne fallax* Karssen have been found

25.4.1.	Tubers of *Solanum tuberosum* L., other than those intended for planting	Without prejudice to the provisions applicable to tubers listed in Annex III(A) (12) and Annex IV(A)(I) (25.1), (25.2) and (25.3), official statement that the tubers originate in areas in which *Ralstonia solanacearum* (Smith) Yabuuchi et al. is not known to occur
25.4.2.	Tubers of *Solanum tuberosum* L.	Without prejudice to the provisions applicable to tubers listed in Annex III(A) (10), (11) and (12) and Annex IV(A)(I) (25.1), (25.2), (25.3), (25.4) and (25.4.1), official statement that: (a) the tubers originate in a country where *Scrobipalpopsis solanivora* Povolny is not known to occur; or (b) the tubers originate in an area free from *Scrobipalpopsis solanivora* Povolny, established by the national plant protection organisation in accordance with relevant International Standards for Phytosanitary Measures
25.5.	Plants of Solanaceae, intended for planting, other than seeds, originating in countries where Potato stolbur mycoplasm is known to occur	Without prejudice to the provisions applicable to tubers listed in Annex III(A) (10), (11), (12) and (13), and Annex IV(A)(I) (25.1), (25.2), (25.3) and (25.4), official statement that no symptoms of Potato stolbur mycoplasm have been observed on the plants at the place of production since the beginning of the last complete cycle of vegetation
Section II	**Plants, plant products and other objects originating in the Community**	
	Plants, plant products and other objects	**Special requirements**
18.1.	Tubers of *Solanum tuberosum* L., intended for planting	Official statement that: (a) the Union provisions to combat *Synchytrium endobioticum* (Schilbersky) Percival have been complied with; and (b) either the tubers originate in an area known to be free from *Clavibacter michiganensis* ssp. *sepedonicus* (Spieckermann and Kotthoff) Davis et al. or the Union provisions to combat *Clavibacter michiganensis* ssp. *sepedonicus* (Spieckermann and Kotthoff) Davis et al. have been complied with; and (d) (aa) either, the tubers originate in areas in which *Ralstonia solanacearum* (Smith) Yabuuchi et al. is known not to occur; or (bb) in areas where *Ralstonia solanacearum* (Smith) Yabuuchi et al. is known to occur, the tubers originate from a place of production found free from *Ralstonia solanacearum* (Smith) Yabuuchi et al., or considered to be free thereof, as a consequence of the implementation of an appropriate procedure aiming at eradicating *Ralstonia solanacearum* (Smith) Yabuuchi et al.; and (e) either, the tubers originate in areas in which *Meloidogyne chitwoodi* Golden et al. (all populations) and *Meloidogyne fallax* Karssen are known not to occur, or in areas where *Meloidogyne chitwoodi* Golden et al. (all populations) and *Meloidogyne fallax* Karssen are known to occur: — either, the tubers originate from a place of production which has been found free from *Meloidogyne chitwoodi* Golden et al. (all populations) and *Meloidogyne fallax* Karssen based on

		an annual survey of host crops by visual inspection of host plants at appropriate times and by visual inspection both externally and by cutting of tubers after harvest from potato crops grown at the place of production, or — the tubers after harvest have been randomly sampled and, either checked for the presence of symptoms after an appropriate method to induce symptoms or laboratory tested, as well as inspected visually both externally and by cutting the tubers, at appropriate times and in all cases at the time of closing of the packages or containers before marketing according to the provisions on closing in Council Directive 66/403/EEC, and no symptoms of *Meloidogyne chitwoodi* Golden et al. (all populations) and *Meloidogyne fallax* Karssen have been found
18.1.1.	Tubers of *Solanum tuberosum* L., intended for planting, other than those to be planted in accordance with Article 4.4(b) of Council Directive 2007/33/EC	Without prejudice to the requirements applicable to the tubers of *Solanum tuberosum* L., intended for planting in Annex IV, Part A, Section II (18.1), official statement that the Union provisions to combat *Globodera pallida* (Stone) Behrens and *Globodera rostochiensis* (Wollenweber) Behrens are complied with
18.2	Tubers of *Solanum tuberosum* L., intended for planting, other than tubers of those varieties officially accepted in one or more Member States pursuant to Council Directive 70/457/EEC of 29 September 1970 on the common catalogue of varieties of agricultural plant species (1)	Without prejudice to the special requirements applicable to the tubers listed in Annex IV(A)(II) (18.1), official statement that the tubers: — belong to advanced selections such a statement being indicated in an appropriate way on the document accompanying the relevant tubers, — have been produced within the Community, and — have been derived in direct line from material which has been maintained under appropriate conditions and has been subjected within the Community to official quarantine testing in accordance with appropriate methods and has been found, in these tests, free from harmful organisms
18.3	Plants of stolon or tuber-forming species of *Solanum* L., or their hybrids, intended for planting, other than those tubers of *Solanum tuberosum* L. specified in Annex IV(A)(II) (18.1) or (18.2), and other than culture maintenance material being stored in gene banks or genetic stock collections	(a) The plants shall have been held under quarantine conditions and shall have been found free of any harmful organisms in quarantine testing; (b) the quarantine testing referred to in (a) shall: (aa) be supervised by the official plant protection organisation of the Member State concerned and executed by scientifically trained staff of that organisation or of any officially approved body; (bb) be executed at a site provided with appropriate facilities sufficient to contain harmful organisms and maintain the material including indicator plants in such a way as to eliminate any risk of spreading harmful organisms; (cc) be executed on each unit of the material; – by visual examination at regular intervals during the full length of at least one vegetative cycle, having regard to the type of material and its stage of development during the testing programme, for symptoms caused by any harmful organisms, – by testing, in accordance with appropriate methods to be submitted to the Committee referred to in Article 18: – in the case of all potato material at least for:

		– Andean potato latent virus, – Arracacha virus B. oca strain, – Potato black ringspot virus, – Potato spindle tuber viroid, – Potato virus T, – Andean potato mottle virus, – common potato viruses A, M, S, V, X and Y (including Yo, Yn and Yc) and Potato leaf roll virus, – *Clavibacter michiganensis* ssp. *sepedonicus* (Spieckermann and Kotthoff) Davis et al., – *Ralstonia solanacearum* (Smith) Yabuuchi et al., – in the case of true seed potato of least for the viruses and viroid listed above; (dd) by appropriate testing on any other symptom observed in the visual examination in order to identify the harmful organisms having caused such symptoms; (c) any material, which has not been found free, under the testing specified under (b) from harmful organisms as specified under (b) shall be immediately destroyed or subjected to procedures which eliminate the harmful organism(s); (d) each organisation or research body holding this material shall inform their official Member State plant protection service of the material held
18.3.1.	Seeds of *Solanum tuberosum* L., other than those specified in point 18.4	Official statement that: The seeds derive from plants complying, as applicable, with the requirements set out in points 18.1., 18.1.1, 18.2 and 18.3; and (a) the seeds originate in areas known to be free from *Synchytrium endobioticum* (Schilbersky) Percival, *Clavibacter michiganensis* ssp. *sepedonicus* (Spieckermann and Kotthoff) Davis et al., *Ralstonia solanacearum* (Smith) Yabuuchi et al. and Potato spindle tuber viroid; or (b) the seeds comply with all of the following requirements: (i) they have been produced in a site where, since the beginning of the last cycle of vegetation, no symptoms of disease caused by the harmful organisms referred to in point (a) have been observed; (ii) they have been produced at a site where all of the following actions have been taken: separation of the site from other solanaceous plants and other host plants of Potato spindle tuber viroid; prevention of contact with staff and items, such as tools, machinery, vehicles, vessels and packaging material, from other sites producing solanaceous plants and other host plants of

		Potato spindle tuber viroid, or appropriate hygiene measures concerning staff or items from other sites producing solanaceous plants and other host plants of Potato spindle tuber viroid to prevent infection; only water free from all harmful organisms referred to in this point is used
18.4	Plants of stolon, or tuber-forming species of *Solanum* L., or their hybrids, intended for planting, being stored in gene banks or genetic stock collections	Each organisation or research body holding such material shall inform their official Member State plant protection service of the material held
18.5.	Tubers of *Solanum tuberosum* L., other than those mentioned in Annex IV(A)(II)(18.1), (18.1.1), (18.2), (18.3) or (18.4)	There shall be evidence by a registration number put on the packaging, or in the case of loose-loaded potatoes transported in bulk, on the vehicle transporting the potatoes, that the potatoes have been grown by an officially registered producer, or originate from officially registered collective storage or dispatching centres located in the area of production, indicating that the tubers are free from *Ralstonia solanacearum* (Smith) Yabuuchi et al. and that (a) the Union provisions to combat *Synchytrium endobioticum* (Schilbersky) Percival, and (b) where appropriate, the Union provisions to combat *Clavibacter michiganensis* ssp. *sepedonicus* (Spieckermann and Kotthoff) Davis et al., and (c) the Union provisions to combat *Globodera pallida* (Stone) Behrens and *Globodera rostochiensis* (Wollenweber) Behrens are complied with

Annex IV, Part B	**Special requirements which shall be laid down by all member states for the introduction and movement of plants, plant products and other objects into and within certain protected zones**		
	Plants, plant products and other objects	**Special requirements**	Protected zone(s)
20.1.	Tubers of *Solanum tuberosum* L., intended for planting	Without prejudice to the provisions applicable to the plants listed in Annex III(A) (10), (11), Annex IV(A)(I) (25.1), (25.2), (25.3), (25.4), (25.5), (25.6), Annex IV(A)(II) (18.1), (18.2), (18.3), (18.4), (18.6), official statement that the tubers: (a) were grown in an area where Beet necrotic yellow vein virus (BNYVV) is known not to occur; or (b) were grown on land, or in growing media consisting of soil that is known to be free from BNYVV, or officially tested by appropriate methods and found free from BNYVV; or (c) have been washed free from soil	F (Britanny), FI, IRL, P (Azores), UK (Northern Ireland)

20.2.	Tubers of *Solanum tuberosum* L., other than those mentioned in Annex IV(B) (20.1)	(a) The consignment or lot shall not contain more than 1% by weight of soil, or (b) the tubers are intended for processing at premises with officially approved waste disposal facilities which ensures that there is no risk of spreading BNYVV	F (Britanny), FI, IRL, P (Azores), UK (Northern Ireland)
Annex V	**Plants, plant products and other objects which must be subject to a plant health inspection (at the place of production if originating in the Community, before being moved within the Community—in the country of origin or the consignor country, if originating outside the Community) before being permitted to enter the Community**		
Part A	**Plants, plant products and other objects originating in the Community**		
Section I	**Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for the entire Community and which must be accompanied by a plant passport**		
1.3.	Plants of stolon- or tuber-forming species of *Solanum* L. or their hybrids, intended for planting		
Section II	**Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for certain protected zones and which must be accompanied by a plant passport valid for the appropriate zone when introduced into or moved within that zone** Without prejudice to the plants, plant products and other objects listed in Part I.		
1.5.	Tubers of *Solanum tuberosum* L., intended for planting.		
Part B	**Plants, plant products and other objects originating in territories, other than those territories referred to in Part A**		
Section I	**Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for the entire Community**		
4.	Tubers of *Solanum tuberosum* L.		

3.3.3. Legislation addressing the organisms that vector potato viruses (Directive 2000/29/EC)

From the list of organisms that are known to vector the non-EU viruses of potato (Table 14), the following ones are addressed in Directive 2000/29/EC:

- *Bemisia tabaci* Genn. is listed in Annex I, AI, position (a) 7, as well as in Annex I, B, position (a) 1
- *Bemisia tabaci* Genn. is also listed in Annex IV, AI:

45.1.	Plants of herbaceous species and plants of *Ficus* L. and *Hibiscus* L., intended for planting, other than bulbs, corms, rhizomes, seeds and tubers, originating in non-European countries	Without prejudice to the requirements applicable to the plants in Annex IV, Part A, Section I (27.1), (27.2), (28), (29), (32.1), (32.3) and (36.1), official statement that the plants: (a) originate in an area, established in the country of export by the national plant protection service in that country, as being free from *Bemisia tabaci* Genn. (non-European populations) in accordance with relevant International Standards for Phytosanitary Measures, and which is mentioned on the certificates referred to in Articles 7 or 8 of this Directive under the rubric 'Additional declaration', or (b) originate in a place of production, established in the country of export by the national plant protection service in that country, as being free from *Bemisia tabaci* Genn. (non-European populations) in accordance with relevant International Standards for Phytosanitary Measures, and which is mentioned on the certificates referred to in Articles 7 or 8 of this Directive under the rubric 'Additional declaration', and declared free from *Bemisia tabaci* Genn. (non-European populations) on official inspections carried out at least once each three weeks during the nine weeks prior to export, or (c) in cases where *Bemisia tabaci* Genn. (non-European populations) has been found at the place of production, are held or produced in this place of production and have undergone an appropriate treatment to ensure freedom from *Bemisia tabaci* Genn. (non-European populations) and subsequently this place of production shall have been found free from *Bemisia tabaci* Genn. (non- European populations) as a consequence of the implementation of appropriate procedures aiming at eradicating *Bemisia tabaci* Genn. (non-European populations), in both official inspections carried out weekly during the nine weeks prior to export and in monitoring procedures throughout the said period. Details of the treatment shall be mentioned on the certificates referred to in Article 7 or 8 of this Directive, or (d) originate from plant material (explant) which is free from *Bemisia tabaci* Genn. (non-European populations); are grown *in vitro* in a sterile medium under sterile conditions that preclude the possibility of infestation with *Bemisia tabaci* Genn. (non-European populations); and are shipped in transparent containers under sterile conditions
45.2.	Cut flowers of *Aster* spp., *Eryngium* L., *Gypsophila* L., *Hypericum* L., *Lisianthus* L., *Rosa* L., *Solidago* L., *Trachelium* L., and leafy vegetables of *Ocimum* L., originating in non-European countries	Official statement that the cut flowers and leafy vegetables: — originate in a country free from *Bemisia tabaci* Genn. (non-European populations), or — immediately prior to their export, have been officially inspected and found free from *Bemisia tabaci* Genn. (non-European populations)

45.3	Plants of Solanum lycopersicum L. intended for planting, other than seeds, originating in countries where Tomato yellow leaf curl virus is known to occur	Without prejudice to the requirements applicable to plants listed in Annex III(A)(13) and Annex IV(A)(I)(25.5), (25.6) and 25.7 where appropriate
	(a) Where Bemisia tabaci Genn. is not known to occur	Official statement that no symptoms of Tomato yellow leaf curl virus have been observed on the plants
	(b) Where Bemisia tabaci Genn. is known to occur	Official statement that: (a) no symptoms of Tomato yellow leaf curl virus have been observed on the plants, and (aa) the plants originate in areas known to be free from *Bemisia tabaci* Genn., or (bb) the place of production has been found free from *Bemisia tabaci* Genn. on official inspections carried out at least monthly during the three months prior to export; or (b) no symptoms of Tomato yellow leaf curl virus have been observed on the place of production and the place of production has been subjected to an appropriate treatment and monitoring regime to ensure freedom from *Bemisia tabaci* Genn.
46.	Plants intended for planting, other than seeds, bulbs, tubers, corms and rhizomes, originating in countries where the relevant harmful organisms are known to occur. The relevant harmful organisms are: — Bean golden mosaic virus, — Cowpea mild mottle virus, — Lettuce infectious yellow virus, — Pepper mild tigré virus, — Squash leaf curl virus, — other viruses transmitted by *Bemisia tabaci* Genn.	Without prejudice to the requirements applicable to the plants listed in Annex III(A)(13) and Annex IV(A)(I)(25.5) (25.6), (32.1), (32.2), (32.3), (35.1), (35.2), (44), (45.1), (45.2) and (45.3) where appropriate
	(a) Where *Bemisia tabaci* Genn. (non-European populations) or other vectors of the relevant harmful organisms are not known to occur	Official statement that no symptoms of the relevant harmful organisms have been observed on the plants during their complete cycle of vegetation
	(b) Where *Bemisia tabaci* Genn. (non-European populations) or other vectors of the relevant harmful organisms are known to occur	Official statement that no symptoms of the relevant harmful organisms have been observed on the plants during an adequate period, and (a) the plants originate in areas known to be free from *Bemisia tabaci* Genn. and other vectors of the relevant harmful organisms; or (b) the place of production has been found free from *Bemisia tabaci* Genn. and other vectors of the relevant harmful organisms on official inspections carried out at appropriate times; or (c) the plants have been subjected to an appropriate treatment aimed at eradicating *Bemisia tabaci* Genn; or

		(d) the plants originate from plant material (explant) which is free from *Bemisia tabaci* Genn. (non-European populations) and which did not show any symptoms of the relevant harmful organisms; are grown *in vitro* in a sterile medium under sterile conditions that preclude the possibility of infestation with *Bemisia tabaci* Genn. (non-European populations); and are shipped in transparent containers under sterile conditions.

- *Bemisia tabaci* Genn. is also listed in Annex IV, AII:

26.1.	Plants of *Solanum lycopersicum* L., intended for planting, other than seeds	Without prejudice to the requirements applicable to the plants, where appropriate, listed in Annex IV(a)(II) (18.6) and (23) official statement that: (a) the plants originate in areas known to be free from Tomato yellow leaf curl virus; or (b) no symptoms of Tomato yellow leaf curl virus have been observed on the plants; and (aa) the plants originate in areas known to be free from *Bemisia tabaci* Genn; or (bb) the place of production has been found free from *Bemisia tabaci* Genn. on official inspections carried out at least monthly during the three months prior to export; or (c) no symptoms of Tomato yellow leaf curl virus have been observed on the place of production and the place of production has been subjected to an appropriate treatment and monitoring regime to ensure freedom from *Bemisia tabaci* Genn.

- *Bemisia tabaci* Genn. is also listed in Annex IV, B:

	Plants, plant products and other objects	Special requirements	Protected zone(s)
24.1.	Unrooted cuttings of *Euphorbia pulcherrima* Willd., intended for planting	Without prejudice to the requirements applicable to the plants listed in Annex IV(A)(I) (45.1), where appropriate, official statement that: (a) the unrooted cuttings originate in an area known to be free from *Bemisia tabaci* Genn. (European populations), or (b) no signs of *Bemisia tabaci* Genn. (European populations) have been observed either on the cuttings or on the plants from which the cuttings are derived and held or produced at the place of production on official inspections carried out at least each three weeks during the whole production period of these plants on this place of production, or (c) in cases where *Bemisia tabaci* Genn. (European populations) has been found at the place of production, the cuttings and the plants from which the cuttings are derived and held or produced in this place of production have undergone an appropriate treatment to ensure freedom from *Bemisia tabaci* Genn. (European populations) and subsequently this place of production shall have been found free from *Bemisia tabaci* Genn. (European populations) as a consequence of the	IRL, P (Azores, Beira Interior, Beira Litoral, Entre Douro e Minho and Trás-os-Montes), UK, S, FI

		implementation of appropriate procedures aiming at eradicating *Bemisia tabaci* Genn. (European populations), in both official inspections carried out weekly during the three weeks prior to the movement from this place of production and in monitoring procedures throughout the said period. The last inspection of the above weekly inspections shall be carried out immediately prior to the above movement.	
24.2.	Plants of *Euphorbia pulcherrima* Willd., intended for planting, other than: — seeds, — those for which there shall be evidence by their packing or their flower (or bract) development or by other means that they are intended for sale to final consumers not involved in professional plant production, — those specified in 24.1	Without prejudice to the requirements applicable to the plants listed in Annex IV(A)(I)(45.1), where appropriate official statement that: (a) the plants originate in an area known to be free from *Bemisia tabaci* Genn. (European populations), or (b) no signs of *Bemisia tabaci* Genn. (European populations) have been observed on plants at the place of production on official inspections carried out at least once each three weeks during the nine weeks prior to marketing, or (c) in cases where *Bemisia tabaci* Genn. (European populations) has been found at the place of production, the plants, held or produced in this place of production have undergone an appropriate treatment to ensure freedom from *Bemisia tabaci* Genn. (European populations) and subsequently this place of production shall have been found free from *Bemisia tabaci* Genn. (European populations) as a consequence of the implementation of appropriate procedures aiming at eradicating *Bemisia tabaci* Genn. (European populations), in both official inspections carried out weekly during the three weeks prior to the movement from this place of production and in monitoring procedures throughout the said period. The last inspection of the above weekly inspections shall be carried out immediately prior to the above movement, and (d) evidence is available that the plants have been produced from cuttings which: (da) originate in an area known to be free from *Bemisia tabaci* Genn. (European populations), or (db) have been grown at a place of production where no signs of *Bemisia tabaci* Genn. (European populations) have been observed on official inspections carried out at least once each three weeks during the whole production period of these plants, or (dc) in cases where *Bemisia tabaci* Genn. (European populations) has been found at the place of production, have been grown on plants held or produced in this place of production having undergone an appropriate treatment to ensure freedom from *Bemisia tabaci* Genn. (European populations) and subsequently this place of production shall have been found free from *Bemisia tabaci* Genn. (European populations) as a consequence of the implementation of appropriate procedures aiming	IRL, P (Azores, Beira Interior, Beira Litoral, Entre Douro e Minho and Trás-os-Montes), UK, S, FI

		at eradicating *Bemisia tabaci* Genn. (European populations), in both official inspections carried out weekly during the three weeks prior to the movement from this place of production and in monitoring procedures throughout the said period. The last inspection of the above weekly inspections shall be carried out immediately prior to the above movement	
24.3.	Plants of *Begonia* L., intended for planting, other than seeds, tubers and corms, and plants of *Dipladenia* A.DC., *Ficus* L., *Hibiscus* L., *Mandevilla* Lindl. and *Nerium oleander* L., intended for planting, other than seeds	Without prejudice to the requirements applicable to the plants listed in Annex IV(A)(I)(45.1), where appropriate, official statement that: (a) the plants originate in an area known to be free from *Bemisia tabaci* Genn. (European populations), or (b) no signs of *Bemisia tabaci* Genn. (European populations) have been observed on plants at the place of production on official inspections carried out at least once each three weeks during the nine weeks prior to marketing, or (c) in cases where *Bemisia tabaci* Genn. (European populations) has been found at the place of production, the plants, held or produced in this place of production have undergone an appropriate treatment to ensure freedom from *Bemisia tabaci* Genn. (European populations) and subsequently this place of production shall have been found free from *Bemisia tabaci* Genn. (European populations) as a consequence of the implementation of appropriate procedures aiming at eradicating *Bemisia tabaci* Genn. (European populations), in both official inspections carried out weekly during the three weeks prior to the movement from this place of production and in monitoring procedures throughout the said period, or (d) for those plants for which there shall be evidence by their packing or their flower development or by other means that they are intended for direct sale to final consumers not involved in professional plant production, the plants have been officially inspected and found free from *Bemisia tabaci* Genn. (European populations) immediately prior to their movement.	IRL, P (Azores, Beira Interior, Beira Litoral, Entre Douro e Minho and Trás-os-Montes), UK, S, FI

- *Circulifer tenellus* is listed in Annex II, AII, position (a) 6
- *Scirtothrips dorsalis* Hood is listed in Annex II, AI, position (a) 26
- *Thrips palmi* Karny is listed in Annex IAI, position (a) 24
- *Thrips palmi* Karny is also listed in Annex IV, AI:

36.1.	Plants, intended for planting, other than: — bulbs, — corms, — rhizomes, — seeds, — tubers, originating in third countries	Without prejudice to the requirements applicable to the plants in Annex IV, Part A, Section I (27.1), (27.2), (28), (29), (31), (32.1) and (32.3), official statement that the plants have been grown in nurseries and: (a) originate in an area, established in the country of export by the national plant protection service in that country, as being free from *Thrips palmi* Karny in accordance with relevant International Standards for Phytosanitary Measures, and which is mentioned on the certificates referred to in Articles 7 or 8 of this Directive under the rubric 'Additional declaration', or

		(b) originate in a place of production, established in the country of export by the national plant protection service in that country, as being free from *Thrips palmi* Karny in accordance with relevant International Standards for Phytosanitary Measures, and which is mentioned on the certificates referred to in Articles 7 or 8 of this Directive under the rubric 'Additional declaration', and declared free from *Thrips palmi* Karny on official inspections carried out at least monthly during the three months prior to export, or (c) immediately prior to export, have been subjected to an appropriate treatment against *Thrips palmi* Karny and have been officially inspected and found free from *Thrips palmi* Karny. Details of the treatment shall be mentioned on the certificates referred to in Article 7 or 8 of this Directive, or (d) originate from plant material (explant) which is free from *Thrips palmi* Karny; are grown *in vitro* in a sterile medium under sterile conditions that preclude the possibility of infestation with *Thrips palmi* Karny; and are shipped in transparent containers under sterile conditions
36.2.	Cut flowers of Orchidaceae and fruits of *Momordica* L. and *Solanum melongena* L., originating in third countries	Official statement that the cut flowers and the fruits: — originate in a country free from *Thrips palmi* Karny, or — immediately prior to their export, have been officially inspected and found free from *Thrips palmi* Karny

- *Xiphinema americanum* Cobb sensu lato (non-European populations) is listed in Annex I, A1, position (a) 26
- *Xiphinema americanum* Cobb sensu lato (non-European populations) is also listed in Annex IV, AI:

31.	Plants of *Pelargonium* L'Herit. ex Ait., intended for planting, other than seeds, originating in countries where Tomato ringspot virus is known to occur:	Without prejudice to the requirements applicable to the plants listed in Annex IV(A)(I)(27.1 and) (27.2),
	(a) where *Xiphinema americanum* Cobb *sensu lato* (non- European populations) or other vectors of Tomato ringspot virus are not known to occur	official statement that the plants: (a) are directly derived from places of production known to be free from Tomato ringspot virus; or (b) are of no more than fourth generation stock, derived from mother plants found to be free from Tomato ringspot virus under an official approved system of virological testing.
	(b) where *Xiphinema americanum* Cobb *sensu lato* (non- European populations) or other vectors of Tomato ringspot virus are known to occur	official statement that the plants: (a) are directly derived from places of production known to be free from Tomato ringspot virus in the soil or plants; or (b) are of no more than second generation stock, derived from mother plants found to be free from Tomato ringspot virus under an officially approved system of virological testing

3.4. Entry, establishment and spread in the EU

3.4.1. Host range

Table 10 reports for the categorised viruses on the uncertainties regarding potato as a natural host, on the existence of other natural hosts, including the associated uncertainties, and regulation. Potato as a natural host is associated with uncertainties for ChiLCV, CPSbV, CYSDV, PapMV, RCVMV, SB26/29, SB41 and ToMoTV since they have been reported once on potato. Additionally, potato as a natural

host for both PaLCrV and ToMHaV is also associated with uncertainties since they have been reported only in the NCBI GenBank database, without associated publications in peer-reviewed journals. The natural host range that is reported varies from no other hosts reported to many non-potato hosts. For all viruses, but in particular for poorly characterised viruses or recently discovered and in the case of latent infections, the existence of additional natural hosts cannot be excluded.

Table 10: Natural hosts of the categorised viruses. Data regarding natural hosts were retrieved from the EPPO global database and CABI crop protection compendium (CABI cpc) up to 30-4-2019 and if different source used specified in the table

Genus, Acronym	Uncertainty on potato as host	Other hosts[(1)]	Uncertainty on other hosts	Regulation addressing other host plants
Begomovirus				
ChiLCV	One report in potato (Mubin et al., 2009) and one NCBI GenBank accession from potato (FM179613)	**Literature:** *Capsicum annuum, Petunia x hybrida, Solanum lycopersicum* (Al-Shihi et al., 2014)	Narrow host range reported, additional natural hosts may exist	***Capsicum* sp.:** IVAI 16.6, 25.7, 36.3, IVAII 18.6.1, 18.7; VBI 1,3. ***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4. ***Solanaceae***: IIIA 13
PaLCrV	Reported only in one GenBank accession (KY216071)	**Literature:** *Andrographis paniculata, Carica papaya, Glycine max, Solanum nigrum* (Jaidi et al., 2015)	Narrow host range reported, additional natural hosts may exist	***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4.
PYMV	Rare on potato (Geraud-Pouey et al., 2016)	**Literature:** *Solanum americanum, Solanum lycopersicum, Solanum pimpinellifolium* (Romay et al., 2016)	Narrow host range reported, additional natural hosts may exist	***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4.
ToLCNDV	No uncertainty	**EPPO global database:** Major: *Benincasa hispida, Capsicum annuum, Capsicum frutescens, Citrullus lanatus, Cucumis melo, Cucumis sativus, Cucurbita moschata, Cucurbita pepo, Lagenaria siceraria, Luffa cylindrica, Momordica charantia, Solanum lycopersicum* Minor: *Glycine max, Gossypium hirsutum, Solanum melongena*	ToLCNDV has a wide natural host range; it is unlikely that all natural hosts have been identified	***Capsicum* sp.:** IVAI 16.6, 25.7, 36.3, IVAII 18.6.1, 18.7; VBI 1,3. ***Cucumis* sp.:** VAI 2.1. ***Momordica* sp.:** IVAI 36.2; VBI 3. ***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4.

Genus, Acronym	Uncertainty on potato as host	Other hosts[(1)]	Uncertainty on other hosts	Regulation addressing other host plants
		Incidental: *Carica papaya, Hibiscus cannabinus, Papaver somniferum* Wild/weed: *Calotropis procera, Eclipta prostrata* **CABI cpc:** *Daucus carota*		***Gossypium* sp.:** IVB 28, 28.1; VAII 1.8, 1.9; VBII 6. ***Hibiscus* sp.:** IVAI 45.1; IVB 24.3; VAII 2.1. ***Daucus* sp.:** IVB 22.
ToMHaV	Reported only in five GenBank accessions (HE820051, HE820052, HE820053, HE820054, HE820055)	**CABI cpc:** *Solanum lycopersicum*	Narrow host range reported, only *Nicotiana benthamiana* reported as experimental host (Monger et al., 2008). Additional natural host may exist	***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4.
ToMoTV	Reported only once in potato (Cordero et al., 2003)	**EPPO global database:** Major: *Solanum lycopersicum* **Literature:** *Nicotiana*	Narrow host range reported, additional natural hosts may exist	***Nicotiana* sp.:** IVAI 25.7; IVAII 18.7. ***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4.
ToSRV	No uncertainty	**CABI cpc:** *Glycine max* **Literature:** *Capsicum annuum, Nicandra physaloides, Phaseolus vulgaris, Solanum lycopersicum, Solanum melongena* (Barbosa et al., 2009; Macedo et al., 2017; Moura et al., 2018)	Narrow host range reported, additional natural hosts may exist	***Capsicum* sp.:** IVAI 16.6, 25.7, 36.3, IVAII 18.6.1, 18.7; VBI 1,3. ***Phaseolus* sp.:** IVAI 51; IVAII 29; VAI 2.4; VAII 1.8; VBI 1; VBII 5. ***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4. ***Solanaceae***: IIIA 13

Genus, Acronym	Uncertainty on potato as host	Other hosts[(1)]	Uncertainty on other hosts	Regulation addressing other host plants
ToYVSV	No uncertainty	**EPPO global database:** Major: *Solanum lycopersicum* **Literature:** Phaseolus vulgaris (Morales and Anderson, 2001)	Narrow host range reported, additional natural hosts may exist	***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4. ***Phaseolus* sp.:** IVAI 51; IVAII 29; VAI 2.4; VAII 1.8; VBI 1; VBII 5.
Carlavirus				
PotLV	No uncertainty	No other hosts reported	Experimental hosts in different botanical families (Brattey et al., 2002). Additional natural hosts may exist	–
PVH	No uncertainty	**Literature:** *Solanum muricatum* (Abouelnasr et al., 2014)	Additional experimental Solanaceous hosts are reported (Li et al., 2013). Additional natural hosts may exist	***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4.
PVP	No uncertainty	No other hosts reported	Experimental hosts in different botanical families are reported (Jeffries, 1998; Massa et al., 2006). Additional natural hosts may exist.	–
RCVMV	Reported only once in potato, based on only one identification technique (DAS-ELISA) (Al-Shahwan et al., 2017)	**CABI cpc:** *Cicer arietinum, Medicago sativa, Phaseolus vulgaris, Pisum sativum, Trifolium pratense, Trifolium repens* **Literature:** *Lathyrus odoratus, Lens culinaris, Vicia faba* (Freeman, 2008)	Mainly reported in legumes. Additional natural hosts may exist	***Medicago sativa* L.:** IVAI 49.1, 49.2; IVAII 28.1, 28.2; VAI 2.4; VBI 1. ***Phaseolus* sp.:** IVAI 51; IVAII 29; VAI 2.4; VAII 1.8; VBI 1; VBII 5. ***Trifolium* sp.:** VBI 1.

Genus, Acronym	Uncertainty on potato as host	Other hosts[(1)]	Uncertainty on other hosts	Regulation addressing other host plants
Cheravirus				
AVB	No uncertainty	**EPPO global database (AVB-oca strain):** Minor: *Oxalis tuberosa, Solanum* **CABI cpc**: *Arracacia xanthorrhiza*	EPPO lists hosts for the oca strain of AVB, whereas CABI lists hosts for AVB. Experimental hosts in different botanical families are reported (Jones and Kenten, 1983). Additional natural hosts may exist.	***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4.
Comovirus				
APMoV	No uncertainty	**EPPO global database:** Minor: *Capsicum frutescens, Solanum aethiopicum, Solanum melongena, Solanum sisymbriifolium* **CABI cpc:** *Capsicum annuum, Capsicum chinense, Datura stramonium, Nicandra physalodes, Nicotiana rustica*	Narrow host range, only *Solanaceous* hosts reported. Additional natural hosts may exist.	***Capsicum* sp.:** IVAI 16.6, 25.7, 36.3, IVAII 18.6.1, 18.7; VBI 1,3. ***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4. ***Nicotiana* sp.:** IVAI 25.7; IVAII 18.7. ***Solanaceae***: IIIA 13
Crinivirus				
CYSDV	Reported only once in potato (Orfanidou et al., 2019)	**EPPO global database:** Major: *Citrullus lanatus, Cucumis melo, Cucumis sativus, Cucurbita pepo* Minor: *Cucurbitaceae* Incidental: *Lactuca sativa, Medicago sativa, Phaseolus vulgaris,* Wild/weed: *Amaranthus retroflexus, Bassia hyssopifolia, Chenopodium album, Malva neglecta, Malva parviflora, Malvella leprosa, Physalis acutifolia, Sisymbrium irio, Solanum elaeagnifolium, Sonchus* sp. **CABI cpc:** *Amaranthus blitum, Cucurbita moschata*	CYSDV has a wide natural host range; it is unlikely that all natural hosts have been identified.	***Cucumis* sp.:** VAI 2.1. ***Lactuca* sp.:** VAI 2.1. ***Medicago sativa* L.:** IVAI 49.1, 49.2; IVAII 28.1, 28.2; VAI 2.4; VBI 1. ***Phaseolus* sp.:** IVAI 51; IVAII 29; VAI 2.4; VAII 1.8; VBI 1; VBII 5. ***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4.

Genus, Acronym	Uncertainty on potato as host	Other hosts[(1)]	Uncertainty on other hosts	Regulation addressing other host plants
PYVV	No uncertainty	**EPPO global database:** Minor: *Solanum* **Literature:** *Solanum lycopersicum* (Muñoz Baena et al., 2017)	Narrow host range reported (Jeffries, 1998). Additional natural hosts may exist	***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4.
ToCV	No uncertainty	**EPPO global database:** Major: *Solanum lycopersicum* Minor: *Physalis peruviana, Physalis philadelphica, Solanum aethiopicum, Solanum melongena, Vigna unguiculata* Incidental: *Capsicum annuum, Cucurbita moschata, Nicotiana tabacum, Zinnia* Wild/weed: *Cardamine flexuosa, Cerastium glomeratum, Chenopodium album, Datura stramonium, Erigeron annuus, Erigeron canadensis, Ipomoea coccinea, Ipomoea hederacea, Mazus pumilus, Physalis angulata, Phytolacca americana, Phytolacca icosandra, Plantago major, Ruta chalepensis, Solanum americanum, Solanum nigrum, Solanum sisymbriifolium. Sonchus asper. Stellaria media, Trigonotis peduncularis, Vicia sativa subsp. Nigra, Vicia tetrasperma, Youngia japonica* **CABI cpc:** *Brassica, Eruca vesicaria, Nicotiana tabacum, Raphanus*	ToCV has a wide natural host range; it is unlikely that all natural hosts have been identified.	***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4. ***Capsicum* sp.:** IVAI 16.6, 25.7, 36.3, IVAII 18.6.1, 18.7; VBI 1,3. ***Brassica* sp.:** IVAII 24.1; IVB 22; VAI 2.1. ***Nicotiana* sp.:** IVAI 25.7; IVAII 18.7. ***Solanaceae***: IIIA 13

Genus, Acronym	Uncertainty on potato as host	Other hosts[1]	Uncertainty on other hosts	Regulation addressing other host plants
Ilarvirus				
PYV	No uncertainty	**EPPO global database:** Minor: *Capsicum annuum, Solanum phureja* Wild/weed: *Solanum*	Narrow host range reported (Jeffries, 1998). Additional natural hosts may exist	***Capsicum* sp.:** IVAI 16.6, 25.7, 36.3, IVAII 18.6.1, 18.7; VBI 1,3. ***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4.
Nepovirus				
PBRSV	No uncertainty	**EPPO global database:** Minor: *Solanum* Incidental: *Arracacia xanthorrhiza,* Artificial: *Amaranthaceae* **CABI cpc:** *Oxalis tuberosa*	Experimental hosts in different botanical families (Salazar and Harrison, 1978a; Jeffries, 1998). Additional natural hosts may exist	***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4.
PVB	No uncertainty	No other host reported	Recently described virus, additional natural hosts may exist	–
PVU	Isolated once from potato and experimental transmission proved difficult, suggesting it might predominantly infect potato roots or that potato is only a minor host (Jones et al., 1983; Jeffries, 1998; Adams et al., 2018a)	No other host reported	Experimental hosts in different botanical families (Jeffries, 1998). Additional natural hosts may exist	–

Genus, Acronym	Uncertainty on potato as host	Other hosts[(1)]	Uncertainty on other hosts	Regulation addressing other host plants
Nucleorhabdovirus				
PYDV	No uncertainty	**EPPO global database:** Incidental: *Mirabilis jalapa, Nicotiana alata, Tagetes erecta, Zinnia elegans* Wild/weed: *Solanaceae, Solanum*	Experimental hosts in different botanical families (Black, 1970). Additional natural hosts may exist.	***Nicotiana* sp.:** IVAI 25.7; IVAII 18.7. ***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4.
Pomovirus				
CPSbV	Reported once based on a baiting experiment using soil from potato fields (Gil et al., 2016).	**Literature:** *Nicotiana benthamiana* reported as host in the same baiting experiment	Poorly described virus, additional hosts may exist	***Nicotiana* sp.:** IVAI 25.7; IVAII 18.7.
Potexvirus				
PapMV	Reported only once in potato (Salazar, 2006)	**EPPO global database:** Major: *Carica papaya* Unclassified: *Persea americana, Ullucus tuberosus*	PapMV in *Ullucus tuberosus* was reported to be distinct from other PapMV isolates (Fox et al., 2019); therefore, *U. tuberosus* might not be a natural host. Narrow host range reported, additional natural hosts may exist	***Persea* sp.:** IVAI 18; IVAII 11; VAI 2.3
PAMV	No uncertainty	**Literature:** *Cyphomandra betacea* (Mossop, 1982), *Solanum jasminoides*(Fox et al., 2016), *Trifolium incarnatum, Trifolium subterraneum* (Jeffries, 1998)	Experimental hosts in different botanical families (Bokx de, 1975; Jeffries, 1998). Additional natural hosts may exist.	***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4. ***Trifolium* sp.:** VBI 1. ***Solanaceae***: IIIA 13

Genus, Acronym	Uncertainty on potato as host	Other hosts[1]	Uncertainty on other hosts	Regulation addressing other host plants
Potyvirus				
TVBMV	One report in potato (Geng et al., 2014) and one NCBI GenBank accession from potato (DQ917752)	**Literature:** *Datura stramonium* (Roggero et al., 2000), *Nicotiana tabacum* (Reddick et al., 1992; Habera et al., 1994), *Sesamum indicum* (Wang et al., 2017), *Solanum torvum* (Zhou et al., 2014)	Narrow host range reported, additional natural hosts may exist	***Nicotiana* sp.:** IVAI 25.7; IVAII 18.7. ***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4. ***Solanaceae***: IIIA 13
WPMV	No uncertainty	**Literature:** *Solanum lycopersicum, Solanum muricatum* (Jeffries, 1998; Fribourg et al., 2019)	Narrow host range reported, additional natural hosts may exist	***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4.
Tepovirus				
PVT	No uncertainty	**EPPO global database:** Wild/weed: *Solanum* **CABI cpc:** *Oxalis tuberosa, Ullucus tuberosus* **Literature:** *Tropaeolum tuberosum* (Lizárraga et al., 2000)	Experimental hosts in different botanical families (Salazar and Harrison, 1978c). Additional natural hosts may exist	***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4.
Tymovirus				
APLV	No uncertainty	**EPPO global database:** Minor: *Solanum* **CABI cpc:** *Ullucus tuberosus*	*Ullucus tuberosus* is reported as host, however, later APLV in *U. tuberosus* was reported to be distinct from APLV in potato (Fox et al., 2019). Narrow host range reported. Additional natural hosts may exist	***Solanum* sp.:** IIIA 10,11,12; IVAI 25.1, 25.2, 25.3, 25.4, 25.4.1, 25.4.2, 25.5, 25.6, 25.7, 25.7.1, 25.7.2, 28.1, 36.2, 45.3, 48; IVAII 18.1, 18.1.1, 18.2, 18.3, 18.3.1, 18.4, 18.5, 18.6, 18.6.1, 18.7, 26.1, 27; IVBI 20.1, 20.2; VAI 1.3, 2.4; VAII 1.5; VBI 1, 3, 4.
APMMV	No uncertainty	See APLV	Formerly considered as isolate of APLV. Additional natural hosts may exist	

Genus, Acronym	Uncertainty on potato as host	Other hosts(1)	Uncertainty on other hosts	Regulation addressing other host plants
Unassigned				
SALCV	No uncertainty	No other host reported	Poorly described virus, additional hosts may exist.	
SB26/29	Reported only once in potato (Tenorio et al., 2003)	No other host reported	One report, including two experimental Solanaceous hosts. Additional hosts may exist	
SB41	Reported only once in potato (Salazar, 2006)	No other host reported	Poorly described virus, additional hosts may exist	

(1): Hosts listed in EPPO global database and only additional hosts from CABI cpc are reported. In case limited or no data were retrieved from these databases, additional hosts from literature are reported. Therefore, natural host data are not necessary exhaustive.

3.4.2. Entry

Are the pests able to enter into the EU territory? (Yes or No) If yes, identify and list the pathways.

Yes. All categorised viruses may enter the EU territory via plants for planting, i.e. seed potatoes (tubers), microplants, true potato seeds and/or potato pollen. Additional pathways include ware potatoes (i.e. tubers intended for consumption or processing), plants for planting of other hosts, and/or viruliferous vectors.

For entry of the categorised viruses into the EU, the following pathways can be considered: potato plants for planting (seed potatoes, microplants, true potato seeds and potato pollen), ware potatoes (tubers intended for consumption or processing), plants for planting of other natural hosts (including seeds and pollen) and viruliferous vectors. Table 11 reports the major potential entry pathways of the categorised viruses.

All categorised viruses are transmitted by vegetative propagation and therefore seed potatoes and more generally, plants for planting, are considered the most important pathway for entry. The potential pathways for entry via seed potatoes of *Solanum tuberosum* and plants for planting of other tuber-forming *Solanum* species and their hybrids is addressed by the current EU legislation (Table 8; (EU) 2000/29 Annex IIIA, 10 and 11), which sets that import is not allowed from third countries except Switzerland. However, import of seed potatoes from Canada into Greece, Spain, Italy, Cyprus, Malta and Portugal is allowed by a derogation (2011/778/EU, 2014/368/EU, document C (2014) 3878). None of the categorised viruses are present in Switzerland. PotLV and RCVMV are reported from Canada. Taken together, the pathway for entry via plants for planting is considered closed by legislation for the categorised viruses except for PotLV and RCVMV which may enter via seed potatoes from Canada. Since this pathway is only open for these specific imports, it is not further addressed in Table 11.

Entry of ware potatoes is regulated by the current EU legislation (Table 8, Annex IIIA, 12). Import of ware potatoes is prohibited from third countries other than Algeria, Egypt, Israel, Libya, Morocco, Syria, Switzerland, Tunisia and Turkey and European non-EU countries which are not free from *Clavibacter michiganensis* spp. *sepedonicus* or in which provisions on combating *Clavibacter michiganensis* spp. *sepedonicus* are not deemed equivalent to those applied in the EU. The latter exemption currently applies to Serbia and Bosnia-Herzegovina. Should the categorised viruses be present in those countries, they could in principle enter the EU via the ware potato pathway as there are no specific measures in place that mitigate the risk of entry of the categorised viruses. Some of the categorised viruses are reported to be present in these specified countries (Table 6). The panel notes that as long as ware potatoes are used for their intended use (consumption or processing) the ability of the categorised viruses to establish is likely very low. In addition, there are specific measures in place (Annex IV 25.3) for countries where potato spindle tuber viroid is known to occur (according to EPPO: Egypt, Israel and Turkey) aimed at mitigating the risk of establishment by a request for treatments suppressing the faculty of germination of ware potatoes, other than early potatoes, from these countries. In conclusion, the ware potato pathway is considered closed for the following categorised viruses: APLV, APMMV, APMoV, AVB, ChiLCV, CPSbV, PaLCrV, PapMV, PAMV, PBRSV, PotLV, PVB, PVH, PVP, PVT, PVU, PYDV, PYMV, PYVV, PYV, RCVMV, SB26/29, SB41, SALCV, TVBMV, ToMHaV, ToMoTV, ToSRV, ToYVSV and WPMV. The ware potato pathway is partially regulated for some of the categorised viruses: CYSDV (Egypt, Israel, Morocco, Syria, Tunisia, Turkey), ToCV (Israel, Morocco, Tunisia, Turkey) and ToLCNDV (Morroco, Tunisia).

For most of the categorised viruses, other natural hosts are reported. Plants for planting of these other hosts provide additional entry pathways, unless these hosts are regulated and/or banned. Other natural hosts and the associated regulation are listed in Table 10 and possible pathways of entry evaluated in Table 11. The pathway of entry can be considered as closed only when import of these additional hosts is fully prohibited from countries where the virus is present, or when the import of all plant stages that could carry the viruses is prohibited, which does not apply to any of the categorised viruses. The entry pathway of plants for planting of other hosts for PVH, PYMV, PYVV, ToMHaV, ToMoTV and ToYVSV is regulated (regulations exist that limit the probability of entry along the pathway), but there is not a complete ban on imports. For the remaining categorised viruses, the pathway of entry via plants for planting of other hosts is possibly open because they have or could have unregulated natural hosts.

Viruliferous vectors are a pathway of entry for those categorised viruses that have insect, fungal or nematode vectors (Table 4). Several of the categorised viruses can be transmitted by insect species

(Tables 4 and 14) of which only some are currently regulated as EU-quarantine pests (*Bemisia tabaci*, *Circulifer tenellus, Scirtothrips dorsalis*, *Thrips palmi* and several *Epitrix* species). Furthermore, some of the categorised viruses are possibly transmitted by soil-borne vectors; AVB, PBRSV, PVB and PVU possibly by nematodes and CPSbV possibly by *Spongospora subterranea*. For these viruses, soil and/or growing media from areas where the vectors occur may constitute a pathway for entry. This pathway is closed by the current legislation (Annex IIIA 14 of EU Directive 2000/29/EC). However, according to a previous EFSA pest categorisation of *Xiphinema americanum* sensu lato (EFSA, 2018b), *Soil and growing media attached to plants (hosts or non-host plants) from areas where the nematode occurs* is a major entry pathway for nematodes vectoring viruses. *This pathway is not closed as plants may be imported with soil or growing media attached to sustain their live* (EFSA PLH Panel, 2018b). In the same opinion, *'soil and growing media attached to (agricultural) machinery, tools, packaging materials'* has been identified as an entry pathway, but it *'is not considered an important pathway'* (EFSA PLH Panel, 2018b). Taken together, vectors of the categorised viruses are not all regulated and, therefore, their importance as a pathway of entry is evaluated in Table 11. For PapMV, PAMV, PotLV, PYDV, PYV, PYVV, RCVMV, SB26/29 and WPMV, the pathway is open since the vectors are not regulated. The pathway of viruliferous vectors of AVB, APLV, APMMV, APMoV, CPSbV, PBRSV, PVB, PVH, PVP, PVU and TVBMV is possibly open, because the existence of the pathway cannot be excluded based on comparisons with the biology of closely related viruses (in the same genus or family), and no legislation addresses this potential pathway.

Table 11: Identified major pathways for potential entry of the categorised viruses and the extent to which these pathways are addressed by current legislation[(1)]

Genus, Acronym	Plants for planting of other hosts[(1),(2),(3)]	Viruliferous vectors[(1)]	Uncertainties
Begomovirus			
ChiLCV	Pathway partially regulated: regulated and unregulated hosts exist	Pathway regulated: entry of *Bemisia tabaci* in the EU territory is banned (Annex IAI of Directive 2000/29/EC)	– Geographic distribution – Existence of other natural hosts
PaLCrV	Pathway partially regulated: regulated and unregulated hosts exist	Pathway regulated: entry of *Bemisia tabaci* in the EU territory is banned (Annex IAI of Directive 2000/29/EC)	– Geographic distribution – Existence of other natural hosts
PYMV	Pathway regulated: other natural hosts are regulated	Pathway regulated: entry of *Bemisia tabaci* in the EU territory is banned (Annex IAI of Directive 2000/29/EC)	– Geographic distribution – Existence of other natural hosts
ToLCNDV	Pathway partially regulated: wide host range with regulated and unregulated hosts	Pathway regulated: entry of *Bemisia tabaci* in the EU territory is banned (Annex IAI of Directive 2000/29/EC)	– Geographic distribution
ToMHaV	Pathway regulated: other natural hosts are regulated	Pathway regulated: entry of *Bemisia tabaci* in the EU territory is banned (Annex IAI of Directive 2000/29/EC)	– Geographic distribution – Existence of other natural hosts
ToMoTV	Pathway regulated: other natural hosts are regulated	Pathway regulated: entry of *Bemisia tabaci* in the EU territory is banned (Annex IAI of Directive 2000/29/EC)	– Geographic distribution – Existence of other natural hosts
ToSRV	Pathway partially regulated: regulated and unregulated hosts exist	Pathway regulated: entry of *Bemisia tabaci* in the EU territory is banned (Annex IAI of Directive 2000/29/EC)	– Geographic distribution – Existence of other natural hosts
ToYVSV	Pathway regulated: other natural hosts are regulated	Pathway regulated: entry of *Bemisia tabaci* in the EU territory is banned (Annex IAI of Directive 2000/29/EC)	– Geographic distribution – Existence of other natural hosts
Carlavirus			
PotLV	Pathway possibly open: other natural hosts may exist	Pathway open: *Myzus persicae* not regulated and widespread	– Geographic distribution – Existence of other natural hosts – Relevance of the vector pathway; given the non-persistent transmission mode, establishment would only be possible if the transfer occurs within a few hours of entry

Genus, Acronym	Plants for planting of other hosts[1],[2],[3]	Viruliferous vectors[1]	Uncertainties
PVH	Pathway regulated: other natural hosts are regulated	Pathway possibly open: possible vector transmission (aphids)	– Geographic distribution – Existence of other natural hosts – Existence and relevance of vectors
PVP	Pathway possibly open: other natural hosts may exist	Pathway possibly open: possible vector transmission (aphids)	– Geographic distribution – Existence of other natural hosts – Existence and relevance of vectors
RCVMV	Pathway partially regulated: wide host range with regulated and unregulated hosts	Pathway open: *Myzus persicae* not regulated and widespread	– Geographic distribution – Relevance of the vector pathway; given the non-persistent transmission mode, establishment would only be possible if the transfer occurs within a few hours of entry
Cheravirus			
AVB	Pathway partially regulated: regulated and unregulated hosts exist	Pathway possibly open: possible vector transmission (nematode)	– Geographic distribution – Existence of other natural hosts – Existence and relevance of vectors
Comovirus			
APMoV	Pathway partially regulated: wide host range with regulated and unregulated hosts	Pathway possibly open: possible vector transmission (beetles)	– Geographic distribution – Existence and relevance of vectors
Crinivirus			
CYSDV	Pathway partially regulated: wide host range with regulated and unregulated hosts	Pathway regulated: entry of *Bemisia tabaci* in the EU territory is banned (Annex IAI of Directive 2000/29/EC)	– Geographic distribution
PYVV	Pathway regulated: other natural hosts are regulated	Pathway open: *Trialeurodes vaporariorum* not regulated and widespread	– Geographic distribution – Existence of other natural hosts
ToCV	Pathway partially regulated: wide host range with regulated and unregulated hosts	Pathway regulated: entry of *Bemisia tabaci* in the EU territory is banned (Annex IAI)	– Geographic distribution
Ilarvirus			
PYV	Pathway partially regulated: other natural hosts regulated, except for seeds of Solanaceous hosts	Pathway open: *Myzus persicae* not regulated and widespread	– Geographic distribution – Existence of other natural hosts – Seed transmission not proven – Relevance of the vector pathway; given the non-persistent transmission mode, establishment would only be possible if the transfer occurs within a few hours of entry

Genus, Acronym	Plants for planting of other hosts[1],[2],[3]	Viruliferous vectors[1]	Uncertainties
Nepovirus			
PBRSV	Pathway partially regulated: regulated and unregulated hosts exist	Pathway possibly open: possible vector transmission (nematodes)	– Geographic distribution – Existence of other natural hosts – Existence and relevance of vectors
PVB	Pathway possibly open: other natural hosts may exist	Pathway possibly open: possible vector transmission (nematodes)	– Geographic distribution – Existence of other natural hosts – Existence and relevance of vectors
PVU	Pathway possibly open: other natural hosts may exist	Pathway possibly open: possible vector transmission (nematodes)	– Geographic distribution – Existence of other natural hosts – Existence and relevance of vectors
Nucleorhabdovirus			
PYDV	Pathway partially regulated: regulated and unregulated hosts exist	Pathway open: *Aceratagallia sanguinolenta* and *Agallia constricta* not regulated and reported in America (Natural museum Wales, 2019a,b)	– Geographic distribution – Existence of other natural hosts
Pomovirus			
CPSbV	Pathway possibly open: other natural hosts may exist	Pathway possibly open: possible vector transmission (*Spongospora subterranea*)	– Geographic distribution – Existence of other natural hosts – Existence and relevance of vectors
Potexvirus			
PapMV	Pathway partially regulated: regulated and unregulated hosts exist	Pathway open: *Myzus persicae* not regulated and widespread	– Geographic distribution – Existence of other natural hosts – Relevance of vectors
PAMV	Pathway partially regulated: other natural hosts regulated, except for seeds of Solanaceous hosts	Pathway open: *Myzus persicae* not regulated and widespread	– Geographic distribution – Existence of other natural hosts – Relevance of vectors
Potyvirus			
TVBMV	Pathway partially regulated: regulated and unregulated hosts exist	Pathway possibly open: possible vector transmission (aphids)	– Geographic distribution – Existence of other natural hosts – Existence and relevance of vectors

Genus, Acronym	Plants for planting of other hosts[1],[2],[3]	Viruliferous vectors[1]	Uncertainties
WPMV	Pathway partially regulated: other natural hosts regulated, except for seeds of Solanaceous hosts	Pathway open: *Myzus persicae* not regulated and widespread	– Geographic distribution – Existence of other natural hosts – Relevance of the vector pathway; given the non-persistent transmission mode, establishment would only be possible if the transfer occurs within a few hours of entry
Tepovirus			
PVT	Pathway partially regulated: regulated and unregulated hosts exist	Not a pathway: no known vector	– Geographic distribution – Existence of other natural hosts
Tymovirus			
APLV	Pathway partially regulated: regulated and unregulated hosts exist	Pathway possibly open: It is unclear whether Epitrix species (partially regulated) can transmit APLV	– Geographic distribution – Existence of other natural hosts – Existence and relevance of vectors
APMMV	Pathway possibly open: other natural hosts may exist	Pathway possibly open: possible vector transmission (*Epitrix* sp.)	– Geographic distribution – Existence of other natural hosts – Existence and relevance of vectors
Unassigned			
SALCV	Pathway possibly open: other natural hosts may exist	Unable to conclude on this pathway given the absence of information on virus biology	– Geographic distribution – Existence of other natural hosts – Existence and relevance of vectors
SB26/29	Pathway possibly open: other natural hosts may exist	Pathway open: *Russelliana solanicola* is not regulated and reported in several countries in South America	– Geographic distribution – Existence of other natural hosts
SB41	Pathway possibly open: other natural hosts may exist	Unable to conclude on this pathway given the absence of information on virus biology	– Geographic distribution – Existence of other natural hosts – Existence and relevance of vectors

(1): '**Pathway open'**: no regulation or ban that prevents this pathway, '**Pathway closed**' (as opposed to 'pathway open'): ban that prevents entry. '**Pathway possibly open'**: no direct evidence of the existence of the pathway (not closed by current legislation), but existence cannot be excluded based on comparisons with the biology of closely related viruses (in the same genus or family). '**Pathway regulated'**: regulations exist that limit the probability of entry along the pathway, but there is not a complete ban on imports. '**Pathway partially regulated'**: pathway consists of several sub-pathways, some are open, while others are closed (e.g. regulation for some hosts, but not for others; a ban exists for some non-EU MSs but not for all). '**Not a pathway'**: no evidence supporting the existence of the pathway

(2): Plants for planting, including seeds and pollen, of other hosts which are listed in Table 10.

(3): Wide host range: more than five other host species reported in Table 10.

Table 12 reports on the import of ware potatoes into the EU from third countries. Only import from countries where one or more of the categorised viruses are reported (Table 6) is listed. The majority of ware potatoes are imported from Egypt and Israel (respectively, 47 and 47.2%). For these countries, however, where CYSDV (Egypt and Israel), ToCV (Israel) are reported, specific measures are in place to suppress the germination faculty of ware potatoes, other than early potatoes (Annex IV 25.3), limiting therefore the ability of the viruses to establish. For these specific viruses, import of ware potatoes may be a pathway although minor.

Table 12: Volume (in tons) of potato tubers imported during the period 2014–2018 into the EU from third countries (Source: Eurostat, extracted on 03/05/2019)

Country[2]	2014 (tons)[1]	2015 (tons)[1]	2016 (tons)[1]	2017 (tons)[1]	2018 (tons)[1]	Average	%
Total non-EU countries	288,063	306,178	377,150	430,285	362,440	352 823	100
Africa:							
Egypt	119,657	151,334	157,821	220,899	179,752	165,893	47
Morocco	8,844	5,668	13,194	11,010	4,076	8,558	2.4
Tunisia	5,051	745	1,040	879	832	1,710	0.5
Asia:							
Israel	150,503	143,404	191,746	177,886	168,505	166,408	47.2
Europe (non-EU):							
Turkey	0	194	5,397	5,846	508	2,389	0.7
Serbia	203	230	476	4,055	276	1,048	0.3

(1): Only countries with average import greater than 500 tons are reported.
(2): Only countries were categorised viruses are present are included in this table.

Table 13 reports on the interceptions of the categorised viruses by EU member states between 1995 and 18 April 2019. Only interceptions involving consignments imported from outside the EU were considered. Interceptions of material from outside the EU are limited in number. Four interceptions concerned potato (*Solanum tuberosum*) i.e. APLV, AVB and PYV were detected in an illegal import of 30 kg of tubers for consumption (ID 109175), and PVP in post-entry quarantine testing of a potato accession from Argentina (ID 13121). ToLCNDV is known to be present in the EU (but not widely distributed).

Table 13: Interceptions by EU MSs of the categorised viruses on imported material from outside the EU. Data retrieved from the Europhyt database on 18 April 2019

Genus, Acronym	Europhyt interception ID	Year of interception	Origin	Plant species on which it has been intercepted
Begomovirus				
ToLCNDV	86236	2014	Spain	*Cucurbita pepo*
Carlavirus				
PVP[1]	13121	2000	Argentina	*Solanum tuberosum*
Cheravirus				
AVB	109175	2017	Peru	*Solanum tuberosum*
Ilarvirus				
PYV	109175	2017	Peru	*Solanum tuberosum*
Tymovirus				
APLV	109175	2017	Peru	*Solanum tuberosum*

(1): Reported in the Europhyt database as potato rough dwarf virus, a strain of PVP (Nisbet et al., 2006).

3.4.3. Establishment

Are the pests able to become established in the EU territory? (Yes or No)

Yes. Natural hosts of the viruses under categorisation are widespread in the EU and climatic conditions are appropriate for their establishment wherever these hosts may grow in the EU.

3.4.3.1. EU distribution of main host plants

Table 14 reports on the mean area per MSs where potato is grown according to the Eurostat database. Potatoes are also grown, but to a lesser extent, in Ireland, Slovakia, Cyprus, Estonia, Slovenia, Malta and Luxembourg.

Table 14: Area (in 1 000 ha) cultivated with *Solanum tuberosum* in the 28 EU Member States between 2014 and 2018 (Source: Eurostat, extracted on 23/04/2019)

Member State*	2014	2015	2016	2017	2018	Mean area grown with *Solanum tuberosum* (in 1 000 ha) during the period 2014–2018
European Union (EU28)	1,663	1,656	1,689	1,746	1,690	1,689
Poland	267	293	301	321	300	296
Germany	245	237	243	251	252	245
Romania	203	196	186	171	168	185
France	168	167	179	194	200	182
Netherlands	156	156	156	161	165	159
United Kingdom	141	129	139	145	121	135
Belgium	80	79	89	93	93	87
Spain	76	72	72	71	67	72
Italy	52	50	48	49	46	49
Denmark	20	42	46	50	52	42
Sweden	24	23	24	25	24	24
Portugal	27	25	23	24	21	24
Czechia	24	23	23	23	23	23
Austria	21	20	21	23	24	22
Lithuania	27	23	22	19	19	22
Finland	22	22	22	21	21	22
Greece	24	21	19	19	19	20
Hungary	21	19	16	15	13	17
Latvia	11	10	11	22	10	13
Bulgaria	10	11	8	13	14	11
Croatia	10	10	10	10	10	10

*: Only Member States growing more than 10 000 ha are reported.

3.4.3.2. Climatic conditions affecting establishment

Except for those affecting the hosts, no eco-climatic constrains exist for the viruses categorised here. Therefore, it is expected that these viruses are able to establish wherever their hosts may live. Potato is widely cultivated in the EU, and therefore, the Panel considers that climatic conditions will not impair the ability of the viruses addressed here to establish in the EU. However, it must be taken into consideration that virus impact, accumulation and distribution within natural hosts are dependent on environmental conditions. The same applies to vector populations and virus transmission, which are also affected by climatic conditions.

3.4.4. Spread

Are the pests able to spread within the EU territory following establishment? (Yes or No) How?

Yes. All categorised viruses can spread through the trade of tubers for planting. Some of them are also able to spread by plants for planting of non-potato hosts, by vectors and/or seeds and pollen

RNQPs: Is spread mainly via specific plants for planting, rather than via natural spread or via movement of plant products or other objects?

Yes. All the categorised viruses are spread mainly by plants for planting

3.4.4.1. Vectors and their distribution in the EU

Table 15 reports on the distribution in the EU of the vectors of the categorised viruses (see Table 4).

For several of the categorised viruses, there is uncertainty regarding their vectors, i.e. APMoV, APMMV, AVB, CPSbV, PBRSV, PVB, PVH, PVP, PVT, PVU and TVBMV. Direct evidence is lacking but based on reports for viruses of the same genus, vector transmission cannot be excluded.

Insect vectors listed in Table 4 that are not reported in the EU are: *Aceratagallia sanguinolenta, Agallia constricta, Ceratothripoides claratris, Frankliniella gemina, Russelliana solanicola, Thrips palmi and Trialeurodes abutiloneus*. However, other insect vectors shown to be able to transmit several of the categorised viruses are reported in the EU. These are: *Bemisia tabaci, Circulifer tenellus, Frankliniella intonsa, F. occidentalis, F. schultzei, Microcephalothrips abdominalis, Myzus persicae*,*Thrips tabaci, Trialeurodes vaporariorum* and *Scirtothrips dorsalis*. In addition, several *Epitrix* species are reported in the EU, but it is not known whether these species can transmit APLV and/or APMMV.

Baiting experiments (Gil et al., 2016) suggest that CPSbV is transmitted by a soil-borne vector, similar to potato mop top virus (PMTV), another Pomovirus, possibly *Spongospora subterranea. Spongospora subterranea* is reported in the EU.

Nematode species possibly transmitting AVB, PVB, PBRSV and PVU have not been reported or are reported with only limited presence in the EU. *Xiphinema americanum* sensu stricto, *X. californicum* and *X. tarjanense* are not reported in the EU. *X. intermedium* has been reported in Portugal (Fauna Europea, 2019), but without supporting reference. *X. rivesi* has been reported in eight EU MSs.

Table 15: Vector presence and distribution in the EU. Data regarding natural hosts was retrieved from the EPPO global database up to 30-4-2019 and if different source used specified in the table

Name	Transmitted virus (acronym)(1)	Reported in EU MSs(1)	Distribution map
Insect vectors			
Aceratagallia sanguinolenta	PYDV	Not reported in the EU (CABI cpc, Fauna Europaea)	Not available
Agallia constricta	PYDV	Not reported in the EU (CABI cpc, Fauna Europaea)	Not available
Bemisia tabaci	ChiLCV, CYSDV, PaLCrV, PYMV, ToLCNDV, ToMHaV, ToMoTV, ToSRV, ToYVSV and ToCV	**EPPO global database:** Present, widespread: Cyprus, Greece, Italy (Sardegna), Malta, Netherlands, Spain Present, few occurrences: Bulgaria, Croatia, Hungary, Slovenia, Sweden, United Kingdom Present, restricted distribution: Austria, Belgium, Czech Republic, France, Germany, Poland, Portugal, Spain (Islas Baleares), Switzerland Present, no details: France	EPPO map, Appendix B.1

Name	Transmitted virus (acronym)(1)	Reported in EU MSs(1)	Distribution map
		(Corse), Greece (Kriti), Italy (Sicilia), Portugal (Madeira), Spain (Islas Canárias) Transient, under eradication: Finland	
Epitrix sp.	APLV, APMMV(1)	The specific *Epitrix* species transmitting APLV and APMMV is/are not known Several *Epitrix* species occur in the EU: *Epitrix allardi*, *Epitrix atropae, Epitrix caucasica*, *Epitrix intermedia*, *Epitrix pubescens* (Fauna Europaea). In addition, *Epitrix cucumeris*, *Epitrix fasciata, Epitrix hirtipennis* and *Epitrix papa* have been introduced in the EU (Germain et al., 2013; Orlova-Bienkowskaja, 2015; EFSA PLH Panel, 2019c). The ability of these species to transmit APLV and/or APMMV is not known	
Myzus persicae	PAMV, PapMV, PotLV, PVH(1), PVP(1), PYV, RCVMV, TVBMV(1) and WPMV	**CABI cpc:** Present: Austria, Belgium, Bulgaria, Croatia, Czech Republic, Finland, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Spain (Balearic Islands), Sweden Present, widespread: Cyprus, Denmark, France, Germany, Spain, Switzerland, United Kingdom	CABI map, Appendix B.2
Russelliana solanicola	SB26/29	**EPPO global database:** Not reported in the EU	EPPO map, Appendix B.3
Trialeurodes abutiloneus	ToCV	**EPPO global database:** Not reported in the EU	EPPO map, Appendix B.4
Trialeurodes vaporariorum	PYVV and ToCV	**EPPO global database:** Present, no details: Austria, Belgium, Bulgaria, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Portugal (Azores), Portugal (Madeira), Slovenia, Spain, Spain (Islas Canárias), United Kingdom **CABI cpc:** Present: Croatia, Czech Republic, Estonia, Latvia	EPPO map, Appendix B.5
Fungal vectors			
Spongospora subterranea	CPSbV(1)	**EPPO present widespread:** Present few occurrences: Greece Present no details: Cyprus, France, Greece (Kriti), Netherlands, United Kingdom, United Kingdom (Scotland) Transient, under eradication: Malta **CABI cpc:** Present: Belgium	EPPO map, Appendix B.6

Name	Transmitted virus (acronym)(1)	Reported in EU MSs(1)	Distribution map
Nematode vectors			
Xiphinema americanum sensu stricto	AVB(1), PBRSV(1), PVB(1) and PVU(1)	**EPPO global database:** Not reported in the EU	EPPO map, Appendix B.7
Xiphinema intermedium	AVB(1), PBRSV(1), PVB(1) and PVU(1)	**Fauna Europea:** Present: Portugal	Not available
Xiphinema rivesi	AVB(1), PVB(1), PBRSV(1) and PVU(1)	**EPPO global database:** Present, restricted distribution: Slovenia, Spain Present, widespread: Italy, Portugal Spain Present, no details: France, Germany, Portugal **CABI cpc:** Present: Slovakia	EPPO map, Appendix B.8
Xiphinema tarjanense	AVB(1), PBRSV(1), PVB(1) and PVU(1)	Not reported in the EU (EFSA PLH Panel, 2018b)	Not available
Xiphinema californicum	AVB(1), PBRSV(1), PVB(1) and PVU(1)	**EPPO global database:** Not reported in the EU	EPPO map, Appendix B.9

(1): Experimental evidence is lacking, but vector transmission is reported for viruses in the same genus.

3.5. Impacts

Would the pests' introduction have an economic or environmental impact on the EU territory?

Yes. APLV, APMMV, APMoV, ChiLCV, CYSDV, PAMV, PBRSV, PVH, PVP, PVT, PYDV, PYMV, PYV, PYVV, RCVMV, SALCV, SB26/29, ToCV, ToLCNDV, ToMHaV, ToMoTV, ToSRV and ToYVSV are expected to have an impact on the EU territory.

No. PotLV and WPMV are not expected to have an impact in the EU territory.

Unable to conclude: AVB, CPSbV, PaLCrV, PapMV, PVB, PVU, SB41 and TVBMV due to the lack of conclusive data on symptoms and/or yield losses.

RNQPs: Does the presence of the pest on potato plants for planting have an economic impact, as regards the intended use of those plants for planting?

Yes. APLV, APMMV, APMoV, PAMV, PBRSV, PVH, PVP, PVT, PYDV, PYMV, PYV, PYVV, SALCV, SB26/29, ToCV, ToLCNDV, ToMoTV, ToSRV and ToYVSV and may impact the intended use of plants for planting of potato.

No. PotLV and WPMV are not expected to have an impact on the intended use of plant for planting of potato.

Unable to conclude: AVB, ChiLCV, CPSbV, CYSDV, PaLCrV, PapMV, PVB, PVU, RCVMV, SB41, ToMHaV, and TVBMV due to the lack of conclusive data on symptoms and/or yield losses in potato.

Symptoms caused by viruses are influenced by different factors such as the pathogenicity of the virus isolate, the interactions of the virus with the host species, cultivars and environmental conditions. A causal relationship between a virus and reported symptoms may not always be clear, for example, in the case of mixed infections. Mixed infections are especially common in vegetatively propagated crops such as potato and the presence of additional viruses might increase or attenuate the observed symptoms. Therefore, reports on the symptomatology of individual viruses might not be conclusive, and is reason for uncertainties on the causal relation between a virus and the symptoms reported.

Table 16 reports on the expected impact for the categorised viruses. Yield losses in potato, implying economic impact, are only reported for PYVV, SB26/29, ToLCNDV and ToMoTV. When a virus is reported to cause growth reduction, dwarfing or stunting of potato plants without information on tuber production, the uncertainty on the existence of economic impact is limited, but there are uncertainties on the magnitude of this impact under EU conditions (APMoV, PAMV, PVP, PYDV, PYMV and SALCV). Many viruses have been reported to cause foliar symptoms in potato without information on plant

growth and tuber production. Such foliar symptoms are likely to affect the photosynthesis in the symptomatic leaves, and therefore to impact the yield and/or quality of tubers; the existence and magnitude of such an impact carries however more uncertainties (APLV, APMMV, PBRSV, PVH, PVT, PYV, ToCV, ToSRV and ToYVSV). In some cases, no symptoms are reported or the association of the virus with the reported symptoms is unclear, 'unable to conclude' is then indicated in Table 16 (AVB, ChiLCV, CPSbV, CYSDV, PaLCrV, PapMV, PVB, PVU, RCVMV, SB41, ToMHaV and TVBMV). For viruses for which symptomless infections are reported in potato, no impact is expected and 'No' is indicated in Table 16 (PotLV and WPMV).

For viruses with impact reported as 'unable to conclude' and 'no', the literature search was continued by screening the other hosts (listed in Table 10) starting with *Solanum lycopersicum*, subsequently followed by *Capsicum annuum*, and **other hosts** cultivated in the EU. As soon as an impact was identified in one of these hosts, the search was discontinued (ChiLCV, CYSDV, RCVMV, and ToMHaV). The Panel is unable to conclude on the impact of PaLCrV since the association of symptoms or yield losses on potato or other hosts is unclear. For PotLV and WPMV, no impact is expected, in potato nor in other hosts, in the EU territory.

Table 16: Potential impact of the categorised viruses on the EU territory and rationale

Genus, Acronym	Would the pests' introduction have an economic or environmental impact in the EU territory?		Does the presence of the pest on potato plants for planting have an economic impact, as regards the intended use of those plants for planting?	Rationale and/or uncertainty[(1)]
	Potato	Other hosts		
Begomovirus				
ChiLCV	Unable to conclude	Yes	Unable to conclude	Reported once in potato, indicating growth reduction and (apical) leaf distortion (Mubin et al., 2009), however, the association of ChiLCV with the reported symptoms is unclear. Furthermore, according to Senanayake et al., 2012, *S. tuberosum* is not an experimental host. No other information is available regarding incidence, yield and/or quality losses in potato. Therefore, "unable to conclude" regarding impact on potato. Reduction in flowers, fruits, leaf and branch size are reported in *Capsicum annuum* (Senanayake et al., 2012). Therefore, impact is expected in other hosts in the EU territory
PaLCrV	Unable to conclude	Unable to conclude	Unable to conclude	Reported in potato in NCBI GenBank (one accession, Table 10) without information on symptoms. Within the narrow host range of PaLCrV (see Table 10), only cultivation of *Glycine max* is of importance. Stunting, less flowers and pods, leaf crumpling, distortion are reported in a mixed infection with mung bean yellow mosaic India virus in *Glycine max* (Jaidi et al., 2015), so the association of PaLCrV with the reported symptoms is unclear. Therefore, 'unable to conclude' on impact on other hosts in the EU territory
PYMV	Yes	Not evaluated	Yes	Growth reduction, leaf chlorosis and distortion have been reported in potato (Roberts et al., 1986). PYMV is considered rare in potato (Geraud-Pouey et al., 2016) and reported to incidentally infect potato plants that grow in the vicinity of infected tomato crops (Morales et al., 2001). The magnitude of the impact on potato is unclear
ToLCNDV	Yes	Not evaluated	Yes	Yield losses in potato are associated with the presence of ToLCNDV and its vector *Bemisia tabaci* in northern India (Bhatnagar et al., 2017). Furthermore, growth

Genus, Acronym	Would the pests' introduction have an economic or environmental impact in the EU territory?		Does the presence of the pest on potato plants for planting have an economic impact, as regards the intended use of those plants for planting?	Rationale and/or uncertainty[(1)]
	Potato	Other hosts		
				reduction and (apical) leaf distortion have been reported in potato (Usharani et al., 2004; Hameed et al., 2017). Therefore, impact is expected in potato
ToMHaV	Unable to conclude	Yes	Unable to conclude	Reported in potato only in NCBI GenBank (five accessions, Table 10), without information on symptoms. Growth reduction and leaf distortion are reported in *Solanum lycopersicum* (Martinez Zubiaur et al., 1998). Therefore, impact is expected on other hosts in the EU territory
ToMoTV	Yes	Not evaluated	Yes	Reported in potato, indicating yield loss, growth reduction and leaf chlorosis (Cordero et al., 2003)
ToSRV	Yes	Not evaluated	Yes	Deforming mosaic leaf symptoms have been reported once in potato (Souza-Dias et al., 2008). Confirmation of symptomology or information regarding incidence, plant growth, yield and/or quality losses in potato is not available. Therefore, impact is expected on potato, although its magnitude is unclear
ToYVSV	Yes	Not evaluated	Yes	Leaf chlorosis and distortion have been reported in potato (Ribeiro et al., 2006; Albuquerque et al., 2010). No specific information available regarding plant growth, yield or quality loss, but Albuquerque et al. (2010) indicate that ToYVSV is the major begomovirus affecting potatoes (and tomatoes) in the state of São Paulo, Brazil. Therefore, impact is expected on potato, although its magnitude is unclear
Carlavirus				
PotLV	No	No	No	No symptoms have been reported in potato (Brattey et al., 2002) and no other hosts are known. Therefore, no impact is expected on potato or other hosts in the EU territory. Might cause symptoms under specific conditions (particular varieties, mixed infections)
PVH	Yes	Not evaluated	Yes	Two reports in potato, one indicating mild leaf symptoms (Li et al., 2013). Another study reported reduced growth, leaf chlorosis and distortion in potato; however, this was in mixed infections with potato virus X, potato leaf roll virus and potato virus S (Rashid et al., 2018). No further information is available regarding incidence, plant growth, yield and/or quality losses in potato. Therefore, impact is expected on potato, although its magnitude is unclear
PVP	Yes	Not evaluated	Yes	Cultivar dependent; in some cultivars growth reduction, leaf distortion and chlorosis are reported, but in other cultivars, symptomless infections are reported (Jeffries,

Genus, Acronym	Would the pests' introduction have an economic or environmental impact in the EU territory?		Does the presence of the pest on potato plants for planting have an economic impact, as regards the intended use of those plants for planting?	Rationale and/or uncertainty[(1)]
	Potato	Other hosts		
				1998; Massa et al., 2006). Therefore, impact is expected on potato, although its magnitude is unclear
RCVMV	Unable to conclude	Yes	Unable to conclude	Reported in potato (Al-Shahwan et al., 2017) but the identification in this report is based on serology, with no further confirmation and is therefore doubtful. Therefore, the association of RCVMV with the reported symptoms is doubtful. RCVMV affects various *Leguminosae* and reduces yield and seed quality in *Cicer arietinum* (Larsen and Miklas, 2001), and pod formation and crop yield in *Pisum sativum* (Larsen et al., 2009). In contrast, no visible symptoms were observed in legume crops in New Zealand and the impact on yield was unclear but probably negligible, unless in mixed infection with other viruses (Fletcher et al., 2016). Therefore, impact is expected on other hosts, although its magnitude is unclear
Cheravirus				
AVB	Unable to conclude	No	Unable to conclude	Symptomless infections have been reported in potato (Jones and Kenten, 1981). Symptoms in potato have been reported in mixed infections (Jones, 1981). The association of AVB with the reported symptoms is unclear. AVB might still be able to contribute to symptoms under specific environmental conditions or mixed infection. No other natural host of economic importance is reported (see Table 10), therefore, no impact is expected on other hosts in the EU territory
Comovirus				
APMoV	Yes	Not evaluated	Yes	Growth reduction, mottling, necrosis and leaf deformation have been reported in potato (Fribourg et al., 1977a; Salazar and Harrison, 1978c; Avila et al., 1984; Jeffries, 1998). Therefore, impact is expected on potato, although its magnitude is unclear
Crinivirus				
CYSDV	Unable to conclude	Yes	Unable to conclude	Reported once in potato (Orfanidou et al., 2019), but the association of CYSDV with the reported symptoms is unclear. Yield losses, growth reduction and leaf chlorosis have been reported in cucurbit hosts, including *Cucumis melo* (Abou-Jawdah et al., 2000; López-Sesé and Gómez-

Genus, Acronym	Would the pests' introduction have an economic or environmental impact in the EU territory?		Does the presence of the pest on potato plants for planting have an economic impact, as regards the intended use of those plants for planting?	Rationale and/or uncertainty[(1)]
	Potato	Other hosts		
				Guillamón, 2000; Orfanidou et al., 2019). Therefore, impact is expected on other hosts in the EU territory
PYVV	Yes	Not evaluated	Yes	Yield loss, veinal chlorosis, but also symptomless infections are reported in potato affected by potato yellow vein disease (reviewed in Jeffries, 1998). Symptoms vary between potato cultivars and depend on environmental conditions and Potato yellow vein disease was later associated with PYVV (Salazar et al., 2000). Additional reports show yield loss in a experimental study (Guzmán-Barney et al., 2012) and yellowing symptoms in a field survey (Franco-Lara et al., 2013). Therefore, impact is expected on potato
ToCV	Yes	Not evaluated	Yes	One report indicates leaf roll and interveinal chlorosis in older leaves of potato plants (Freitas et al., 2012) and one report does not report information on symptoms (Fortes and Navas-Castillo, 2012). No information is available regarding incidence, plant growth, yield and/or quality losses in potato. Therefore, impact is expected on potato, although its magnitude is unclear
Ilarvirus				
PYV	Yes	Not evaluated	Yes	Leaf chlorosis has been reported in potato (Silvestre et al., 2011). No information is available regarding incidence, plant growth, yield and/or quality losses in potato. Therefore, impact is expected on potato, although its magnitude is unclear
Nepovirus				
PBRSV	Yes	Not evaluated	Yes	Leaf chlorosis and necrosis have been reported in potato (Fribourg, 1977; Salazar and Harrison, 1977; Jeffries, 1998). No information is available regarding incidence, plant growth, yield and/or quality losses in potato. Therefore, impact is expected on potato, although its magnitude is unclear
PVB	Unable to conclude	No	Unable to conclude	Leaf chlorosis (calico) has been reported in potato (De Souza et al., 2017). This study indicates that not all these symptomatic plants tested positive for the virus and that it remains unclear to what extent PVB contributes to the observed symptoms. Therefore, the association of PVB with the reported symptoms is unclear.

Genus, Acronym	Would the pests' introduction have an economic or environmental impact in the EU territory?		Does the presence of the pest on potato plants for planting have an economic impact, as regards the intended use of those plants for planting?	Rationale and/or uncertainty[(1)]
	Potato	Other hosts		
				No other natural host of economic importance is known (see Table 10); therefore, no impact is expected on other hosts in the EU territory
PVU	Unable to conclude	No	Unable to conclude	Reported once in potato indicating leaf chlorosis (Jones et al., 1983); it proved difficult to re-establish systemic infection in potato and symptoms were only reproduced with difficulty by top-grafting potato scions on infected tobacco plants. On the other hand, foliar symptoms were observed in two of eight wild tuber-bearing Solanum species following mechanical inoculation (Jones et al., 1983). Overall, the ability of PVU to cause symptoms in potato is unclear. No other natural host of economic importance are reported (see Table 10); therefore, no impact is expected on other hosts in the EU territory
Nucleorhabdovirus				
PYDV	Yes	Not evaluated	Yes	Growth reduction, leaf distortion and chlorosis and tuber necrosis have been reported in potato (reviewed in Jackson et al., 2018). Therefore, impact is expected on potato, although its magnitude is unclear. Additionally, this statement is accompanied by uncertainty, since potato is not considered to be a major host of PYDV and only is sporadically infected (EPPO (online) data sheets on quarantine pests)
Pomovirus				
CPSbV	Unable to conclude	No	Unable to conclude	Reported once in potato in a mixed infection with potato mop top virus (PMTV), indicating mild symptoms only on indicator plants (Gil et al., 2016). The association of CPSbV with the reported symptoms is unclear. CPSbV is a poorly known and recently described virus, so uncertainty exists to whether it causes symptoms under specific conditions (particular varieties, mixed infections). No other hosts of economic importance to the EU territory have been identified. Therefore, no impact is expected on potato and/or other hosts in the EU territory
Potexvirus				
PapMV	Unable to conclude	No	Unable to conclude	Reported once in potato in a review (Salazar, 2006), without supporting identification data and lacking information on symptoms. Therefore, unable to conclude.

Genus, Acronym	Would the pests' introduction have an economic or environmental impact in the EU territory?		Does the presence of the pest on potato plants for planting have an economic impact, as regards the intended use of those plants for planting?	Rationale and/or uncertainty[(1)]
	Potato	Other hosts		
				No impact or symptoms are reported in *Persea americana.* The main host (*Carica papaya*, Table 10) is not of economic importance in the EU. Therefore, no impact is expected on other hosts in the EU territory
PAMV	Yes	Not evaluated	Yes	Symptoms vary between potato cultivars and depend on environmental conditions. However, growth reduction, tuber necrosis, leaf distortion and chlorosis have been reported in potato (reviewed in: Loebenstein et al., 2001). Therefore, impact is expected on potato, although the magnitude is unclear
Potyvirus				
TVBMV	Unable to conclude	No	Unable to conclude	Reported twice in potato. One NCBI Genbank accession without information on symptoms and one report indicating leaf chlorosis (Geng et al., 2014). However, the association of TVBMV with the symptoms is unclear. No other natural host of economic importance are reported (see Table 10). Therefore, no impact is expected on other hosts in the EU territory. This statement is associated with uncertainties given that *Solanum lycopersicum* has been reported as an experimental host (Reddick et al., 1992)
WPMV	No	No	No	Leaf chlorosis and distortion have been reported in the wild potato species *Solanum chancayense* (Jones and Fribourg, 1979). Experimentally 16 wild, tuber-forming, *Solanum* spp. were infected. However, none of the 13 tested domestic potato cultivars were infected (Jones and Fribourg, 1979). Therefore, no impact is expected in cultivated potato in the EU. There might be some impact in other tuber-bearing *Solanum* species. In *Solanum lycopersicum*, the only reported host of economic importance, no information on symptoms is available (Jeffries, 1998). Therefore, no impact is expected on other hosts in the EU territory
Tepovirus				
PVT	Yes	Not evaluated	Yes	The virus was initially characterised from symptomless potato plants (Salazar and Harrison, 1977). Leaf symptoms have been reported under experimental conditions

Genus, Acronym	Would the pests' introduction have an economic or environmental impact in the EU territory?		Does the presence of the pest on potato plants for planting have an economic impact, as regards the intended use of those plants for planting?	Rationale and/or uncertainty(1)
	Potato	Other hosts		
				in some cultivars (Jones et al., 1982). No information is available regarding incidence, plant growth, yield and/or quality losses in potato. Therefore, impact is expected on potato, although its magnitude is unclear
Tymovirus				
APLV	Yes	Not evaluated	Yes	Leaf distortion and chlorosis have been reported in potato (Jones and Fribourg, 1978). No information is available regarding incidence, plant growth, yield and/or quality losses in potato. Therefore, impact is expected on potato, although its magnitude is unclear
APMMV	Yes	Not evaluated	Yes	See APLV. APMMV was initially considered to be a strain of ALPV (APLV-Hu)
Unassigned				
SALCV	Yes	Not evaluated	Yes	Growth reduction and leaf distortion have been reported in potato (Hooker and Salazar, 1983; Hooker et al., 1985; Jeffries, 1998). Therefore, impact is expected on potato, although its magnitude is unclear
SB26/29	Yes	Not evaluated	Yes	Reported once in potato, indicating yield loss, growth reduction, leaf distortion and chlorosis (Tenorio et al., 2003). These results have not been confirmed by other reports; however, yield loss was emphasised. Therefore, impact is expected on potato, but, this statement is associated with uncertainty
SB41	Unable to conclude	No	Unable to conclude	Reported once in potato, indicating leaf chlorosis (Salazar, 2006). However, the association of SB41 with the symptoms is unclear. No information is available regarding incidence, plant growth, yield and/or quality losses in potato. No other hosts are reported. Therefore, no impact is expected on other hosts in the EU territory

(1): First impact is reported on potato. In the case of 'Unable to conclude' or 'No', impact on other hosts is reported. As soon as the literature retrieved indicates that there is impact in one host, the search is discontinued, and, therefore, listed impact is not exhaustive.

3.6. Availability and limits of mitigation measures

Are there measures available to prevent the entry into, establishment within or spread of the pests within the EU such that the risk becomes mitigated?

Yes. Please see section 3.3 for measures already implemented in the current legislation. Additional measures could be implemented to further regulate the identified pathways or to limit entry, establishment or spread.

RNQPs: Are there measures available to prevent pests presence on plants for planting such that the risk becomes mitigated?

Yes. Testing and certification of plants for planning of susceptible hosts of the categorised viruses may help to mitigate the risks.

3.6.1. Identification of additional measures

Phytosanitary measures are currently applied to potato and other hosts (see Sections 3.3 and 3.4.1). Potential additional measures to mitigate the risk of entry of the viruses categorised here may include:

- Repel import derogation potato plants for planting;
- Set specific phytosanitary requirements addressing the isolates categorised in the opinion for imported seed potatoes and/or ware potatoes;
- Extension of phytosanitary measures to specifically include hosts other than potato;
- Banning import of non-potato hosts plants for planting from countries where the categorised viruses are reported;
- Extension of certification schemes and testing requirements to all natural hosts;
- Extension of plant passport requirements to specifically include hosts other than potato.

Some of the viruses may also enter in the EU through viruliferous nematodes or arthropods. In agreement with a recent EFSA scientific opinion (EFSA PLH Panel, 2018a,b), an additional measure could be the regulation of soil and growing media attached to imported plants and/or tubers. Additional measures against arthropods may include mechanical, physical or chemical treatment on consignments identified as potential entry pathways.

3.6.1.1. Additional control measures

Table 17 reports on the potential additional control measures to reduce the likelihood of entry, establishment and/or spread of the categorised viruses. The additional control measures are selected form a longer list reported in EFSA PLH Panel (2018a). Control measures are measures that have a direct effect on pest abundance.

Table 17: Selected additional control measures to consider to reduce the likelihood of pest entry, establishment and/or spread of the categorised viruses

Information sheet (with hyperlink to information sheet if available)	Control measure summary	Risk component	Viruses*
Growing plants in isolation	Description of possible exclusion conditions that could be implemented to isolate the crop from pests and if applicable relevant vectors. E.g. a dedicated structure such as glass or plastic greenhouses. Growing plants in insect proof greenhouses and/or isolated from natural soil may prevent infestation by viruliferous vectors. This measure would not be applicable for potato, with the exception of early stages of seed potato production	Spread	Insect proof greenhouses: APLV, APMMV*, APMoV*, ChiLCV, CYSDV, PaLCrV, PAMV, PapMV, PotLV, PVH*, PVP*, PYDV, PYMV, PYV, PYVV, RCVMV, SB26/29, ToCV, ToLCNDV, ToMHaV, ToMoTV, ToSRV, ToYVSV, TVBMV*, and WPMV. Isolation from soil: AVB*, CPSbV*, PBRSV*, PVB* and PVU*

Information sheet (with hyperlink to information sheet if available)	Control measure summary	Risk component	Viruses*
Chemical treatments on consignments or during processing	Use of chemical compounds that may be applied to plants or to plant products after harvest, during process or packaging operations and storage. The treatments addressed in this information sheet are: a) fumigation; b) spraying/dipping pesticides; c) surface disinfectants; d) process additives; e) protective compounds a), b) and c) could remove viruliferous vectors.	Entry	All vector transmitted viruses: APLV, APMMV*, APMoV*, AVB*, ChiLCV, CPSbV*, CYSDV, PaLCrV, PAMV, PapMV, PBRSV*, PotLV, PVB*, PVH*, PVP*, PVU*, PYDV, PYMV, PYV, PYVV, RCVMV, SB26/29, ToCV, ToLCNDV, ToMHaV, ToMoTV, ToSRV, ToYVSV, TVBMV* and WPMV
Cleaning and disinfection of facilities, tools and machinery	The physical and chemical cleaning and disinfection of facilities, tools, machinery, transport means, facilities and other accessories (e.g. boxes, pots, pallets, palox, supports, hand tools). The measures addressed in this information sheet are: washing, sweeping and fumigation. These measures may limit the spread of mechanically transmitted or soil-borne viruses	Spread	All soil-borne vector transmitted viruses: AVB*, CPSbV*, PBRSV*, PVB*, PVU* and All mechanically transmitted viruses: APLV, APMMV, APMoV, AVB, CPSbV, PAMV, PapMV, PBRSV, PotLV, PVB, PVH, PVP, PVT, PVU, PYDV, PYMV, PYV, RCVMV, SB26/29, ToLCNDV, ToYVSV, TVBMV and WPMV
Soil treatment	The control of soil organisms by chemical and physical methods listed below: a) fumigation; b) heating; c) solarisation; d) flooding; e) soil suppression; f) augmentative biological control; g) biofumigation a), b) and d) could remove viruliferous vectors present in soil	Establishment and spread	All soil-borne vector transmitted viruses: AVB*, CPSbV*, PBRSV*, PVB* and PVU*
Physical treatments on consignments or during processing	This information sheet deals with the following categories of physical treatments: irradiation/ionisation; mechanical cleaning (brushing, washing); sorting and grading, and; removal of plant parts (e.g. debarking wood). This information sheet does not address: heat and cold treatment (information sheet 1.14); roguing and pruning (information sheet 1.12). Mechanical cleaning and removal of plant parts (e.g. leaves from fruit consignments) may remove viruliferous vectors	Entry and spread	All vector transmitted viruses: APLV, APMMV*, APMoV*, AVB*, ChiLCV, CPSbV*, CYSDV, PaLCrV, PAMV, PapMV, PBRSV*, PotLV, PVB*, PVH*, PVP*, PVU*, PYDV, PYMV, PYV, PYVV, RCVMV,SB26/29, ToCV, ToLCNDV, ToMHaV, ToMoTV, ToSRV, ToYVSV, TVBMV* and WPMV

Information sheet (with hyperlink to information sheet if available)	Control measure summary	Risk component	Viruses*
Waste management	Treatment of the waste (deep burial, composting, incineration, chipping, production of bio-energy…) in authorised facilities and official restriction on the movement of waste. Treatment of the waste may inactivate viruliferous soil-borne vectors.	Entry and spread	All soil-borne vector transmitted viruses: AVB*, CPSbV*, PBRSV*, PVB* and PVU*
Roguing and pruning	Roguing is defined as the removal of infested plants and/or uninfested host plants in a delimited area, whereas pruning is defined as the removal of infested plant parts only, without affecting the viability of the plant. Roguing of infested plants is efficient, particularly for viruses that are not vector-transmitted. Pruning is not effective to remove a virus from infected plants	Establishment and spread	All categorised viruses, especially the non-vector transmitted viruses
Crop rotation, associations and density, weed/ volunteer control	Crop rotation, associations and density, weed/volunteer control are used to prevent problems related to pests and are usually applied in various combinations to make the habitat less favourable for pests. The measures deal with (1) allocation of crops to field (over time and space) (multi-crop, diversity cropping) and (2) to control weeds and volunteers as hosts of pests/vectors. Crop rotation may reduce the population of soil-borne viruliferous vectors. However, as fungal vectors/spores might remain viruliferous for longer period of time than usual rotation period, crop rotation is of limited usefulness in those cases. As all categorised viruses are vegetatively propagated, control of volunteers is important for all categorised viruses. Control of weeds may be of relevance only for viruses having a wide host range.	Spread and impact	All soil-borne vector transmitted viruses: AVB*, CPSbV*, PBRSV*, PVB* and PVU* All viruses with a wide host range: CYSDV, RCVMV, ToCV and ToLCNDV
Timing of planting and harvesting	The objective is to produce phenological asynchrony in pest/crop interactions by acting on or benefiting from specific cropping factors such as: cultivars, climatic conditions, timing of the sowing or planting, and level of maturity/age of the plant seasonal timing of planting and harvesting. Relevant for insect-transmitted viruses.	Spread and impact	All insect-transmitted viruses: APMoV*, APLV, APMMV*, ChiLCV, CYSDV, PaLCrV, PAMV, PapMV, PotLV, PVH*, PVP*, PYDV, PYMV, PYV, PYVV, RCVMV, SB26/29, ToCV, ToLCNDV, ToMHaV, ToMoTV, ToSRV, ToYVSV, TVBMV* and WPMV.

Information sheet (with hyperlink to information sheet if available)	Control measure summary	Risk component	Viruses*
Chemical treatments on crops including reproductive material	Chemical treatments on crops may prevent infestations by vectors and seed transmission. Dessication/removal of the foliage reduces the risk of transmission via vectors and may prevent transport to the tubers of infected plants.	Spread and impact	All insect-transmitted viruses: APMoV*, APLV, APMMV*, ChiLCV, CYSDV, PaLCrV, PAMV, PapMV, PotLV, PVH*, PVP*, PYDV, PYMV, PYV, PYVV, RCVMV, SB26/29, ToCV, ToLCNDV, ToMHaV, ToMoTV, ToSRV, ToYVSV, TVBMV* and WPMV.
Use of resistant and tolerant plant species/ varieties	Resistant plants are used to restrict the growth and development of a specified pest and/or the damage they cause when compared to susceptible plant varieties under similar environmental conditions and pest pressure. It is important to distinguish resistant from tolerant species/varieties. Resistant and tolerant cultivars could be developed and could be used, should they be available.	Spread and impact	Potentially all categorised viruses
Post-entry quarantine and other restrictions of movement in the importing country	This information sheet covers post-entry quarantine of relevant commodities; temporal, spatial and end-use restrictions in the importing country for import of relevant commodities; prohibition of import of relevant commodities into the domestic country. Relevant commodities are plants, plant parts and other materials that may carry pests, either as infection, infestation or contamination. Identifying virus-infected plants and banning their movement limit the risks of entry and spread in the EU	Entry and spread	All categorised viruses

*: The measure may apply to these viruses since it cannot be excluded that they have the relevant biological property.

3.6.1.2. Additional supporting measures

Table 18 reports on the possible additional supporting measures which are selected from the list reported in EFSA PLH Panel (2018a,b). Supporting measures are organisational measures or procedures supporting the choice of appropriate risk reduction options that do not directly affect pest abundance.

Table 18: Selected supporting measures in relation to currently unregulated hosts and pathways. Supporting measures are organisational measures or procedures supporting the choice of appropriate risk reduction options that do not directly affect pest abundance

Information sheet title (with hyperlink to information sheet if available)	Supporting measure summary	Risk component	Virus*
Inspection and trapping	Inspection is defined as the official visual examination of plants, plant products or other regulated articles to determine if pests are present or to determine compliance with phytosanitary regulations (ISPM 5). The effectiveness of sampling and subsequent inspection to detect pests may be enhanced by including trapping and luring techniques. Visual inspection may detect potentially infected material	Entry and spread	All categorised viruses with visible symptoms on leaves and/or propagating tissues
Laboratory testing	Examination, other than visual, to determine if pests are present using official diagnostic protocols. Diagnostic protocols describe the minimum requirements for reliable diagnosis of regulated pests. Laboratory testing may detect/identify viruses on sampled material	Entry and spread	All categorised viruses
Certified and approved premises	Mandatory/voluntary certification/ approval of premises is a process including a set of procedures and of actions implemented by producers, conditioners and traders contributing to ensure the phytosanitary compliance of consignments. It can be a part of a larger system maintained by a National Plant Protection Organization in order to guarantee the fulfilment of plant health requirements of plants and plant products intended for trade. Key property of certified or approved premises is the traceability of activities and tasks (and their components) inherent the pursued phytosanitary objective. Traceability aims to provide access to all trustful pieces of information that may help to prove the compliance of consignments with phytosanitary requirements of importing countries. Certified and approved premises may guarantee the absence of the harmful viruses imported for research and/or breeding purposes	Entry and spread	All categorised viruses

Information sheet title (with hyperlink to information sheet if available)	Supporting measure summary	Risk component	Virus*
Delimitation of Buffer zones	ISPM 5 defines a buffer zone as 'an area surrounding or adjacent to an area officially delimited for phytosanitary purposes in order to minimize the probability of spread of the target pest into or out of the delimited area, and subject to phytosanitary or other control measures, if appropriate' (ISPM 5). The objectives for delimiting a buffer zone can be to prevent spread from the outbreak area and to maintain a pest-free production place, site or area. Buffer zones may contribute to reduce the spread of non-EU viruses of potato after entry in the EU	Spread	For viruses with additional spreading mechanisms beside plants for planting (e.g. vector transmitted viruses: APLV, APMoV*, APMMV*, AVB*, ChiLCV, CPSbV*, CYSDV, PaLCrV, PAMV, PapMV, PBRSV*, PotLV, PVB*, PVH*, PVP*, PVU*, PYDV, PYMV, PYV, PYVV, RCVMV, SB26/29, ToCV, ToLCNDV, ToMHaV, ToMoTV, ToSRV, ToYVSV, TVBMV* and WPMV)
Phytosanitary certificate and plant passport	An official paper document or its official electronic equivalent, consistent with the model certificates of the IPPC, attesting that a consignment meets phytosanitary import requirements (ISPM 5) a) export certificate (import) b) plant passport (EU internal trade)	Entry and spread	All categorised viruses
Certification of reproductive material (voluntary/official)	Certification of reproductive material when not already implemented would contribute to reduce the risk associated with spread	Spread	All categorised viruses
Surveillance	Official surveillance may contribute to early detection of the viruses here categorised, favouring immediate adoption of control measures if the viruses come to establish	Spread	All categorised viruses

*: The measure may apply to these viruses since it cannot be excluded that they have the relevant biological property.

3.6.1.3. Biological or technical factors limiting the effectiveness of measures to prevent the entry, establishment and spread of the pest

- Some of the viruses categorised here are only mentioned under the general term of 'Non-European viruses', which leaves room to interpretation so that measures may not be implemented for some viruses.
- Symptomless infections for some of the categorised viruses in some hosts.
- Uneven virus distribution or low concentrations limiting the reliability o the detection.
- Absence of a validated detection and identification protocol limiting the reliability of the detection for some viruses.
- Wide natural host range and uncertainties on the existence of additional natural hosts.
- Lack of information on virus transmission and difficulties to control vectors.

3.7. Uncertainty

The Panel identified the following knowledge gaps and uncertainties:

Identity and biology

- Uncertainty on the taxonomy of some of the viruses.

Pest distribution

- Uncertainty on the geographical distribution and prevalence of some of the viruses because of the absence of systematic surveys, particularly when they are poorly characterised, recently described or have been subject to taxonomical changes.
- Limitations of records in GenBank.

Interpretation of the Legislation

- Some of the viruses categorised here are only mentioned under the general term of 'Non-European viruses', which leaves room to interpretation of the legislation.

Entry, establishment and spread in the EU (host range, entry, establishment, spread)

- Uncertainty on whether potato is a natural host of some of the viruses.
- Uncertainty on the host range for some of the viruses.
- Uncertainty on the vector distribution for some of the viruses.

Impact

- Uncertainty on the magnitude of the impact for those viruses where only limited information on symptoms are available or when the information available relates to other hosts (not potato).
- Uncertainty on the impact of the categorised viruses under EU conditions.

4. Conclusions

The information currently available on geographical distribution, biology, epidemiology, impact and potential entry pathways has been evaluated with regard to the criteria to qualify as potential Union quarantine pest or as Union regulated non-quarantine pest (RNQP). The Panel's conclusions are summarised in Table 19 and reported in detail in Tables 20.1–20.33.

None of categorised viruses in the current opinion meets the criteria evaluated by EFSA to qualify as potential RNQP because they are non-EU viruses explicitly mentioned or considered as regulated in Annex IAI of Directive 2000/29/EC. The following viruses meet the criteria to qualify as potential Union quarantine pests: APLV, APMMV, APMoV, ChiLCV, CYSDV, PAMV, PBRSV, PVH, PVP, PVT, PYDV, PYMV, PYV, PYVV, RCVMV, SALCV, SB26/29, ToCV, ToLCNDV, ToMHaV, ToMoTV, ToSRV and ToYVSV. With the exception of the criterion regarding the potential for consequences in the EU territory, for which the Panel is unable to conclude (see Section 3.5), all criteria evaluated by EFSA to qualify as potential Union quarantine pest are met for AVB, CPSbV, PaLCrV, PapMV, PVB, PVU, SB41 and TVBMV. PotLV and WPMV do not qualify as potential Union quarantine pest or as Union regulated non-quarantine pest since both are not expected to have an impact on the EU territory.

The Panel wishes to stress that some of these conclusions are associated with high uncertainties especially in the case of viruses discovered only recently and/or for which the information on geographical distribution, biology and epidemiology are scarce. As a consequence, for particular viruses, the conclusions of the present categorisation may change, should new information become available.

Table 19: Summary of Panel's conclusions on pest categorisation of categorised viruses

Genus, Virus	Acronym	Are all criteria to qualify as potential Union quarantine pest met?	Panel unable to conclude on impact, all the other criteria to qualify as potential Union quarantine pest are met	Are all criteria to qualify as potential Union RNQP met?	Conclusion table
Begomovirus					
Chilli leaf curl virus	ChiLCV	Yes	–	No	20.1
Papaya leaf crumple virus	PaLCrV	No	Yes	No	20.2
Potato yellow mosaic virus	PYMV	Yes	–	No	20.3
Tomato leaf curl New Delhi virus	ToLCNDV	Yes	–	No	20.4
Tomato mosaic Havana virus	ToMHaV	Yes	–	No	20.5
Tomato mottle Taino virus	ToMoTV	Yes	–	No	20.6
Tomato severe rugose virus	ToSRV	Yes	–	No	20.7
Tomato yellow vein streak virus	ToYVSV	Yes	–	No	20.8
Carlavirus					
Potato latent virus	PotLV	No	No(1)	No	20.9
Potato virus H	PVH	Yes	–	No	20.10
Potato virus P	PVP	Yes	–	No	20.11
Red clover vein mosaic virus	RCVMV	Yes	–	No	20.12
Cheravirus					
Arracacha virus B	AVB	No	Yes	No	20.13
Comovirus					
Andean potato mottle virus	APMoV	Yes	–	No	20.14
Crinivirus					
Cucurbit yellow stunting disorder virus	CYSDV	Yes	–	No	20.15
Potato yellow vein virus	PYVV	Yes	–	No	20.16
Tomato chlorosis virus	ToCV	Yes	–	No	20.17
Ilarvirus					
Potato yellowing virus	PYV	Yes	–	No	20.18

Genus, Virus	Acronym	Are all criteria to qualify as potential Union quarantine pest met?	Panel unable to conclude on impact, all the other criteria to qualify as potential Union quarantine pest are met	Are all criteria to qualify as potential Union RNQP met?	Conclusion table
Nepovirus					
Potato black ringspot virus	PBRSV	Yes	–	No	20.19
Potato virus B	PVB	No	Yes	No	20.20
Potato virus U	PVU	No	Yes	No	20.21
Nucleorhabdovirus					
Potato yellow dwarf virus	PYDV	Yes	–	No	20.22
Pomovirus					
Colombian potato soil-borne virus	CPSbV	No	Yes	No	20.23
Potexvirus					
Papaya mosaic virus	PapMV	No	Yes	No	20.24
Potato aucuba mosaic virus	PAMV	Yes	–	No	20.25
Potyvirus					
Tobacco vein banding mosaic virus	TVBMV	No	Yes	No	20.26
Wild potato mosaic virus	WPMV	No	No(1)	No	20.27
Tepovirus					
Potato virus T	PVT	Yes	–	No	20.28
Tymovirus					
Andean potato latent virus	APLV	Yes	–	No	20.29
Andean potato mild mosaic virus	APMMV	Yes	–	No	20.30
Unassigned					
Solanum apical leaf curling virus	SALCV	Yes	–	No	20.31
SB26/29	SB26/29	Yes	–	No	20.32
SB41	SB41	No	Yes	No	20.33

(1): No impact.

Table 20: The Panel's conclusions on the pest categorisation criteria defined in Regulation (EU) 2016/2031 on protective measures against pests of plants (the number of the relevant sections of the pest categorisation is shown in brackets in the first column)

Table 20.1: Chilli leaf curl virus (ChiLCV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP.	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	Not explicitly mentioned in Directive 2000/29/EC.
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is partially regulated. The pathway of viruliferous vectors (*Bemisia tabaci*) is regulated by current legislation. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (potato as a natural host, existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact in the EU territory (e.g. on *Capsicum annuum*)	Unable to conclude whether the presence of this virus on potato plants for planting would impact their intended use due to limited information	Unable to conclude regarding impact on potato
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	ChiLCV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	ChiLCV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (potato as a natural host, existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Volume of trade and countries of origin of plants for planting of non-potato hosts		

Table 20.2: Papaya leaf crumple virus (PaLCrV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is partially regulated. The pathway of viruliferous vectors (*Bemisia tabaci*) is regulated by current legislation. If this virus were to enter the EU territory, it could become established and spread.	Plants for planting constitute one of the main means of spread	– Host range (potato as a natural host, existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Unable to conclude on the potential consequences in the EU territory due to limited information	Unable to conclude whether the presence of this virus on potato plants for planting would impact their intended use due to limited information	
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	With the exception of the criterion regarding the potential of consequences in the EU territory for which the Panel is unable to conclude (see Section 3.5), PaLCrV meets the other criteria evaluated by EFSA to qualify as a potential Union quarantine pest	PaLCrV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (potato as a natural host, existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Volume of trade and countries of origin of plants for planting of non-potato hosts; – Potential consequences in the EU territory, on which the Panel was unable to conclude due to the limited information		

Table 20.3: Potato yellow mosaic virus (PYMV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants of other hosts for planting is regulated. The pathway of viruliferous vectors (*Bemisia tabaci*) is regulated by current legislation. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	Magnitude of the impact under EU conditions
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	PYMV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	PYMV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Magnitude of the impact under EU conditions		

Table 20.4: Tomato leaf curl New Delhi virus (ToLCNDV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is reported from several MSs (Greece, Italy, Spain), but its presence is restricted	The virus is reported from several MSs (Greece, Italy, Spain), but its presence is restricted	More widespread/ unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to further enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is partially regulated. The pathway of viruliferous vectors (*Bemisia tabaci*) is regulated by current legislation. If this virus were to further enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	No uncertainty
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	ToLCNDV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	ToLCNDV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible more widespread/unreported presence in the EU; – Efficiency of natural (vector) spread under EU conditions; – Volume of trade and countries of origin of plants for planting of non-potato hosts		

Table 20.5: Tomato mosaic Havana virus (ToMHaV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathways of plants for planting of other hosts is regulated. The pathway of viruliferous vectors (*Bemisia tabaci*) is regulated by current legislation. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (potato as a natural host, existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact in the EU territory (e.g. on *Solanum lycopersicum*)	Unable to conclude whether the presence of this virus on potato plants for planting would impact their intended use due to limited information	Unable to conclude regarding impact on potato
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	ToMHaV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	ToMHaV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (potato as a natural host, existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions		

Table 20.6: Tomato mottle Taino virus (ToMoTV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is regulated. The pathway of viruliferous vectors (*Bemisia tabaci*) is regulated by current legislation. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (potato as a natural host, existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	Magnitude of the impact under EU conditions
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	ToMoTV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	ToMoTV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (potato as a natural host, existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Magnitude of the impact under EU conditions		

Table 20.7: Tomato severe rugose virus (ToSRV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is partially regulated. The pathway of viruliferous vectors (*Bemisia tabaci*) is regulated by current legislation. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	Magnitude of the impact under EU conditions
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	ToSRV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	ToSRV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Volume of trade and countries of origin of plants for planting of non-potato hosts; – Magnitude of the impact under EU conditions		

Table 20.8: Tomato yellow vein streak virus (ToYVSV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The potential pathways of plants for planting of other hosts is regulated. The pathway of viruliferous vectors (*Bemisia tabaci*) is regulated by current legislation. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	Magnitude of the impact under EU conditions
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	ToYVSV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	ToYVSV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Magnitude of the impact under EU conditions		

Table 20.9: Potato latent virus (PotLV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC.
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is open by current legislation from Canada. The pathway of plants for planting of other hosts is possibly open. The pathway of viruliferous vectors (*Myzus persicae*) is open. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Significance of the viruliferous vector pathway given the non-persistent transmission mechanism – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Potential consequences are likely nil or very limited since no symptoms in potato have been associated with infection and no other natural hosts are reported. Therefore, this criterion to qualify as a potential Union quarantine pest is not met	Presence on potato plants for planting is not expected to impact their intended use. Therefore, this criterion to qualify as a potential Union RNQP is not met	Might cause symptoms under specific conditions (particular varieties, mixed infections)
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	PotLV does not meet one of the criteria evaluated by EFSA to be regarded as a potential Union quarantine pest, since it is not expected to have a negative impact in the EU	PotLV does not meet two of the criteria evaluated by EFSA to qualify as a potential Union RNQP: (1) it is not present in the EU (considered as regulated in Annex IAI as 'potato viruses and virus-like organisms') and (2) it is not expected to impact the intended use of potato plants for planting.	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts) – Might cause symptoms under specific conditions (particular varieties, mixed infections) – Significance of the viruliferous vector pathway given the non-persistent transmission mechanism – Efficiency of natural (vector) spread under EU conditions		

Table 20.10: Potato virus H (PVH)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP.	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC.
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is regulated. The pathway of viruliferous vectors (*Myzus persicae*) is open. If this virus were to enter the EU territory, it could become established and spread.	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Significance of the viruliferous vector pathway given the uncertainty regarding the transmission mechanism – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	Magnitude of the impact under EU conditions
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	PVH meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	PVH is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts); – Significance of the viruliferous vector pathway given the uncertainty regarding the transmission mechanism – Efficiency of natural (vector) spread under EU conditions; – Magnitude of the impact under EU conditions		

Table 20.11: Potato virus P (PVP)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP.	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC.
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathways of plants for planting of other hosts and of viruliferous vectors (*Myzus persicae*) are possibly open. If this virus were to enter the EU territory, it could become established and spread.	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Significance of the viruliferous vector pathway given the uncertainty regarding the transmission mechanism – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	Magnitude of the impact under EU conditions
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	PVP meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	PVP is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts); – Significance of the viruliferous vector pathway given the uncertainty regarding the transmission mechanism – Efficiency of natural (vector) spread under EU conditions; – Magnitude of the impact under EU conditions		

Table 20.12: Red clover vein mosaic virus (RCVMV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	Reported from several MSs (Germany, Italy, Lithuania, Netherlands, United Kingdom) with an unknown status. Overall its presence in the EU is considered restricted	Reported from several MSs (Germany, Italy, Lithuania, Netherlands, United Kingdom) with an unknown status. Overall its presence in the EU is considered restricted.	More widespread/ unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC.
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to further enter into the EU. The pathway of plants for planting of potato is open by current legislation from Canada. The pathway of plants for planting of other hosts is partially regulated. The potential pathway of viruliferous vectors (*Myzus persicae*) is open. If this virus were to further enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (potato as a natural host) – Geographical distribution – Significance of the viruliferous vector pathway given the non-persistent transmission mechanism – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact in the EU territory (e.g. on *Pisum sativum*)	Unable to conclude whether the presence of this virus on potato plants for planting would impact their intended use due to limited information	Unable to conclude regarding impact on potato
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	RCVMV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	RCVMV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible more widespread/unreported presence in the EU; – Host range (potato as a natural host); – Significance of the viruliferous vector pathway given the non-persistent transmission mechanism – Efficiency of natural (vector) spread under EU conditions; – Volume of trade and countries of origin of plants for planting of non-potato hosts		

Table 20.13: Arracacha virus B (AVB)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated Annex IAI as 'potato viruses and virus-like organisms' (AVB oca strain)	The virus is currently regulated in Annex IAI	The AVB oca strain is explicitly mentioned in Directive 2000/29/EC.
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is partially regulated. The pathway of viruliferous vectors (nematodes) is possibly open. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Unable to conclude on the potential consequences on potato in the EU territory due to limited information.	Unable to conclude whether the presence of this virus on potato plants for planting would impact their intended use due to limited information	Unable to conclude regarding impact on potato and no other hosts of economic relevance are reported
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU.	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	With the exception of the criterion regarding the potential of consequences in the EU territory for which the Panel is unable to conclude (see Section 3.5), AVB meets the other criteria evaluated by EFSA to qualify as a potential Union quarantine pest.	AVB is a non-EU virus (regulated in Annex IAI of Directive 2000/29/EC), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Volume of trade and countries of origin of plants for planting of non-potato hosts; – Potential consequences in the EU territory, on which the Panel was unable to conclude due to the limited information		

Table 20.14: Andean potato mottle virus (APMoV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP.	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI	The virus is currently regulated in Annex IAI	No uncertainty
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is partially regulated. The pathway of viruliferous vectors (beetles) is possibly open. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	Magnitude of the impact under EU conditions
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	APMoV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	APMoV is a non-EU virus (regulated in Annex IAI of Directive 2000/29/EC), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Efficiency of natural (vector) spread under EU conditions; – Volume of trade and countries of origin of plants for planting of non-potato hosts; – Magnitude of the impact under EU conditions		

Table 20.15: Cucurbit yellow stunting disorder (CYSDV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	Specific primers are available, but there is uncertainty on their inclusivity
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is reported from several MSs (Cyprus, Greece, Italy, Portugal, Spain) but, with the possible exception of Cyprus, its presence is restricted	The virus is reported from several MSs (Cyprus, Greece, Italy, Portugal, Spain) but, with the possible exception of Cyprus, its presence is restricted	More widespread/ unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to further enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is partially regulated. The potential pathway of viruliferous vectors (*Bemisia tabaci*) is regulated by current legislation. If this virus were to further enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (potato as a natural host) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact in the EU territory (e.g. on *Cucumis melo*)	Unable to conclude whether the presence of this virus on potato plants for planting would impact their intended use due to limited information	Unable to conclude regarding impact on potato
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	CYSDV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	CYSDV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible more widespread/unreported presence in the EU; – Host range (potato as a natural host) – Efficiency of natural (vector) spread under EU conditions. – Volume of trade and countries of origin of plants for planting of non-potato hosts – Magnitude of the impact under EU conditions		

Table 20.16: Potato yellow vein virus (PYVV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP.	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is regulated. The pathway of viruliferous vectors (*Trialeurodes vaporariorum*) is open. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	PYVV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	PYVV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions		

Table 20.17: Tomato chlorosis virus (ToCV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is reported from several MSs (Cyprus, Greece, France, Hungary, Italy, Netherlands Spain, Portugal, United Kingdom) but its presence is under eradication and/or restricted	The virus is reported from several MSs (Cyprus, Greece, France, Hungary, Italy, Netherlands Spain, Portugal, United Kingdom) but its presence is under eradication and/or restricted	More widespread/ unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to further enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is partially regulated. The pathway of viruliferous vectors (*Bemisia tabaci*) is regulated by current legislation. If this virus were to further enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	Magnitude of the impact under EU conditions
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	ToCV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	ToCV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms' and as 'viruses transmitted by *Bemisia tabaci* Genn.'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible more widespread/unreported presence in the EU; – Efficiency of natural (vector) spread under EU conditions; – Volume of trade and countries of origin of plants for planting of non-potato hosts; – Magnitude of the impact under EU conditions		

Table 20.18: Potato yellowing virus (PYV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is partially regulated. The pathway of viruliferous vectors (*Myzus persicae*) is open. Entry is possible on seeds of Solanaceous hosts. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Significance of the viruliferous vector pathway given the non-persistent transmission mechanism – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	Magnitude of the impact under EU conditions
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	PYV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	PYV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts); – Significance of the viruliferous vector pathway given the non-persistent transmission mechanism – Efficiency of natural (vector) spread under EU conditions; – Magnitude of the impact under EU conditions		

Table 20.19 Potato black ringspot virus (PBRSV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP.	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI	The virus is currently regulated in Annex IAI	No uncertainty
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is partially regulated. The pathway of viruliferous vectors (nematodes) is possibly open. If this virus were to enter the EU territory, it could become established and spread.	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	Magnitude of the impact under EU conditions
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	PBRSV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	PBRSV is a non-EU virus (regulated in Annex IAI of Directive 2000/29/EC), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Volume of trade and countries of origin of plants for planting of non-potato hosts; – Magnitude of the impact under EU conditions		

Table 20.20: Potato virus B (PVB)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP.	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathways of plants for planting of other hosts and of viruliferous vectors (nematodes) are possibly open. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Unable to conclude on the potential consequences in the EU territory due to limited information	Unable to conclude whether the presence of this virus on potato plants for planting would impact their intended use due to limited information	Unable to conclude regarding impact on potato and no other hosts of economic relevance are reported
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	With the exception of the criterion regarding the potential of consequences in the EU territory for which the Panel is unable to conclude (see Section 3.5), PVB meets the other criteria evaluated by EFSA to qualify as a potential Union quarantine pest	PVB is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Potential consequences in the EU territory, on which the Panel was unable to conclude due to the limited information		

Table 20.21: Potato virus U (PVU)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP.	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathways of plants for planting of other hosts and via viruliferous vectors (nematodes) are possibly open. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (potato as a natural host, existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Unable to conclude on the potential consequences in the EU territory due to limited information	Unable to conclude whether the presence of this virus on potato plants for planting would impact their intended use due to limited information	Unable to conclude regarding impact on potato and no other hosts of economic relevance are reported
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	With the exception of the criterion regarding the potential of consequences in the EU territory for which the Panel is unable to conclude (see Section 3.5), PVU meets the other criteria evaluated by EFSA to qualify as a potential Union quarantine pest	PVU is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (potato as a natural host, existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Potential consequences in the EU territory, on which the Panel was unable to conclude due to the limited information		

Table 20.22: Potato yellow dwarf virus (PYDV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP.	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathways of plants for planting of other hosts is partially regulated. The pathway of viruliferous vectors (*Aceratagallia sanguinolenta* and *Agallia constricta*) is open. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	Magnitude of the impact under EU conditions
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	PYDV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	PYDV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Volume of trade and countries of origin of plants for planting of non-potato hosts; – Magnitude of the impact under EU conditions		

Table 20.23: Colombian potato soil-borne virus (CPSbV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathways of plants for planting of other hosts and of viruliferous vectors (*Spongospora subterranea*) are possibly open. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (potato as a natural host, existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Unable to conclude on the potential consequences in the EU territory due to limited information	Unable to conclude whether the presence of this virus on potato plants for planting would impact their intended use due to limited information	Unable to conclude regarding impact on potato and no other hosts of economic relevance are reported
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	With the exception of the criterion regarding the potential of consequences in the EU territory for which the Panel is unable to conclude (see Section 3.5), CPSbV meets the other criteria evaluated by EFSA to qualify as a potential Union quarantine pest	CPSbV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (potato as a natural host, existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Potential consequences in the EU territory, on which the Panel was unable to conclude due to the limited information		

Table 20.24: Papaya mosaic virus (PapMV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is partially regulated. The pathway of viruliferous vectors (*Myzus persicae*) is open. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (potato as a natural host, existence of other natural hosts) – Significance of the viruliferous vector pathway given the uncertainty regarding the transmission mechanism – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Unable to conclude on the potential consequences in the EU territory due to limited information	Unable to conclude whether the presence of this virus on potato plants for planting would impact their intended use due to limited information	Unable to conclude regarding impact on potato and no impact is reported for other hosts of economic relevance
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	With the exception of the criterion regarding the potential of consequences in the EU territory for which the Panel is unable to conclude (see Section 3.5), PapMV meets the other criteria evaluated by EFSA to qualify as a potential Union quarantine pest	PapMV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (potato as a natural host, existence of other natural hosts); – Significance of the viruliferous vector pathway given the uncertainty regarding the transmission mechanism – Efficiency of natural (vector) spread under EU conditions; – Potential consequences in the EU territory, on which the Panel was unable to conclude due to the limited information		

Table 20.25: Potato aucuba mosaic virus (PAMV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	Reported from United Kingdom, but overall presence in the EU is considered restricted	Reported from United Kingdom, but overall presence in the EU is considered restricted. Therefore this criterion to qualify as potential Union RNQP is not met	Probably worldwide distribution, but no recent reports
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to further enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is partially regulated. The pathway of viruliferous vectors (*Myzus persicae*) is open. If this virus were to further enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Significance of the viruliferous vector pathway given the non-persistent transmission mechanism – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	Magnitude of the impact under EU conditions
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	PAMV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	PAMP is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible more widespread/unreported presence in the EU; – Host range (existence of other natural hosts); – Significance of the viruliferous vector pathway given the non-persistent transmission mechanism – Efficiency of natural (vector) spread under EU conditions; – Magnitude of the impact under EU conditions		

Table 20.26: Tobacco vein banding mosaic virus (TVBMV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC.
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is partially regulated. The pathway of viruliferous vectors (aphids) is possibly open. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (potato as a natural host, existence of other natural hosts) – Significance of the viruliferous vector pathway given the uncertainty regarding the transmission mechanism – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Unable to conclude on the potential consequences in the EU territory due to limited information	Unable to conclude whether the presence of this virus on potato plants for planting would impact their intended use due to limited information	Unable to conclude regarding impact on potato and no other hosts of economic relevance are reported
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	With the exception of the criterion regarding the potential of consequences in the EU territory for which the Panel is unable to conclude (see Section 3.5), TVBMV meets the other criteria evaluated by EFSA to qualify as a potential Union quarantine pest	TVBMV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (potato as a natural host, existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Significance of the viruliferous vector pathway given the uncertainty regarding the transmission mechanism – Volume of trade and countries of origin of plants for planting of non-potato hosts; – Potential consequences in the EU territory, on which the Panel was unable to conclude due to the limited information		

Table 20.27: Wild potato mosaic virus (WPMV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation The pathway of plants for planting of other hosts is partially regulated. The pathway of viruliferous vectors (*Myzus persicae*) is open. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Significance of the viruliferous vector pathway given the non-persistent transmission mechanism – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Potential consequences are likely nil or very limited. Therefore, this criterion to qualify as a potential Union quarantine pest is not met	Presence on potato plants for planting is not expected to impact their intended use. Therefore, this criterion to qualify as a potential Union RNQP is not met	There might be negative impact on other tuber-bearing *Solanum* species
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	WPMV does not meet one of the criteria evaluated by EFSA to be regarded as a potential Union quarantine pest, since it is not expected to have a negative impact in the EU	WPMV does not meet two of the criteria evaluated by EFSA to qualify as a potential Union RNQP: 1) it is not present in the EU (considered as regulated in Annex IAI as 'potato viruses and virus-like organisms') and 2) it is not expected to impact the intended use of potato plants for planting	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts); – Significance of the viruliferous vector pathway given the non-persistent transmission mechanism – Efficiency of natural (vector) spread under EU conditions		

Table 20.28: Potato virus T (PVT)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI	The virus is currently regulated in Annex IAI	No uncertainty
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is partially regulated. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	Magnitude of the impact under EU conditions
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	PVT meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	PVT s a non-EU virus (regulated in Annex IAI of Directive 2000/29/EC), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Volume of trade and countries of origin of plants for planting of non-potato hosts; – Magnitude of the impact under EU conditions		

Table 20.29: Andean potato latent virus (APLV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI	The virus is currently regulated in Annex IAI	No uncertainty
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is partially regulated. The pathway of viruliferous vectors (*Epitrix* sp.) is possibly open. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	Magnitude of the impact under EU conditions
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	APLV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	APLV s a non-EU virus (regulated in Annex IAI of Directive 2000/29/EC), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Magnitude of the impact under EU conditions		

Table 20.30: Andean potato mild mosaic virus (APMMV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of the virus is established and diagnostic methods are available	The identity of the virus is established and diagnostic methods are available	No uncertainty
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter in the EU. The pathway of plants for planting of potato is closed by current legislation. The pathways of plants for planting of other hosts and of viruliferous vectors (*Epitrix* sp.) are possibly open. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	Magnitude of the impact under EU conditions
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	APMMV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	APMMV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Magnitude of the impact under EU conditions		

Table 20.31: Solanum apical leaf curling virus (SALCV)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity is not established, but the virus has been shown to be transmissible and to produce consistent symptoms (Hooker and Salazar, 1983; Hooker et al., 1985). Detection method is available	The identity is not established, but the virus has been shown to be transmissible and to produce consistent symptoms (Hooker and Salazar, 1983; Hooker et al., 1985). Detection method is available	Bioassay and serological test are reported, uncertainty whether the antiserum is still available
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is possibly open. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	Magnitude of the impact under EU conditions
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	SALCV meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	SALCV is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Magnitude of the impact under EU conditions		

Table 20.32: SB26/29

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity is not established, but the virus has been shown to be transmissible and to produce consistent symptoms (Tenorio et al., 2003). Detection method is available	The identity is not established, but the virus has been shown to be transmissible and to produce consistent symptoms (Tenorio et al., 2003). Detection method is available	Bioassay reported. No other method available
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is possibly open. The potential pathway via viruliferous vectors (*Russelliana solanicola*) is open. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (potato as a natural host, existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Introduction and spread would have a negative impact on potato in the EU territory	Presence on potato plants for planting would have a negative impact on their intended use	
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	SB26/29 meets all the criteria evaluated by EFSA to qualify as a potential Union quarantine pest	SB26/29 is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (potato as a natural host, existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions		

Table 20.33: SB41

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity is not established, but the virus has been shown to be transmissible and to produce consistent symptoms (Salazar, 2006). Detection method is available	The identity is not established, but the virus has been shown to be transmissible and to produce consistent symptoms (Salazar, 2006). Detection method is available	Bioassay reported. No other method available
Absence/ presence of the pest in the EU territory (Section 3.2)	The virus is not known to be present in the EU territory	The virus is not known to be present in the EU territory, and therefore does not meet this criterion to qualify as a potential Union RNQP	Unreported presence in the EU

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Regulatory status (Section 3.3)	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	The virus is currently regulated in Annex IAI as 'potato viruses and virus-like organisms'	Not explicitly mentioned in Directive 2000/29/EC
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Able to enter into the EU. The pathway of plants for planting of potato is closed by current legislation. The pathway of plants for planting of other hosts is possibly open. If this virus were to enter the EU territory, it could become established and spread	Plants for planting constitute one of the main means of spread	– Host range (potato as a natural host, existence of other natural hosts) – Geographical distribution – Efficiency of natural (vector) spread under EU conditions
Potential for consequences in the EU territory (Section 3.5)	Unable to conclude on the potential consequences on potato in the EU territory due to limited information	Unable to conclude whether the presence of this virus on potato plants for planting would impact their intended use due to limited information	Unable to conclude regarding impact on potato and no other hosts are reported
Available measures (Section 3.6)	Phytosanitary measures are available to reduce the likelihood of entry and spread of the virus into the EU	Certification of planting material of susceptible hosts is, by far, the most efficient control method	No uncertainty
Conclusion on pest categorisation (Section 4)	With the exception of the criterion regarding the potential of consequences in the EU territory for which the Panel is unable to conclude (see Section 3.5), SB41 meets the other criteria evaluated by EFSA to qualify as a potential Union quarantine pest	SB41 is a non-EU virus (considered as regulated in Annex IAI of Directive 2000/29/EC as 'potato viruses and virus-like organisms'), and as such it does not meet the corresponding criterion evaluated by EFSA to qualify as a potential Union RNQP	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gaps or uncertainties identified concern: – Possible unreported presence in the EU; – Host range (potato as a natural host, existence of other natural hosts); – Efficiency of natural (vector) spread under EU conditions; – Potential consequences in the EU territory, on which the Panel was unable to conclude due to the limited information		

References

Abouelnasr H, Li YY, Zhang ZY, Liu JY, Li SF, Li DW, Yu JL, McBeath JH and Han CG, 2014. First Report of Potato Virus H on Solanum muricatum in China. Plant Disease, 98, 1016–1016.

Abou-Jawdah Y, Sobh H, Fayad A, Lecoq H, Delécolle B and Trad-Ferré J, 2000. Cucurbit yellow stunting disorder virus -a new threat to cucurbits in lebanon. Journal of Plant Pathology, 82, 55–60.

Adams IP, Abad J, Fribourg CE, Boonham N and Jones RAC, 2018a. Complete Genome Sequence of Potato Virus T from Bolivia, Obtained from a 33-Year-Old Sample. Microbioly Resoure Announcements, 7.

Adams IP, Boonham N and Jones RAC, 2018b. A 33-Year-Old Plant Sample Contributes the First Complete Genomic Sequence of Potato Virus U. Microbioly Resoure Announcements, 7.

Albuquerque LC, Martin DP, Avila AC and Inoue-Nagata AK, 2010. Characterization of tomato yellow vein streak virus, a begomovirus from Brazil. Virus Genes, 40, 140–147.

Al-Shahwan IM, Abdalla OA, Al-Saleh MA and Amer MA, 2017. Detection of new viruses in alfalfa, weeds and cultivated plants growing adjacent to alfalfa fields in Saudi Arabia. Saudi Journal of Biological Sciences, 24, 1336–1343.

Al-Shihi AA, Akhtar S and Khan AJ, 2014. Identification of Chili leaf curl virus causing leaf curl disease of Petunia in Oman. Plant Disease, 98, 572.

Andino R and Domingo E, 2015. Viral quasispecies. Virology, 479–480, 46–51.

Avila AC, Salazar LF, Ortega A and Daniels J, 1984. A new strain of Andean Potato mottle virus from Brazil. Plant Disease, 68, 997–998.
Barbosa JC, Barreto SS, Inoue-Nagata AK, Reis MS, Firmino AC, Bergamin FA and Rezende JAM, 2009. Natural infection of Nicandra physaloides by Tomato severe rugose virus in Brazil. Journal of General Plant Pathology, 75, 440–443.
Bhatnagar A, Pant R, Sridhar J, Chakrabarti S and Murari L, 2017. Incidence of apical leaf curl disease (ToLCNDV), and economics and reaction of potato (Solanum tuberosum) cultivars against whitefly, Bemisia tabaci in northern India. Indian Journal of Agricultural Sciences, 87, 1673–1678.
Black LM, 1934. The potato yellow dwarf disease. American Potato Journal, 11, 148–152.
Black LM, 1943. Different vector specificities for varieties of a plant virus. Phytopathology, 33, 17.
Black LM, 1970. Decriptions of plant viruses: potato yellow dwarf virus. Available online: http://www.dpvweb.net/dpv/showdpv.php?dpvno=35
Bokx de JA, 1975. Reactions of various plant species to inoculation with potato aucuba mosaic virus. Potato Research, 18, 397–409.
Bos L, 1999. Plant viruses, unique and intriguing pathogens. A textbook of plant virology. Editor. Backhuys publishers Leiden.
Boubourakas IN, Avgelis AD, Kyriakopoulou PE and Katis NI, 2006. Occurrence of yellowing viruses (Beet pseudo-yellows virus, Cucurbit yellow stunting disorder virus and Cucurbit aphid-borne yellows virus) affecting cucurbits in Greece. Plant Pathology, 55, 276–283.
Brattey C, Badgeb JL, Mulhollanda V, Burnsa R, McDonald JG, Foster GD and Jeffries CJ, 2002. Potato latent virus: a proposed new species in the genus Carlavirus. Plant Pathology, 51, 495–505.
Card SD, Pearson MN and Clover GRG, 2007. Plant pathogens transmitted by pollen. Australasian Plant Pathology, 36, 455.
Chen J, Chen J and Adams MJ, 2001. A universal PCR primer to detect members of the Potyviridae and its use to examine the taxonomic status of several members of the family. Archives of Virology, 146, 757–766.
Codoner FM, Daros JA, Sole RV and Elena SF, 2006. The fittest versus the flattest: experimental confirmation of the quasispecies effect with subviral pathogens. PLoS Pathogens, 2, e136.
Cordero M, Ramos PL, Hernández L, Fernández AI, Echemendía AL, Peral R, González G, García D, Valdés S, Estévez A and Hernández K, 2003. Identification ofTomato Mottle Taino Begomovirus strains in Cuban potato fields. Phytoparasitica, 31, 478–489.
Cuadros DF, Hernandez A, Torres MF, Torres DM, Branscum AJ and Rincon DF, 2017. Vector Transmission Alone Fails to Explain the Potato Yellow Vein Virus Epidemic among Potato Crops in Colombia. Frontiers in Plant Science, 8, 1654.
De Souza J, Muller G, Perez W, Cuellar W and Kreuze J, 2017. Complete sequence and variability of a new subgroup B nepovirus infecting potato in central Peru. Archives of Virology, 162, 885–889.
Deng D, McGrath PF, Robinson DJ and Harrison BD, 1994. Detection and differentiation of whitefly-transmitted geminiviruses in plants and vector insects by the polymerase chain reaction with degenerate primers. Annals of Applied Biology, 125, 327–336.
Di Serio F, Navarro B and Flores R, 2017. Origin and Evolution of Viroids. In: Hadidi A, Flores R, Randles J, Palukaitis P (ed.). Viroids and Satellites. Academic press, London UK. pp. 125–134.
Domingo E, Sheldon J and Perales C, 2012. Viral quasispecies evolution. Microbioly and Molecular Biology Reviews, 76, 159–216.
EFSA PLH Panel (EFSA Panel on Plant Health), 2011. Scientific Opinion on the assessment of the risk of solanaceous pospiviroids for the EU territory and the identification and evaluation of risk management options. EFSA Journal 2011;9(8):2330, 133 pp. https://doi.org/10.2903/j.efsa.2011.2330
EFSA PLH Panel (EFSA Panel on Plant Health), 2012a. Scientific Opinion on the pest categorisation of the tospoviruses. EFSA Journal 2012;10(7):2772, 101 pp. https://doi.org/10.2903/j.efsa.2012.2772
EFSA PLH Panel (EFSA Panel on Plant Health), 2012b. Scientific Opinion on the risk to plant health posed by Chrysanthemum stunt viroid for the EU territory, with identification and evaluation of risk reduction options. EFSA Journal 2012;10(12):3027, 87 pp. https://doi.org/10.2903/j.efsa.2012.3027
EFSA PLH Panel (EFSA Panel on Plant Health), 2013a. Scientific opinion on the risks posed by Prunus pollen, as well as pollen from seven additional plant genera, for the introduction of viruses and virus-like organisms into the EU. EFSA Journal 2013;11(10):3375, 50 pp. https://doi.org/10.2903/j.efsa.2013.3375
EFSA PLH Panel (EFSA Panel on Plant Health), 2013b. Scientific Opinion on the risks to plant health posed by Bemisia tabaci species complex and viruses it transmits for the EU territory. EFSA Journal 2013;11(4):3162, 302 pp. https://doi.org/10.2903/j.efsa.2013.3162
EFSA PLH Panel (EFSA Panel on Plant Health), 2014. Scientific Opinion on the pest categorisation of Tomato yellow leaf curl virus and related viruses causing tomato yellow leaf curl disease in Europe. EFSA Journal 2014;12 (10):3850, 27 pp. https://doi.org/10.2903/j.efsa.2014.3850
EFSA PLH Panel (EFSA Panel on Plant Health), 2017. Pest categorisation of Beet curly top virus (non-EU isolates). EFSA Journal 2017;15(10):4998, 23 pp. https://doi.org/10.2903/j.efsa.2017.4998
EFSA PLH Panel (EFSA Panel on Plant Health), 2018a. Guidance on quantitative pest risk assessment. EFSA Journal 2018;16(8):5350, 86 pp. https://doi.org/10.2903/j.efsa.2018.5350

EFSA PLH Panel (EFSA Panel on Plant Health), 2018b. Pest categorisation of Xiphinema americanum sensu lato. EFSA Journal 2018;16(7):5298, 43 pp. https://doi.org/10.2903/j.efsa.2018.5298
EFSA PLH Panel (EFSA Panel on Plant Health), 2019a. Pest categorisation of non-EU viruses and viroids of *Cydonia* Mill., *Malus* Mill. and *Pyrus* L. EFSA Journal 2019;17(9):5590, 81 pp. https://doi.org/10.2903/j.efsa.2019.5590, accepted for publication.
EFSA PLH Panel (EFSA Panel on Plant Health), 2019b. Pest categorisation of non-EU viruses and viroids of *Prunus* L. EFSA Journal 2019;17(9):5735, 84 pp. https://doi.org/10.2903/j.efsa.2019.5735, accepted for publication.
EFSA PLH Panel (EFSA Panel on Plant Health), Schenk M, Camilleri M, Diakaki M and Vos S, 2019c. Pest survey card on Epitrix cucumeris, Epitrix papa, Epitrix subcrinita and Epitrix tuberis. EFSA Supporting Publications 2019:16(2):EN-1571. 24 pp. https://doi.org/10.2903/sp.efsa.2019.en-1571
EFSA PLH Panel (EFSA Panel on Plant Health), 2020. Scientific Opinion on the list of non-EU viruses and viroids infecting potato (Solanum tuberosum) and other tuber-forming Solanum species. EFSA Journal, 2020;18 (1):5852, 25 pp. https://doi.org/10.2903/j.efsa.2020.5852
EPPO (European and Mediterranean Plant Protection Organization), online. EPPO global database. Available online: https://gd.eppo.int
EPPO diagnostic protocol PM 7/118 (1), 2013. Tomato chlorosis virus and Tomato infectious chlorosis virus. OEPP/EPPO Bulletin, 43, 462–470.
EPPO diagnostic protocol PM7/132(1), 2018.Andean potato latent virus and Andean potato mild mosaic virus. OEPP/EPPO Bulletin, 48, 405–413.
FAO (Food and Agriculture Organization of the United Nations), 1995. ISPM (International standards for phytosanitary measures) No 4. Requirements for the establishment of pest free areas. Available online: https://www.ippc.int/en/publications/614/
FAO (Food and Agriculture Organization of the United Nations), 2004. ISPM (International Standards for Phytosanitary Measures) 21—Pest risk analysis of regulated non-quarantine pests. FAO, Rome, 30 pp. Available online: https://www.ippc.int/sites/default/files/documents//1323945746_ISPM_21_2004_En_2011-11-29_Refor.pdf
FAO (Food and Agriculture Organization of the United Nations), 2013. ISPM (International Standards for Phytosanitary Measures) 11—Pest risk analysis for quarantine pests. FAO, Rome, 36 pp. Available online: https://www.ippc.int/sites/default/files/documents/20140512/ispm_11_2013_en_2014-04-30_201405121523-494.65%20KB.pdf
FAO (Food and Agriculture Organization of the United Nations), 2017. ISPM (International standards for phytosanitary measures) No 5. Glossary of phytosanitary terms. Available online: https://www.ippc.int/en/publications/622/
Fauna Europea, 2019. Available online: https://fauna-eu.org/
Fletcher J, Tang J, Blouin A, Ward L, MacDiarmid R and Ziebell H, 2016. Red clover vein mosaic virus-A Novel Virus to New Zealand that is Widespread in Legumes. Plant Disease, 100, 890–895.
Fortes IM and Navas-Castillo J, 2012. Potato, an experimental and natural host of the crinivirus Tomato chlorosis virus. European Journal of Plant Pathology, 134, 81–86.
Fox A, Fowkes A, Buxton-Kirk A, Jackson L, Forde S, Ward R, MacIvor A, Harju V, Skelton A and Adams I, 2016. First report of Potato aucuba mosaic virus in Solanum jasminoides in the United Kingdom. New Disease Reports, 34, 32.
Fox A, Fowkes AR, Skelton A, Harju V, Buxton-Kirk A, Kelly M, Forde SMD, Pufal H, Conyers C, Ward R, Weekes R, Boonham N and Adams IP, 2019. Using high-throughput sequencing in support of a plant health outbreak reveals novel viruses in Ullucus tuberosus (Basellaceae). Plant Pathology.
Franco-Lara L, Rodríguez D and Guzmán-Barney M, 2013. Prevalence of potato yellow vein virus (PYVV) in Solanum tuberosum Group Phureja Fields in Three States of Colombia. American Journal of Potato Research, 90, 324–330.
Freeman A, 2008. Red Clover Vein Mosaic Virus: Industry Biosecurity Plan for the Grains Industry Threat. Specific Contingency Plan.
Freitas DMS, Nardin I, Shimoyama N, Souza-Dias JAC and Rezende JAM, 2012. First Report of Tomato chlorosis virus in Potato in Brazil. Plant Disease, 96, 593–593.
Fribourg CE, 1977. Andean Potato Calico Strain of Tobacco Ringspot Virus. Etiology, 174–178.
Fribourg CE, Jones RAC and Koenig R, 1977a. Andean potato mottle, an new member of the cowpea mosaic virus group. Phytopathology, 67, 969–974.
Fribourg CE, Jones RAC and Koenig R, 1977b. Host plant reactions, physical properties and serology of three isolates of Andean potato latent virus from Peru. Annals of Applied Biology, 86, 373–380.
Fribourg CE, Jones R and Koenig R, 1979. Description of plant viruses, andean potato mottle virus. Available online: http://www.dpvweb.net/dpv/showdpv.php?dpvno=203
Fribourg CE, Gibbs AJ, Adams IP, Boonham N and Jones RAC, 2019. Biological and Molecular Properties of Wild potato mosaic virus Isolates from Pepino (Solanum muricatum). Plant Disease.
Geng C, Zhu T-S, Liu J-L, Li X-D, Tian Y-P and Gao R, 2014. First report of tobacco vein banding mosaic virus in potato in china. Journal of Plant Pathology, 96, S4. 127.
Geraud-Pouey F, Chirinos DT, Galindo-Castro I, Franco MA, Santana MA, Gillis A and Romay G, 2016. Occurrence of Six Begomoviruses Infecting Tomato Fields in Venezuela and Genetic Characterization ofPotato Yellow Mosaic VirusIsolates. Journal of Phytopathology, 164, 697–703.

Gergerich RC and Scott HA, 1996. Comoviruses: Transmission, Epidemiology, and Control. in: the plant viruses, 77–98.
Germain JF, Chatot C, Meusnier I, Artige E, Rasplus JY and Cruaud A, 2013. Molecular identification of Epitrix potato flea beetles (Coleoptera: Chrysomelidae) in Europe and North America. Bulletin of Entomological Research, 103, 354–362.
Ghosh D, Brooks RE, Wang R, Lesnaw J and Goodin MM, 2008. Cloning and subcellular localization of the phosphoprotein and nucleocapsid proteins of Potato yellow dwarf virus, type species of the genus Nucleorhabdovirus. Virus Research, 135, 26–35.
Gil JF, Adams I, Boonham N, Nielsen SL and Nicolaisen M, 2016. Molecular and biological characterisation of two novel pomo-like viruses associated with potato (Solanum tuberosum) fields in Colombia. Archives of Virology, 161, 1601–1610.
Guzmán-Barney M, Franco-Lara L, Rodríguez D, Vargas L and Fierro JE, 2012. Yield Losses in Solanum tuberosum Group Phureja Cultivar Criolla Colombia in Plants with Symptoms of PYVV in Field Trials. American Journal of Potato Research, 89, 438–447.
Habera LF, Berger PH and Reddick BB, 1994. Molecular evidence from 3'-terminus sequence analysis that tobacco vein-banding mosaic virus is a distinct member of the potyvirus group. Archives of Virology, 138, 27–38.
Hameed A, Tahir MN, Amin I and Mansoor S, 2017. First Report of Tomato leaf curl New Delhi virus and a Tomato yellow leaf curl Thailand betasatellite Causing Severe Leaf Curl Disease of Potato in Pakistan. Plant Disease, 101, 1065–1065.
Higa SY and Namba R, 1971. Vectors of the papaya mosaic virus in Hawaii. Proceedings of the Hawaiian Entomological Society, 21, 93–96.
Hooker WJ and Salazar LF, 1983. A new plant virus from the high jungle of the Eastern Andes; Solanum apical leaf curling virus (SALCV). Annals of Applied Biology, 103, 449–454.
Hooker WJ, Salazar LF and Brown CR, 1983. Field infection of potato by the solanum apical leaf curling virus (SALCV). American Potato Journal, 60, 810.
Hooker WJ, Salazar LF and Brown CR, 1985. Field infection of potato by the solanum apical leaf curling virus (SALCV). American Journal of Potato Research, 62, 263–272.
ICTV, 2011. Virus taxonomy - Classification and Nomenclature of Viruses. Ninth Report of the International Committee on Taxonomy of Viruses. Editors: Andrew M.Q. King, Michael J. Adams, Eric B. Carstens, and Elliot J. Lefkowitz. Elsevier Academic Press. ISBN: 978-0-12-384684-6.
ICTV, 2012. Virus Taxonomy: Ninth Report of the International Committee on Taxonomy of Viruses.
ICTV, 2018b. Release, v1. Virus Taxonomy. Available online: https://talk.ictvonline.org/taxonomy/
INRA, 2013. Available online: http://ephytia.inra.fr/en/C/10907/Tobacco-Tobacco-vein-banding-mosaic-virus-TVBMV [Accessed: 13 June 2019].
Jackson AO, Dietzgen RG, Goodin MM and Li Z, 2018. Development of Model Systems for Plant Rhabdovirus Research. Advances in Virus Research, 102, 23–57.
Jaidi M, Srivastava A, Kumar S, Raj SK and Singh R, 2015. First report of natural occurence of Papaya leaf crumple virus on soyabean in India. Disease Reports, New.
Jeffries CJ, 1998. FAO-IPGRI Technical guidelines for the safe movement of germplasm no19 potato_IPGRI.
Jones RA, 1981. Oca Strain of Arracacha Virus B from Potato in Peru. Plant Disease, 65, 753.
Jones RAC, 1982. Tests for transmission of four potato viruses through potato true seed. Annals of Applied Biology, 100, 315–320.
Jones RAC and Fribourg CE, 1977. Beetle, contact and potato true seed transmission of Andean potato latent virus. Annals of Applied Biology, 86, 123–128.
Jones RAC and Fribourg CE, 1978. Symptoms induced by Andean potato latent virus in wild and cultivated potatoes. Potato Research, 21, 121–127.
Jones RAC and Fribourg CE, 1979. Host Plant Reactions, Some Properties, and Serology of Wild Potato Mosaic Virus. Phytopathology, 69, 446.
Jones RAC and Kenten RH, 1981. A Strain of Arracacha Virus B infecting Oca (Oxalis tuberosa: Oxalidaceae) in the Peruvian Andes. Journal of Phytopathology, 100, 88–95.
Jones RAC and Kenten RH, 1983. Arracacha virus B. Available online: http://www.dpvweb.net/dpv/showdpv.php?dpvno=270
Jones RAC, Fribourg CE and Slack SA, 1982. Plant virus slide set; set 2 Potato virus and virus like diseases. American Journal of Potato Research.
Jones RA, Fribourg CE and Koenig R, 1983. A Previously Undescribed Nepovirus Isolated from Potato in Peru. Phytopathology, 73, 195.
Kassanis B and Govier DA, 1972. Potato aucuba mosaic virus. DPV, 98, http://www.dpvweb.net/dpv/showdpv.php?dpvno=098
Khan AJ, Akhtar S, Singh AK and Briddon RW, 2013. A Distinct Strain of Tomato leaf curl Sudan virus Causes Tomato Leaf Curl Disease in Oman. Plant Disease, 97, 1396–1402.
Kraft JM, Larsen RC and Inglis DA, 1998. Diseases of pea. In; The pathology of food and pasture legumes. Editor. CAB International.

Kreuze J, Koenig R, De Souza J, Vetten HJ, Muller G, Flores B, Ziebell H and Cuellar W, 2013. The complete genome sequences of a Peruvian and a Colombian isolate of Andean potato latent virus and partial sequences of further isolates suggest the existence of two distinct potato-infecting tymovirus species. Virus Research, 173, 431–435.
Larsen RC and Miklas PN, 2001. Effect of red Clover Vein Mosaic Carlavirus Infection on Seed Production and Biomass Yield in Chickpea, Phytopathology, 91.
Larsen RC, Wyatt SD and Druffel KL, 2009. The complete nucleotide sequence and genome organization of red clover vein mosaic virus (genus Carlavirus). Archives of Virology, 154, 891–894.
Li R, Salih S and Hurtt S, 2004. Detection of Geminiviruses in Sweetpotato by Polymerase Chain Reaction. Plant Disease, 88, 1347–1351.
Li YY, Zhang RN, Xiang HY, Abouelnasr H, Li DW, Yu JL, McBeath JH and Han CG, 2013. Discovery and Characterization of a Novel Carlavirus Infecting Potatoes in China. PLoS ONE, 8, e69255.
Lister RM and Murant AF, 1967. Seed-transmission of nematode-borne viruses. Annals of Applied Biology, 59, 49–62.
Lizárraga C, Querci M, Santa Cruz M, Bartolini I and Salazar LF, 2000. Other Natural Hosts of Potato virus T. Plant Disease, 84, 736–738.
Loebenstein G, Berger PH, Brunt AA and Lawson RH, 2001. Virus and Virus-like diseases of potatoes and production of seed-potatoes. Editor.
Lopez R, Asensio C, Guzman MM and Boonham N, 2006. Development of real-time and conventional RT-PCR assays for the detection of potato yellow vein virus (PYVV). Journal of Virological Methods, 136, 24–29.
López-Sesé AI and Gómez-Guillamón MI, 2000. Resistance to Cucurbit Yellowing Stunting Disorder Virus (CYSDV) in Cucumis melo L. HortScience, 35, 110–113.
Macedo MA, Michereff Filho M, Navas-Castillo J and Inoue-Nagata AK, 2015. Host range and whitefly transmission efficiency of Tomato severe rugose virus and Tomato golden vein virus in tomato plants. Tropical Plant Pathology, 40, 405–409.
Macedo MA, Barreto SS, Costa TM, Rocha GA, Dianese EC, Gilbertson RL and Inoue-Nagata AK, 2017. First Report of Tomato severe rugose virus, a Tomato-Infecting Begomovirus, in Soybean Plants in Brazil. Plant Disease, 101, 1959–1959.
Manoussopoulos IN, 2000. Aphid Transmission of Potato aucuba mosaic virus Strains Mediated by Different Strains of Potato virus Y. Journal of Phytopathology, 148, 327–331.
Manoussopoulos IN, 2001. Acquisition and Retention of Potato virus Y Helper Component in the Transmission of Potato aucuba mosaic virus by Aphids. Journal of Phytopathology, 149, 103–106.
Martinez Zubiaur Y, de Blas C, Quiñones M, Castellanos C, Peralta EL and Romero J, 1998. Havana tomato virus, a new bipartite geminivirus infecting tomatoes in Cuba. Archives of Virology, 143, 1757–1772.
Massa GA, Segretin ME, Colavita M, Riero MF, Bravo-Almonacid F and Feingold S, 2006. Biological and sequence data suggest that potato rough dwarf virus (PRDV) and potato virus P (PVP) are strains of the same species. Archives of Virology, 151, 1243–1247.
Matthews REF, 1991. Plant virology, third edition. Editor. Academic press, INC,
Mink GI, 1993. Pollen and seed-transmitted viruses and viroids. Annual Review of Phytopathology, 31, 375–402.
Monger WA, Mumford RA, Antonio García E and Boa E, 2008. Occurrence of Tomato mosaic Havana virus in Nicaragua. Plant Pathology, 57, 387–387.
Morales FJ and Anderson PK, 2001. The emergence and dissemination of whitefly-transmitted geminiviruses in Latin America. Archives of Virology, 146, 415–441.
Morales FJ, Lastra R, Uzcátegui de RC and Calvert L, 2001. Potato yellow mosaic virus: a synonym of Tomato yellow mosaic virus. Archives of Virology, 146, 2249–2253.
Moriones E, Praveen S and Chakraborty S, 2017. Tomato Leaf Curl New Delhi Virus: An Emerging Virus Complex Threatening Vegetable and Fiber Crops. Viruses, 9, 264.
Mossop DW, 1982. Potato aucuba mosaic virus - a latent virus of tamarillo (Cyphomandra betacea(Cav.) Sendt.). New Zealand Journal of Agricultural Research, 25, 449–453.
Moura MF, Ruschel RG, Gotardi GA, Watanabe LFM, Rêgo CM, Inoue-Nagata AK, Pavan MA, Marques Rezende JA and Krause-Sakate R, 2018. First report of tomato severe rugose virus in eggplant. Journal of Plant Pathology, 100, 599.
Mubin M, Briddon RW and Mansoor S, 2009. Complete nucleotide sequence of chili leaf curl virus and its associated satellites naturally infecting potato in Pakistan. Archives of Virology, 154, 365–368.
Muñoz Baena L, Gutiérrez Sánchez PA and Marín Montoya M, 2017. Secuenciación del genoma completo del Potato yellow vein virus (PYVV) en tomate (Solanum lycopersicum) en Colombia. Acta Biológica Colombiana, 22, 5.
Namba R and Kawanish CY, 1966. Transmission of Papaya mosaic virus by the green Peach aphid. Journal of Economic Entomology, 59, 669–671.
Natural museum Wales, 2019a. Available online: https://naturalhistory.museumwales.ac.uk/vectors/browsespecies.php?-recid = 592 [Accessed: 22 May 2019].
Natural museum Wales, 2019b. https://naturalhistory.museumwales.ac.uk/vectors/browsespecies.php?-recid=727 [Accessed 22 May 2019]
Navas-Castillo J, Camero R, Bueno M and Moriones E, 2000. Severe Yellowing Outbreaks in Tomato in Spain Associated with Infections of Tomato chlorosis virus. Plant Disease, 84, 835–837.

Nie X, Bai Y, Molen TA and Desjardins DC, 2008. Development of universal primers for detection of potato carlaviruses by RT-PCR. Journal of Virological Methods, 149, 209–216.
Nisbet C, Butzonitch I, Colavita M, Daniels J, Martin J, Burns R, George E, Akhond MAY, Mulholland V and Jeffries CJ, 2006. Characterization of Potato rough dwarf virus and Potato virus P: distinct strains of the same viral species in the genus Carlavirus. Plant Pathology, 55, 803–812.
Noa-Carrazana JC, Gonzalez-de-Leon D, Ruiz-Castro BS, Pinero D and Silva-Rosales L, 2006. Distribution of Papaya ringspot virus and Papaya mosaic virus in Papaya Plants (Carica papaya) in Mexico. Plant Disease, 90, 1004–1011.
Orfanidou CG, Papayiannis LC, Pappi PG, Katis NI and Maliogka VI, 2019. Criniviruses associated with Cucurbit yellows disease in Greece and Cyprus: an ever changing scenery. Plant Pathology, 68, 764–774.
Orlova-Bienkowskaja MJ, 2015. Epitrix papa sp. n. (Coleoptera: Chrysomelidae: Galerucinae: Alticini), previously misidentified as Epitrix similaris, is a threat to potato production in Europe. European Journal of Entomology, 112, 824–830.
Papayiannis LC, Ioannou N, Boubourakas IN, Dovas CI, Katis NI and Falk BW, 2005. Incidence of Viruses Infecting Cucurbits in Cyprus. Journal of Phytopathology, 153, 530–535.
Pirone TP and Perry KL, 2002. Aphids: Non-persistent transmission. Advances in Botanical Research, 36, 1–19.
Polston JE, Hladky LL, Akad F and Wintermantel WM, 2008. First Report of Cucurbit yellow stunting disorder virus in Cucurbits in Florida. Disease Notes, 92, 1251.
Ramos PL, Guerra O, Peral R, Oramas P, Guevara RG and Rivera-Bustamante R, 1997. Taino Tomato Mottle Virus, a New Bipartite Geminivirus from Cuba. Plant Disease, 81, 1095–1095.
Rashid MO, Li Y-Y, Wang Y and Han CG, 2018. First Report of Potato virus H Infecting Potatoes in Bangladesh. Plant Disease.
Reddick BB, Collins-Shepard MH, Christie RG and Gooding GV, 1992. A New Virus Disease in North America Caused by Tobacco Vein-Banding Mosaic Virus. Plant Disease, 76, 856.
Revers F and Garcia JA, 2015. Molecular biology of potyviruses. Advances in Virus Research, 92, 101–199.
Ribeiro SG, Inoue-Nagata AK, Daniels J and de Ávila AC, 2006. Potato deforming mosaic disease is caused by an isolate of Tomato yellow vein streak virus. Plant Pathology, 55, 569.
Roberts EJ, Buck KW and Coutts RHA, 1986. A New Geminivirus Infecting Potatoes in Venezuela. Plant Disease, 70, 603.
Roggero P, Accotto GP, Ciuffo M, Lenzi R, Desbiez C, Lecoq H, Bosco D, Huang X and Gu Q, 2000. First Report of Tobacco vein banding mosaic virus in China (Xian, Shaanxi Province) in Datura stramonium and Tobacco. Plant Disease, 84, 1152.
Rojas MR, Gilbertson RL, Russel DR and Maxwell DP, 1993. Use of degenerate primers in the polymerase chain reaction to detect whitefly-transmitted geminiviruses. Plant Disease, 77, 340–347.
Romay G, Chririnos DT, Geraud-Pouey F, Torres M and Bragard C, 2016. First report of Potato yellow mosaic virus infecting Solanum americanum in Venezuela. New Disease Reports, 35, 20.
Rosen R, Kanakala S, Kliot A, Cathrin Pakkianathan B, Farich BA, Santana-Magal N, Elimelech M, Kontsedalov S, Lebedev G, Cilia M and Ghanim M, 2015. Persistent, circulative transmission of begomoviruses by whitefly vectors. Current Opinion in Virology, 15, 1–8.
Ruiz L, Simon A, Velasco L and Janssen D, 2017. Biological characterization of Tomato leaf curl New Delhi virus from Spain. Plant Pathology, 66, 376–382.
Russo M, Rubino L, De Stradis A and Martelli GP, 2009. The complete nucleotide sequence of potato virus T. Archives of Virology, 154, 321–325.
Salazar LF, 2006. Emerging and Re-emerging Potato Diseases in the Andes. Potato Research, 49, 43–47.
Salazar LF and Harrison BD, 1977. Two previously undescribed potato viruses from South America. Nature, 265, 337–338.
Salazar LF and Harrison BD, 1978a. Host range and properties of potato black ringspot virus. Annals of Applied Biology, 90, 375–386.
Salazar LF and Harrison BD, 1978b. Host range, purification and properties of potato virus T. Annals of Applied Biology, 89, 223–235.
Salazar LF and Harrison BD, 1978c. Particle Properties and Strains of Andean Potato Mottle Virus. Journal of General Virology, 39, 171–178.
Salazar LF, Muller G, Querci M, Zapata JL and Owens RA, 2000. Potato yellow vein virus: its host range, distribution in South America and identification as a crinivirus transmitted by Trialeurodes vaporariorum. Annals of Applied Biology, 137, 7–19.
Sander E, 1959. Biological properties of red clover vein mosaic virus. Phytopathology, 49, 749–754.
Sangeetha B, Malathi VG, Alice D, Suganthy M and Renukadevi P, 2018. A distinct seed-transmissible strain of tomato leaf curl New Delhi virus infecting Chayote in India. Virus Research, 258, 81–91.
Saxena S, Hallan V, Singh BP and Sane PV, 1998. Leaf Curl Disease of Carica papaya from India May Be Caused by a Bipartite Geminivirus. Plant Disease, 82, 126–126.
Schroeder M and Weidemann HL, 1990. Detection of quarantine viruses of potato by ELISA. EPPO Bulletin, 20, 581–590.

Senanayake DMJB, Varma A and Mandal B, 2012. Virus-vector Relationships, Host Range, Detection and Sequence Comparison of Chilli leaf curl virus Associated with an Epidemic of Leaf Curl Disease of Chilli in Jodhpur, India. Journal of Phytopathology, 160, 146–155.
Shi X, Tang X, Zhang X, Zhang D, Li F, Yan F, Zhang Y, Zhou X and Liu Y, 2018. Transmission Efficiency, Preference and Behavior of Bemisia tabaci MEAM1 and MED under the Influence of Tomato Chlorosis Virus. Frontiers in Plant Science, 8, 2271.
Silvestre R, Untiveros M and Cuellar WJ, 2011. First Report of Potato yellowing virus (Genus Ilarvirus) in Solanum phureja from Ecuador. Plant Disease, 95, 355–355.
Souza-Dias JAC, Sawazaki HE, Pernambuco-Fo PCA, Elias LM and Maluf H, 2008. Tomato severe rugose virus: Another Begomovirus Causing Leaf Deformation and Mosaic Symptoms on Potato in Brazil. Plant Disease, 92, 487–487.
Spetz C and Valkonen JP, 2003. Genomic sequence of Wild potato mosaic virus as compared to the genomes of other potyviruses. Archives of Virology, 148, 373–380.
Spetz C, Taboada AM, Darwich S, Ramsell J, Salazar LF and Valkonen JP, 2003. Molecular resolution of a complex of potyviruses infecting solanaceous crops at the centre of origin in Peru. Journal of General Virology, 84, 2565–2578.
Susaimuthu J, Agindotan BO, Miller LA and Perry KL, 2007. Potato aucuba mosaic virus in Potato in New York State. Plant Disease, 91, 1202–1202.
Tang J, 2016. Solanum tuberosum (Potato) Post-Entry Quarantine Testing Manual April 2016. Ministry for primary Industries, New Zealand.
Tenorio J, Chuquillanqui C, Garcia A, Guillen M, Chavez R and Salazar LF, 2003. Symptomatology and effect on potato yield of achaparramieto rugoso. Fitopathologia, 38, 32–36.
Tzanetakis IE, Martin RR and Wintermantel WM, 2013. Epidemiology of criniviruses: an emerging problem in world agriculture. Frontiers in Microbiology, 4, 119.
Untiveros M, Perez-Egusquiza Z and Clover G, 2010. PCR assays for the detection of members of the genus Ilarvirus and family Bromoviridae. Journal of Virological Methods, 165, 97–104.
Urbino C, Polston JE, Patte CP and Caruana ML, 2004. Characterization and genetic diversity of potato yellow mosaic virus from the Caribbean. Archives of Virology, 149, 417–424.
Usharani KS, Surendranath B, Paul-Khurana SM, Garg ID and Malathi VG, 2004. Potato leaf curl - a new disease of potato in northern India caused by a strain of Tomato leaf curl New Delhi virus. Plant Pathology, 53, 235–235.
Valkonen JPT, Pehu E and Watanabe K, 1992. Symptom expression and seed transmission of alfalfa mosaic virus and potato yellowing virus (SB-22) in Solanum brevidens and S. etuberosum. Potato Research, 35, 403–410.
Valverde RA, 1995. A Comovirus Affecting Tabasco Pepper in Central America. Plant Disease, 79, 421.
Varun P, Ranade SA and Saxena S, 2017. A molecular insight into papaya leaf curl-a severe viral disease. Protoplasma, 254, 2055–2070.
van der Vlugt RAA and Berendsen M, 2002. Development of a general potexvirus detection method. European Journal of Plant Pathology, 108, 367–371.
Wang HY, Gong HH, Yan ZY, Tang W, Zhu TS, Zhao M and Li XD, 2017. First report of Tobacco vein banding mosaic virus Infecting Sesame in China. Plant Disease, 101, 850–850.
Weber KA and Hampton RO, 1980. Transmission of two purified Carlaviruses by the pea aphid. Phytopathology, 70, 631.
Wei T and Clover G, 2008. Use of primers with 5' non-complementary sequences in RT-PCR for the detection of nepovirus subgroups A and B. Journal of Virological Methods, 153, 16–21.
Wintermantel WM, Gilbertson RL, McCreight JD and Natwick ET, 2016. Host-specific relationship between virus titer and whitefly transmission of cucurbit yellow stunting disorder virus. Plant Disease, 100, 92–98.
Wu X, Liu Q, Chai M, Liu J, Zhang L and Cheng X, 2018. First report of potato aucuba mosaic virus on potato in China. Plant Disease, 102, 2671. PDIS-05-18-0851.
Wyatt SD and Brown JK, 1996. Detection of subgroup III geminivirus isolates in leaf extracts by degenerate primers and polymerase chain reaction. Phytopathology, 86, 1288–1293.
Yuan T, Song Y, Li K, Han Q, Zhu CH and Wen F, 2012. Characterization of 10 tobacco vein banding mosaic virus isolates from China. Acta Virologica, 56, 19–24.
Zhou P, Zhang SY, Yu NT, Zhang YL, Wang JH and Liu ZX, 2014. First report of tobacco vein banding mosaic virus infection of wild eggplant in China. Journal of Plant Pathology, 96, 435.

Glossary

Containment (of a pest)	Application of phytosanitary measures in and around an infested area to prevent spread of a pest (FAO, 1995, FAO, 2017)
Control (of a pest)	Suppression, containment or eradication of a pest population (FAO, 1995, 2017)

Entry (of a pest)	Movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled (FAO, 2017)
Eradication (of a pest)	Application of phytosanitary measures to eliminate a pest from an area (FAO, 2017)
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2017)
Impact (of a pest)	The impact of the pest on the crop output and quality and on the environment in the occupied spatial units
Introduction (of a pest)	The entry of a pest resulting in its establishment (FAO, 2017)
Measures	Control (of a pest) is defined in ISPM 5 (FAO, 2017) as 'Suppression, containment or eradication of a pest population' (FAO, 1995). Control measures are measures that have a direct effect on pest abundance. Supporting measures are organisational measures or procedures supporting the choice of appropriate Risk Reduction Options that do not directly affect pest abundance.
Pathway	Any means that allows the entry or spread of a pest (FAO, 2017)
Phytosanitary measures	Any legislation, regulation or official procedure having the purpose to prevent the introduction or spread of quarantine pests, or to limit the economic impact of regulated non-quarantine pests (FAO, 2017)
Protected zones (PZ)	A Protected zone is an area recognised at EU level to be free from a harmful organism, which is established in one or more other parts of the Union.
Quarantine pest	A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (FAO, 2017)
Regulated non-quarantine pest	A non-quarantine pest whose presence in plants for planting affects the intended use of those plants with an economically unacceptable impact and which is therefore regulated within the territory of the importing contracting party (FAO, 2017)
Risk reduction option (RRO)	A measure acting on pest introduction and/or pest spread and/or the magnitude of the biological impact of the pest should the pest be present. A RRO may become a phytosanitary measure, action or procedure according to the decision of the risk manager
Spread (of a pest)	Expansion of the geographical distribution of a pest within an area (FAO, 2017)

Abbreviations

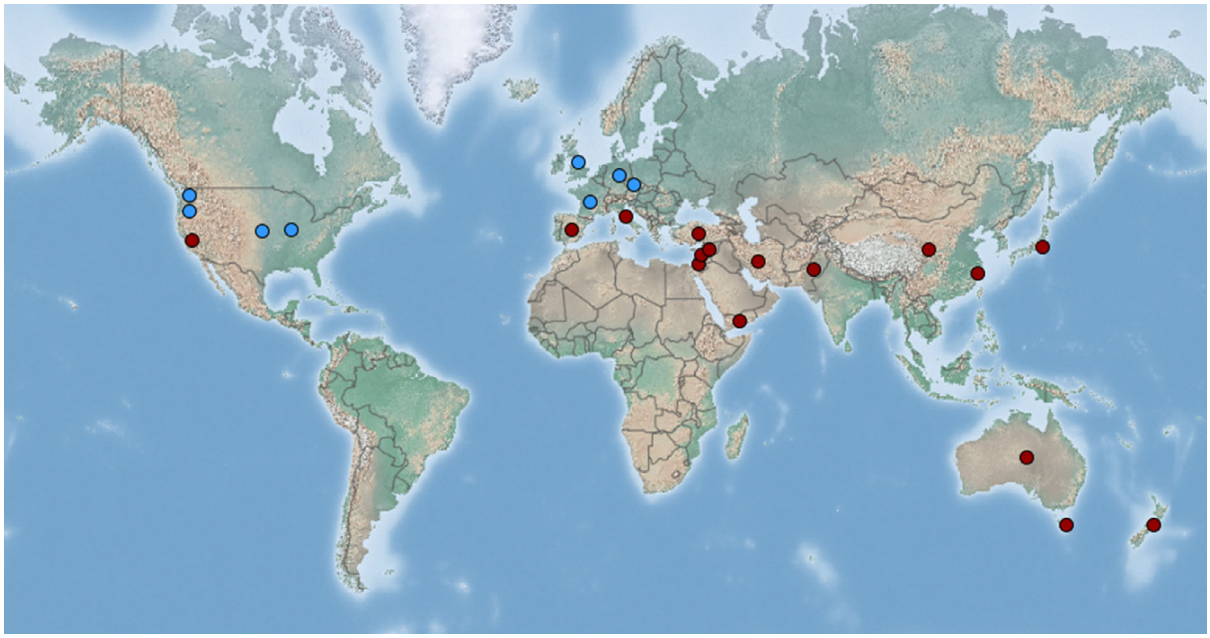
APLV	Andean potato latent virus
APMMV	Andean potato mild mosaic virus
APMoV	Andean potato mottle virus
AVB	arracacha virus B
ChiLCV	chilli leaf curl virus
CPSbV	Colombian potato soil-borne virus
CYSDV	Cucurbit yellow stunting disorder virus
EPPO	European and Mediterranean Plant Protection Organization
FAO	Food and Agriculture Organization
HTS	High-throughput sequencing
IPPC	International Plant Protection Convention
ISPM	International Standards for Phytosanitary Measures
MS	Member State
PaLCrV	papaya leaf crumple virus PAMV potato aucuba mosaic virus
PapMV	papaya mosaic virus
PBRSV	potato black ringspot virus
PLH	EFSA Panel on Plant Health

PotLV	potato latent virus
PVB	potato virus BPVH potato virus H
PVP	potato virus P
PVT	potato virus T
PVU	potato virus U
PYDV	Potato yellow dwarf virus
PYMV	potato yellow mosaic virus
PYVV	potato yellow vein virus
PYV	potato yellowing virus
SALCV	SB26/29, SB41, solanum apical leaf curling virus
PZ	Protected Zone
RCVMV	red clover vein mosaic virus
RNQP	Regulated Non-Quarantine Pest
TFEU	Treaty on the Functioning of the European Union
ToR	Terms of Reference
TVBMV	Tobacco vein banding mosaic virus
ToCV	tomato chlorosis virus
ToLCNDV	tomato leaf curl New Delhi virus
ToMHaV	tomato mosaic Havana virus
ToMoTV	tomato mottle Taino virus
ToSRV	tomato severe rugose virus
ToYVSV	tomato yellow vein streak virus
WPMV	wild potato mosaic virus

Appendix A – Virus distribution maps

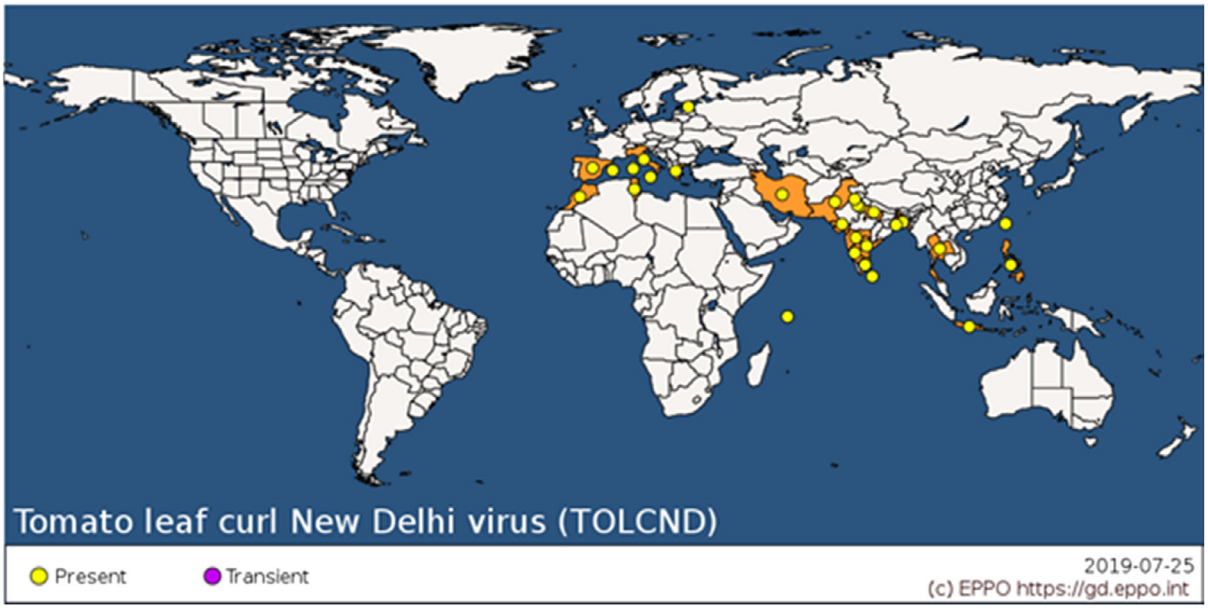
A.1. Distribution map of potato yellow mosaic virus (last updated: 2019-01-04)

Global distribution map extracted from CABI cpc, accessed on 5-4-2019.



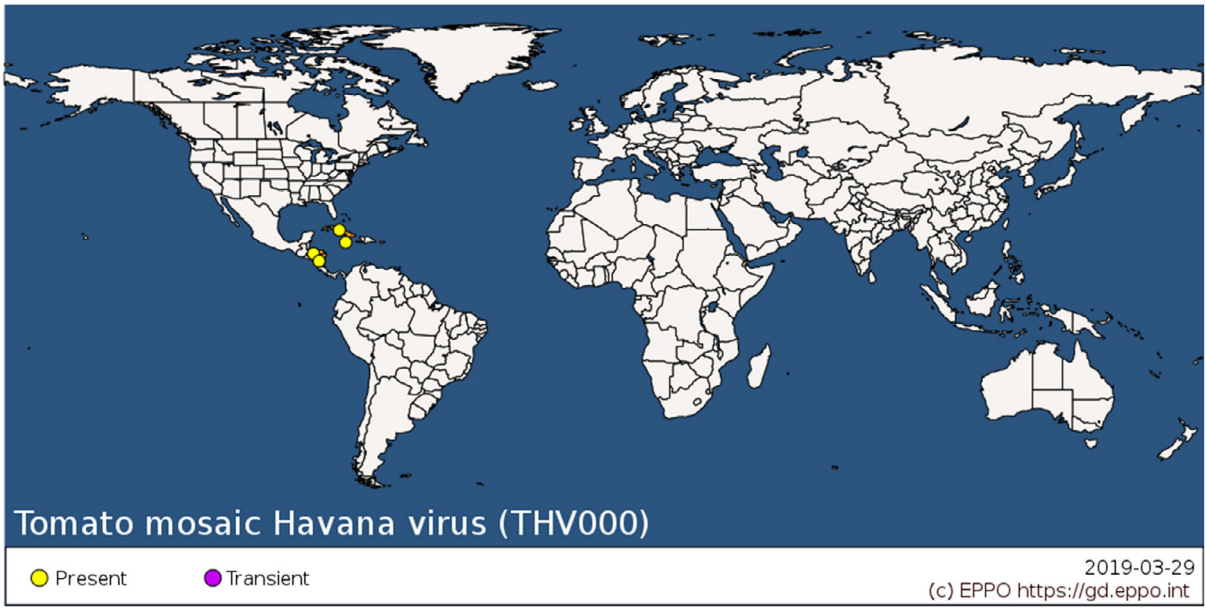
A.2. Distribution map of tomato leaf curl New Delhi virus (last updated: 2019-04-05)

Global distribution map extracted from the EPPO Global database on 25-7-2019.



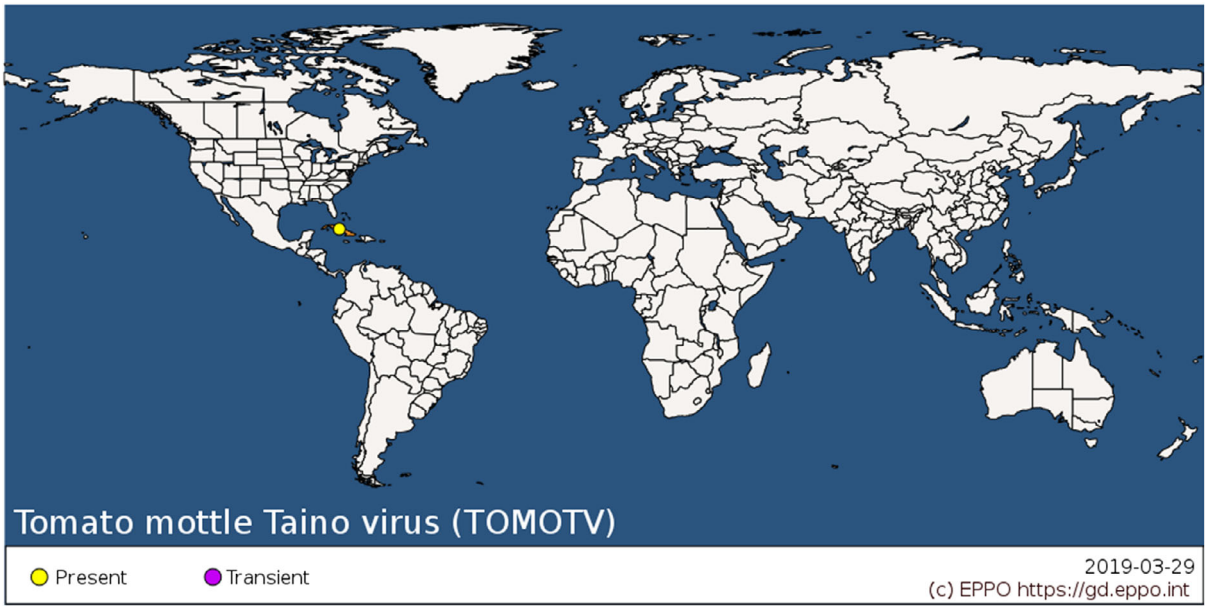
A.3. Distribution map of tomato mosaic Havana virus (last updated: 2010-03-11)

Global distribution map extracted from the EPPO Global database on 29-3-2019.



A.4. Distribution map of tomato mottle Taino virus (last updated: 2010-03-12)

Global distribution map extracted from the EPPO Global database on 29-3-2019.

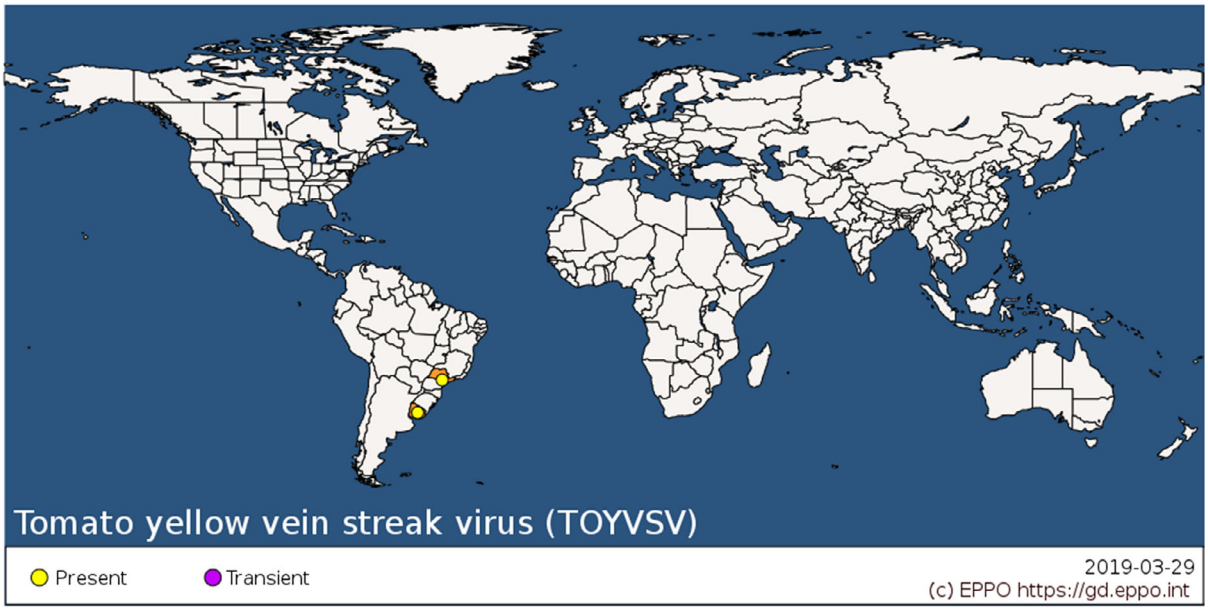


A.5. Distribution map of tomato severe rugose virus (last updated: 2018-07-15)

Global distribution map extracted from CABI cpc, accessed on 8-4-2019.

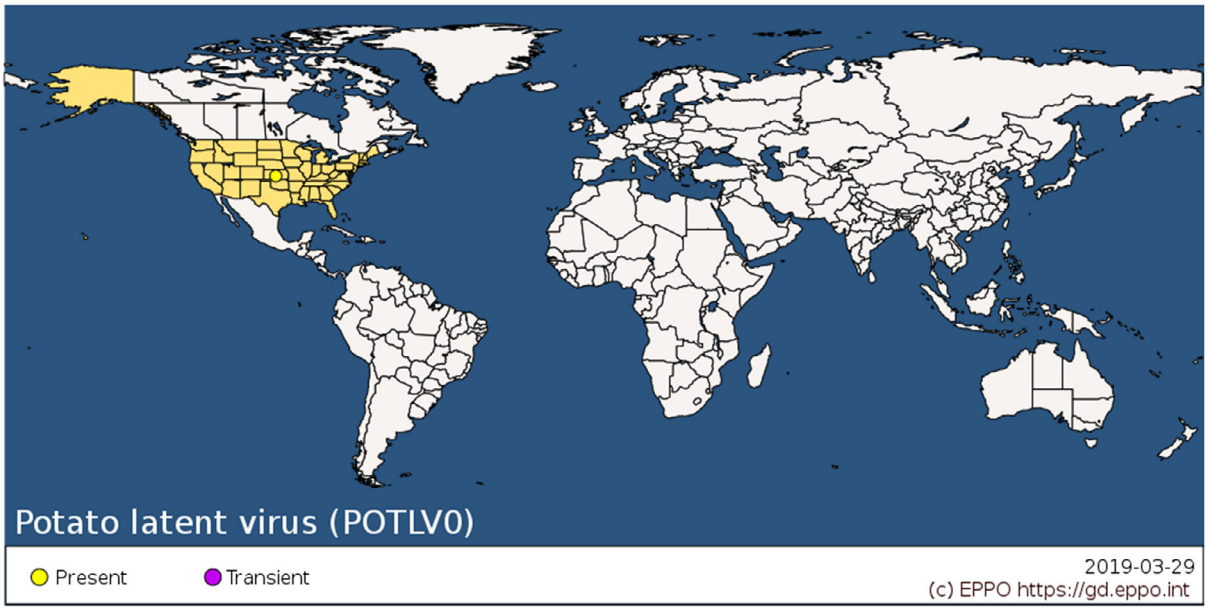
A.6. Distribution map of tomato yellow vein streak virus (last updated: 2016-02-16)

Global distribution map extracted from the EPPO Global database on 29-3-2019.



A.7. Distribution map of potato latent virus (last updated: 2010-03-04)

Global distribution map extracted from the EPPO Global database on 29-3-2019.



A.8. Distribution map of potato virus H (last updated: 2019-03-06)

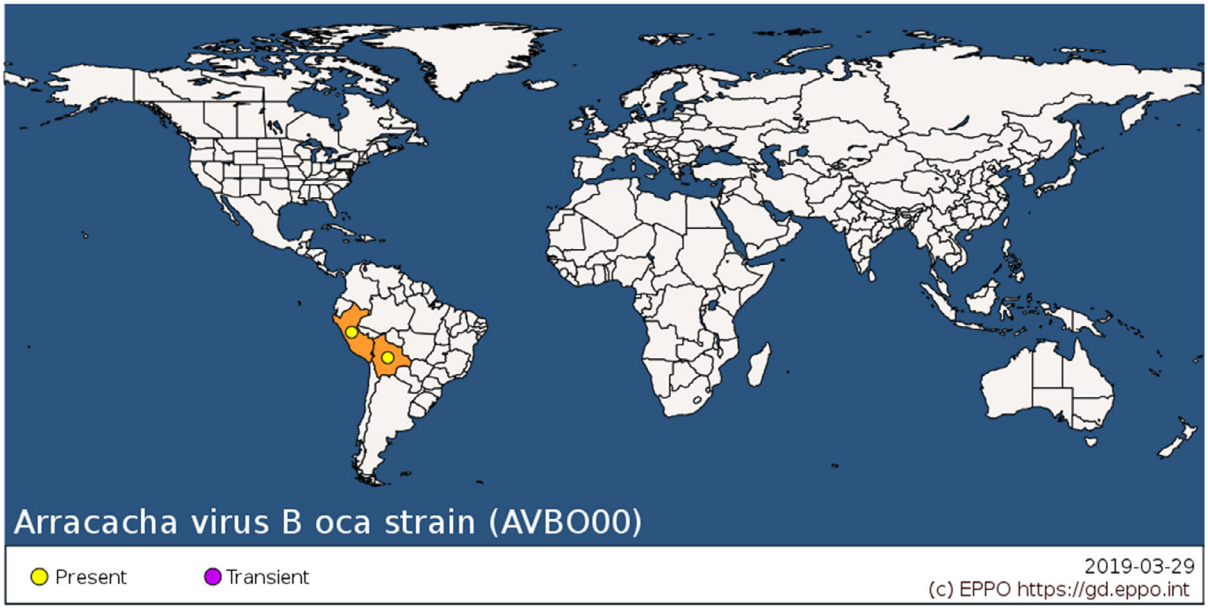
Global distribution map extracted from the EPPO Global database on 29-3-2019.

A.9. Distribution map of red clover vein mosaic virus (last updated: 2018-07-15)

Global distribution map extracted from CABI cpc, accessed on 8-4-2019.

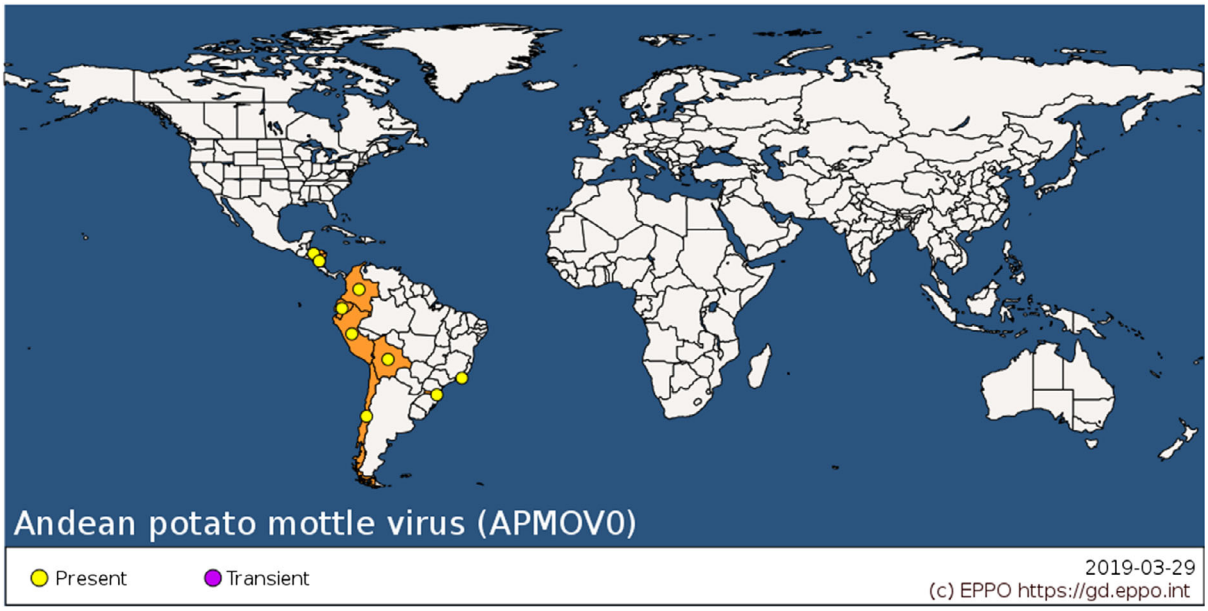
A.10. Distribution map of Arracacha virus B oca strain (last updated: 2017-09-12)

Global distribution map extracted from the EPPO Global database on 29-3-2019. Note: the distribution records on this map are specific for Arracacha virus B, oca strain.



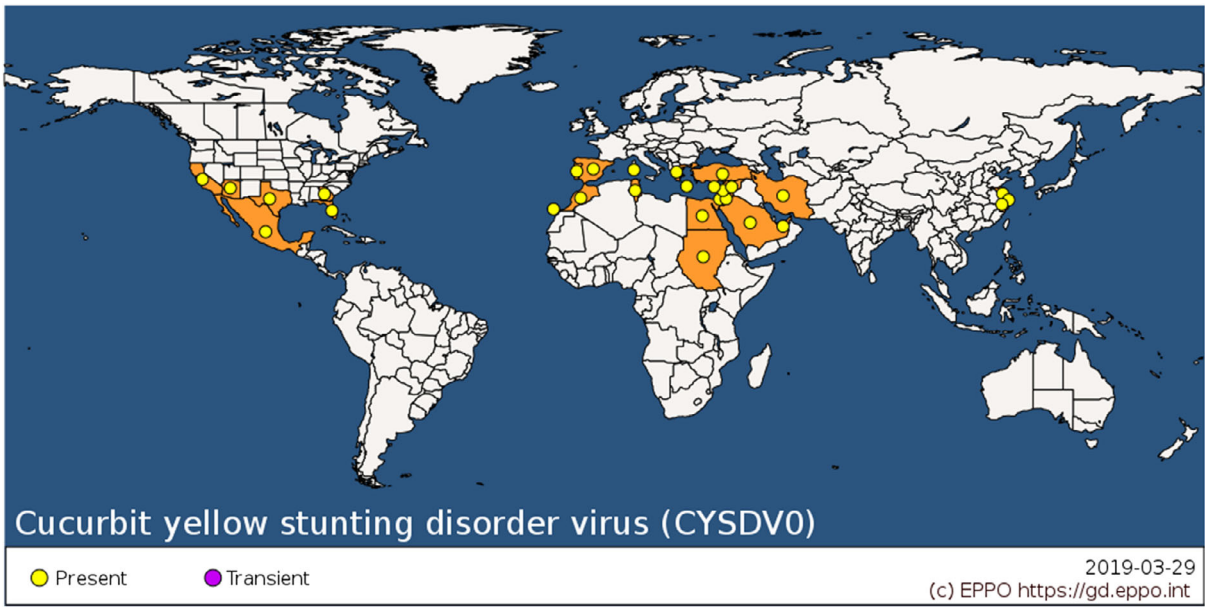
A.11. Distribution map of Andean potato mottle virus (last updated: 2018-05-30)

Global distribution map extracted from the EPPO Global database on 29-3-2019.



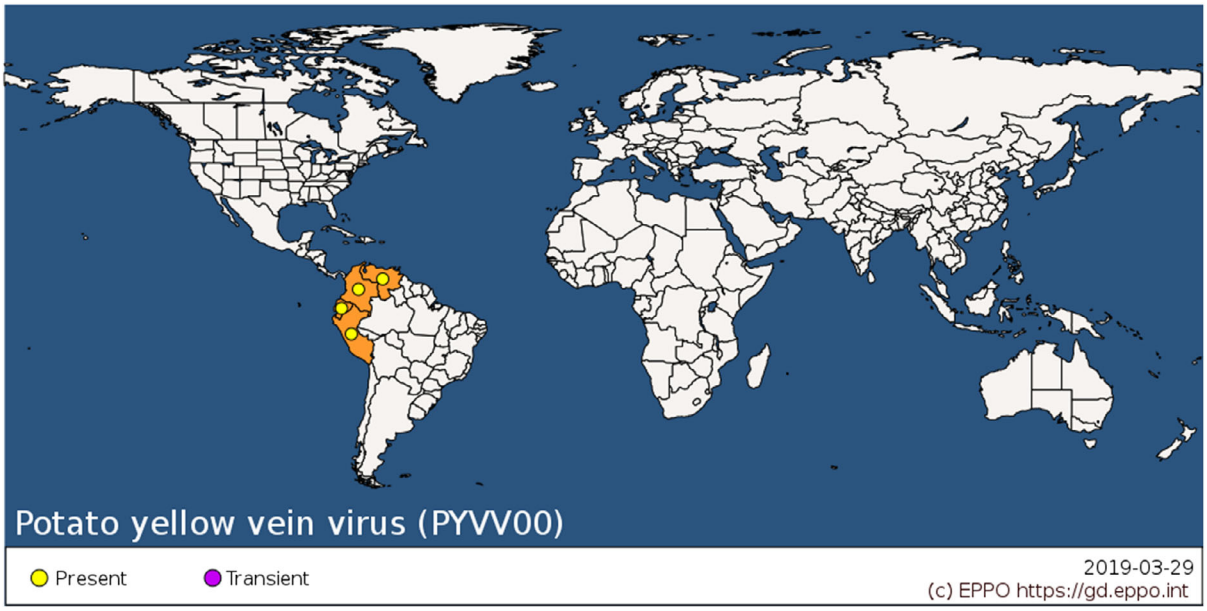
A.12. Distribution map of cucurbit yellow stunting disorder virus (last updated: 2018-05-28)

Global distribution map extracted from the EPPO Global database on 29-3-2019.



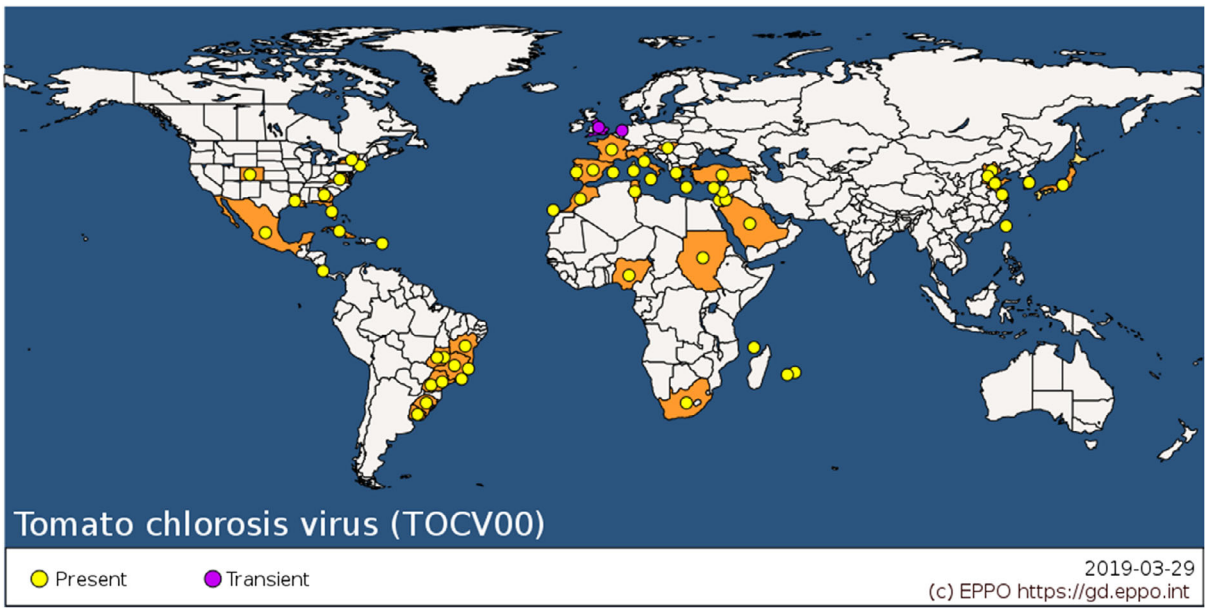
A.13. Distribution map of potato yellow vein virus (last updated: 2013-07-25)

Global distribution map extracted from the EPPO Global database on 29-3-2019.



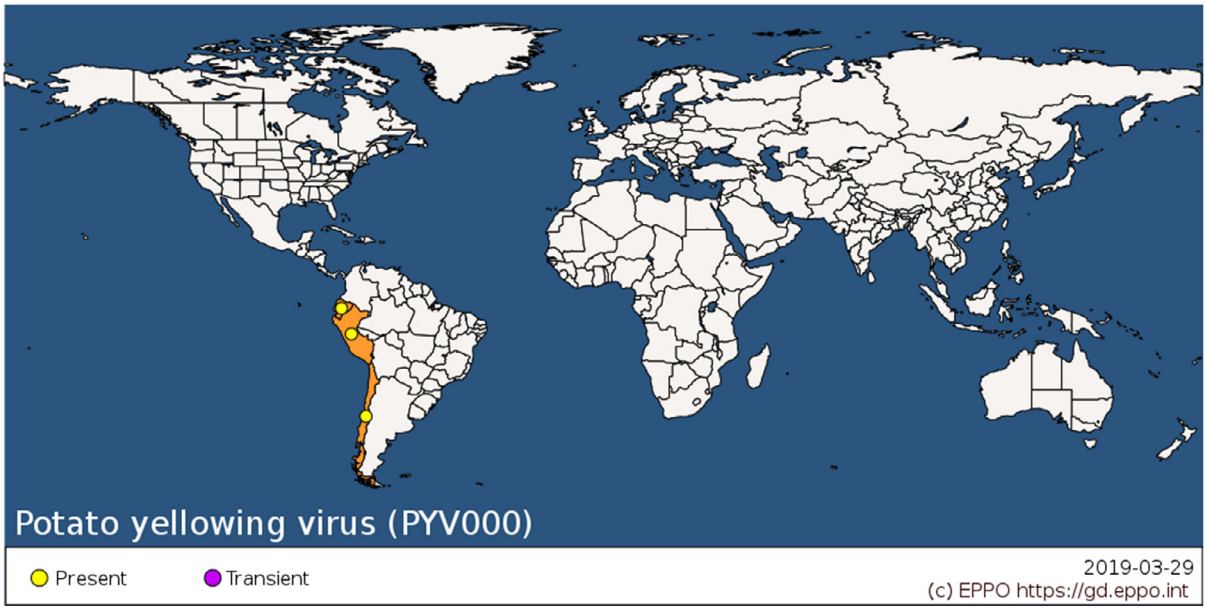
A.14. Distribution map of tomato chlorosis virus (last updated: 2018-07-03)

Global distribution map extracted from the EPPO Global database on 29-3-2019.



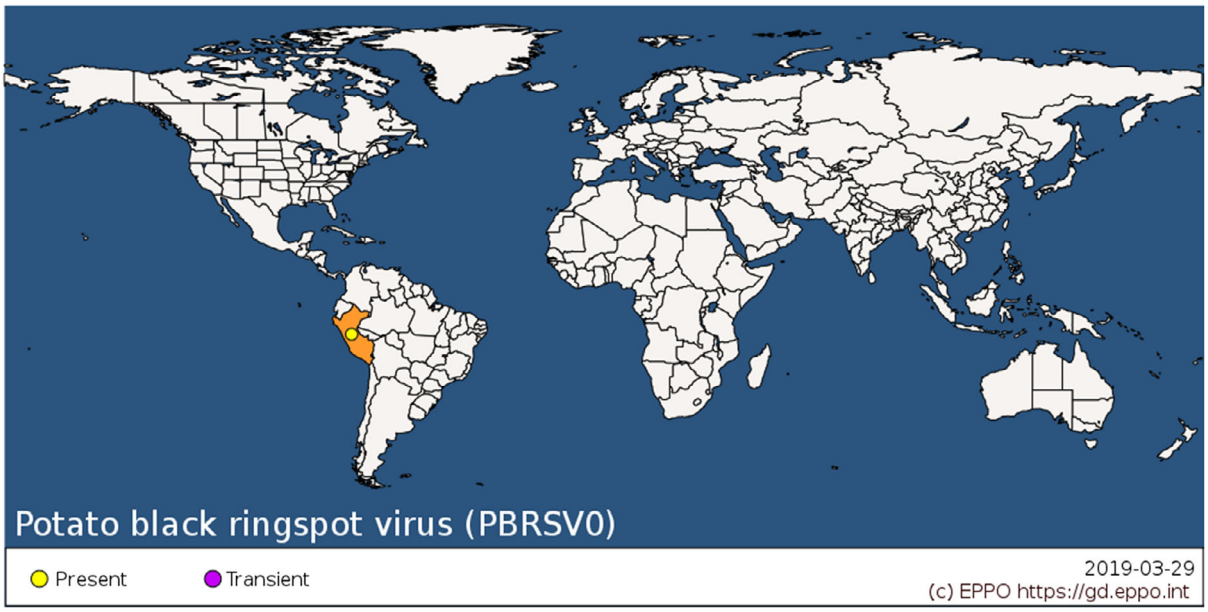
A.15. Distribution map of potato yellowing virus (last updated: 2016-09-05)

Global distribution map extracted from the EPPO Global database on 29-3-2019.



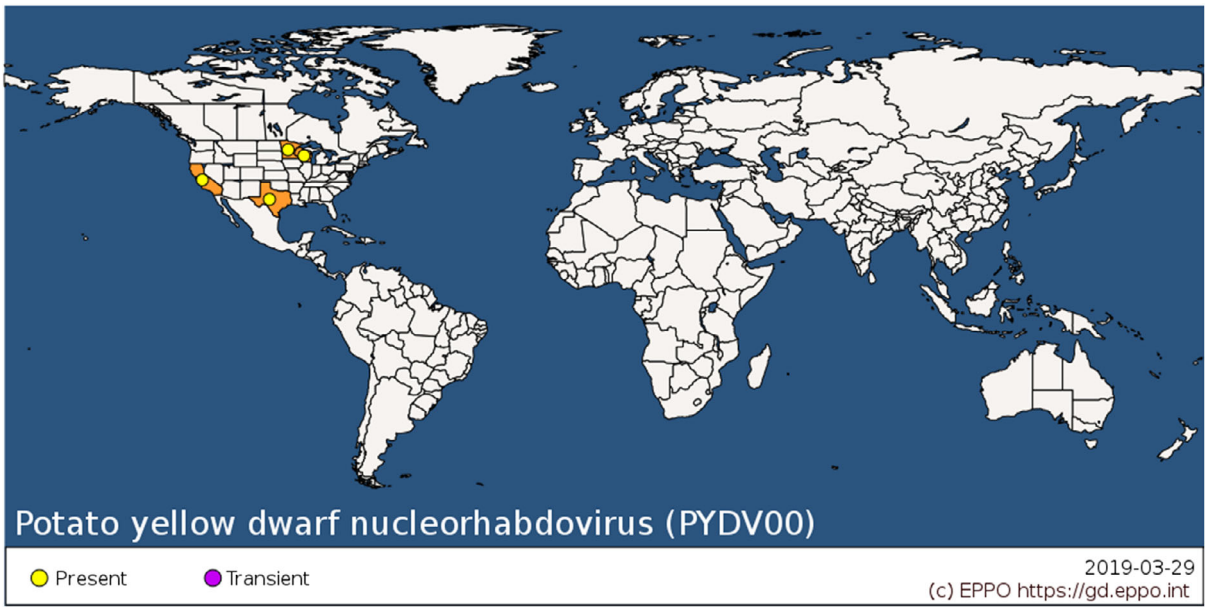
A.16. Distribution map of potato black ringspot virus (last updated: 2018-05-30)

Global distribution map extracted from the EPPO Global database on 29-3-2019.



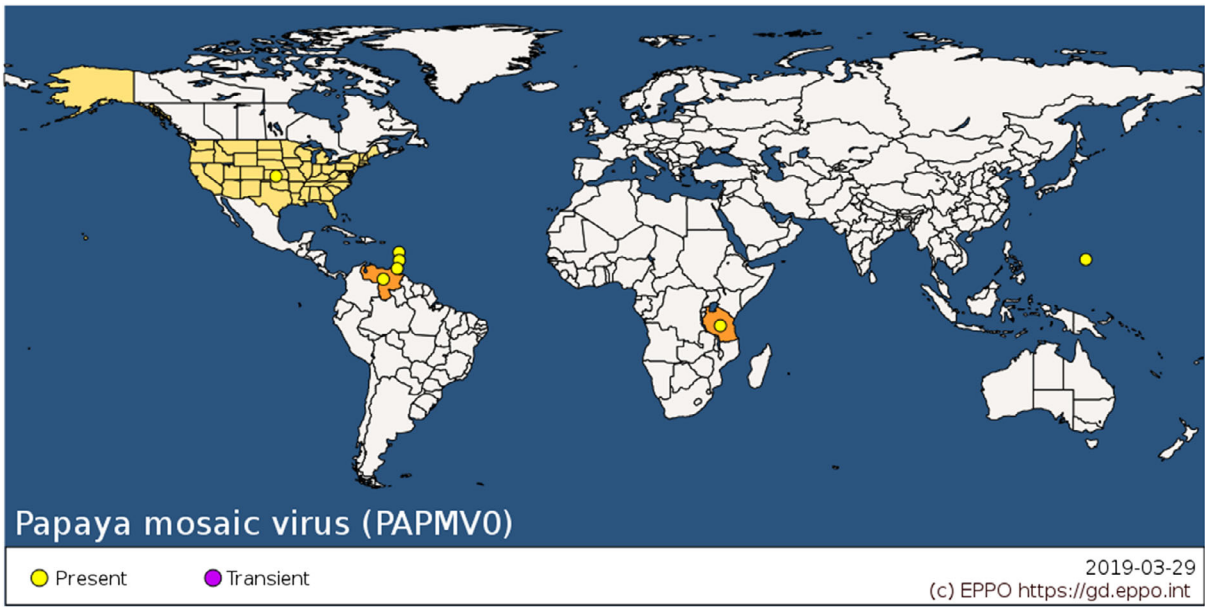
A.17. Distribution map of potato yellow dwarf virus (last updated: 2014-01-30)

Global distribution map extracted from the EPPO Global database on 29-3-2019.



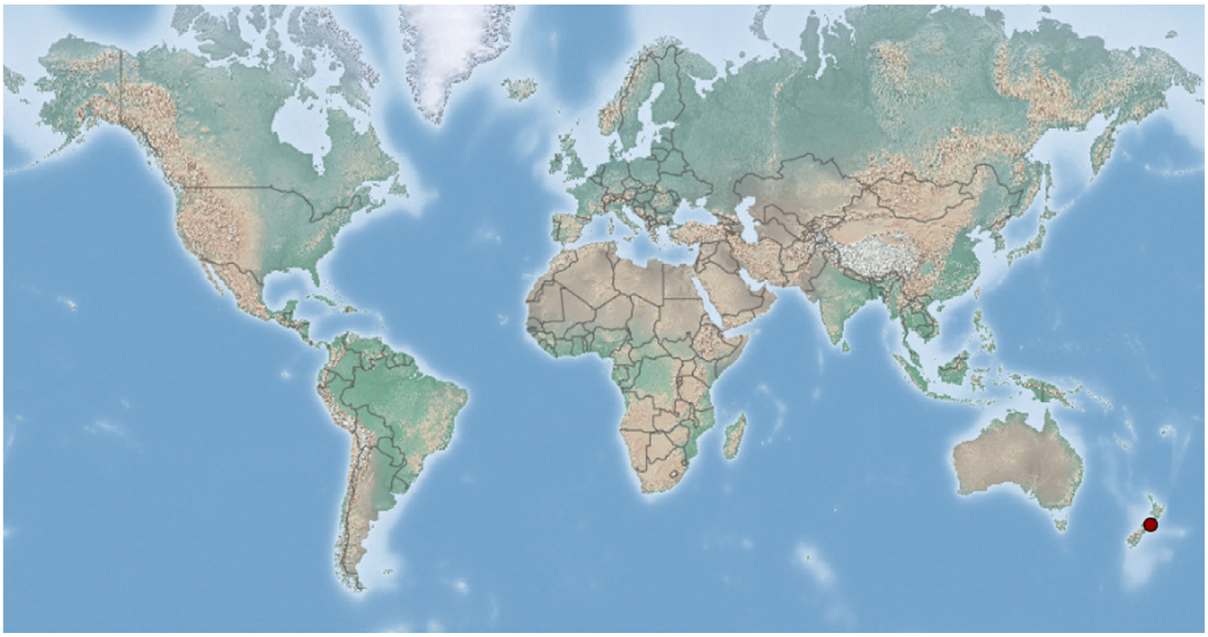
A.18. Distribution map of papaya mosaic virus (last updated: 2010-03-02)

Global distribution map extracted from the EPPO Global database on 29-3-2019.



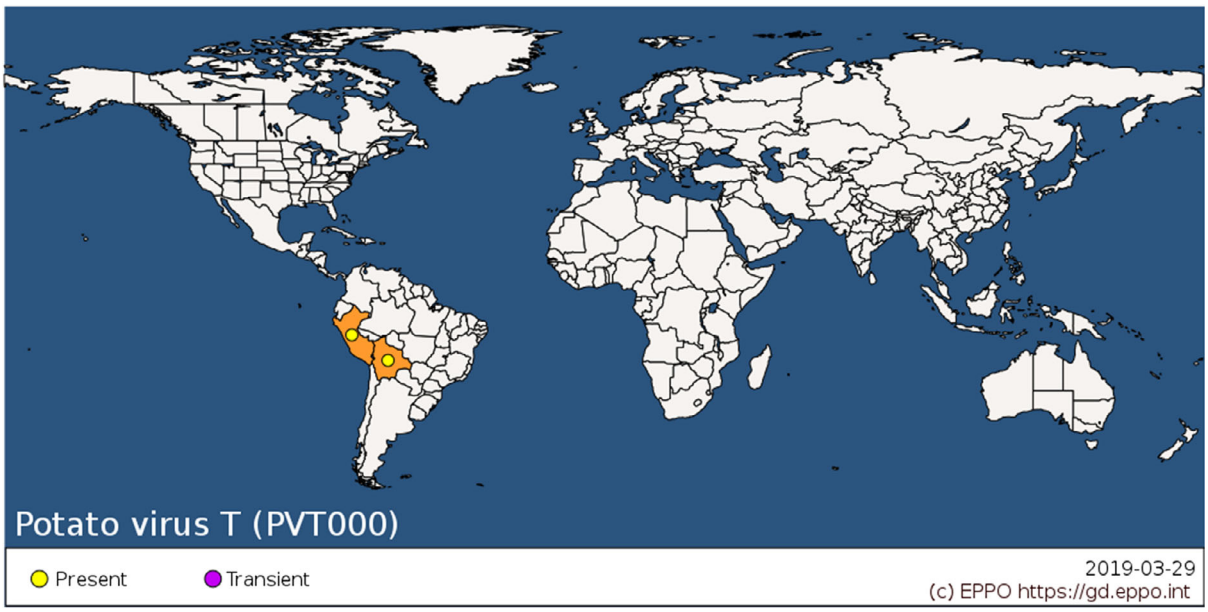
A.19. Distribution map of potato aucuba mosaic virus (last updated: 2018-07-14)

Global distribution map extracted from CABI cpc, accessed on 5-4-2019.



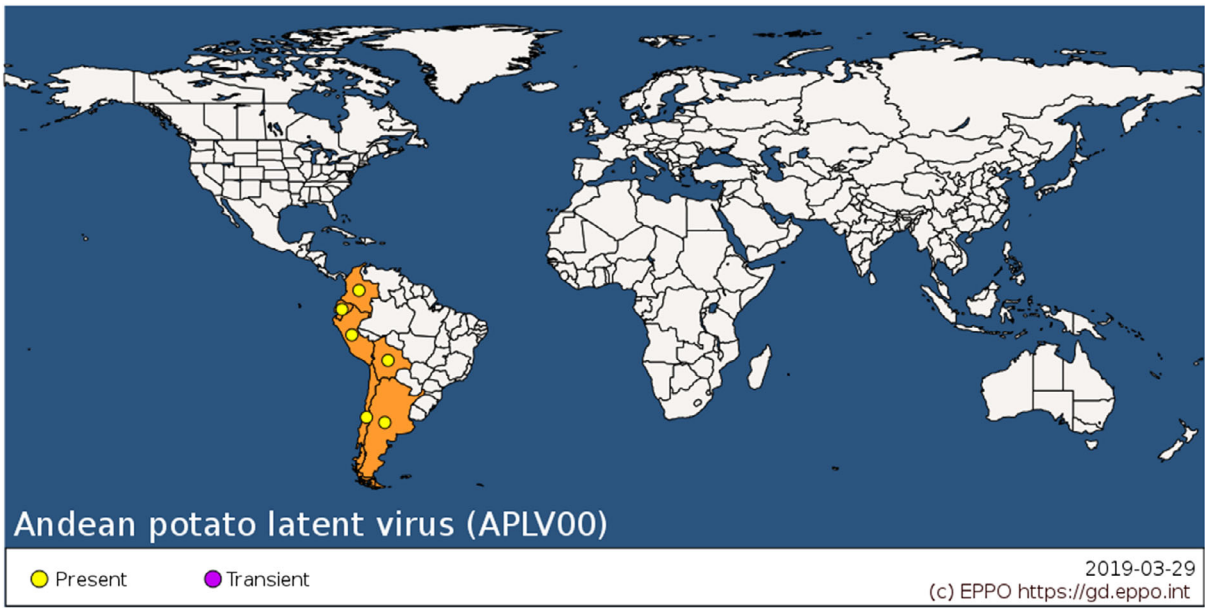
A.20. Distribution map of potato virus T (last updated: 2017-09-12)

Global distribution map extracted from the EPPO Global database on 29-3-2019.



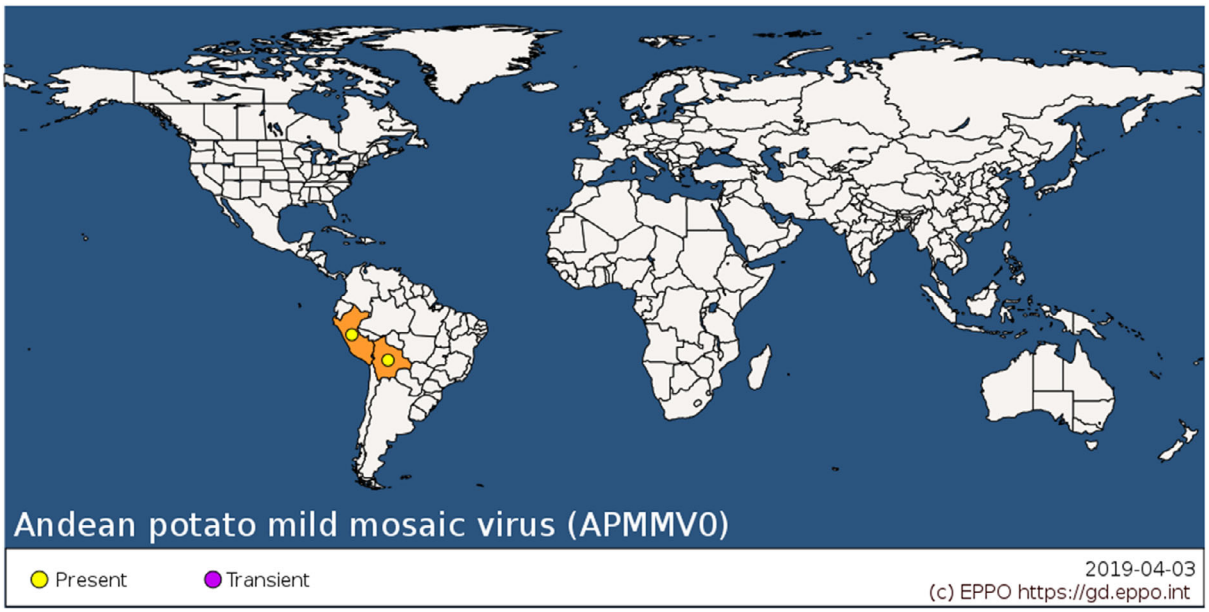
A.21. Distribution map of Andean potato latent virus (last updated: 2018-05-30)

Global distribution map extracted from the EPPO Global database on 29-3-2019.



A.22. Distribution map of Andean potato mild mosaic virus (last updated: 2019-04-03)

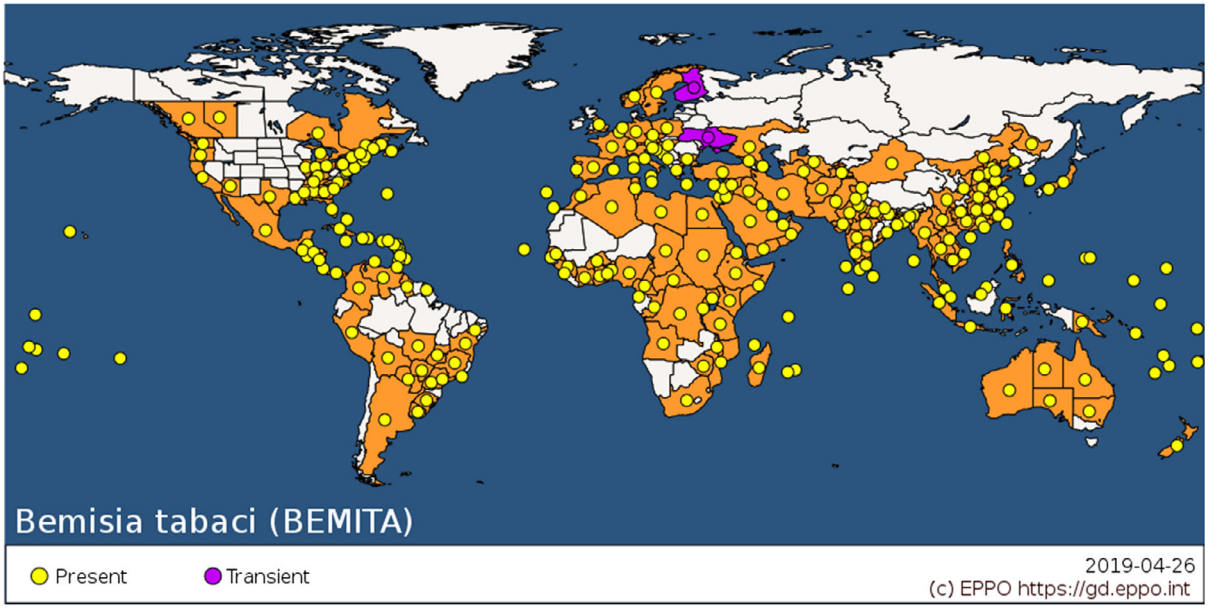
Global distribution map extracted from the EPPO Global database on 3-4-2019.



Appendix B – Vector distribution maps

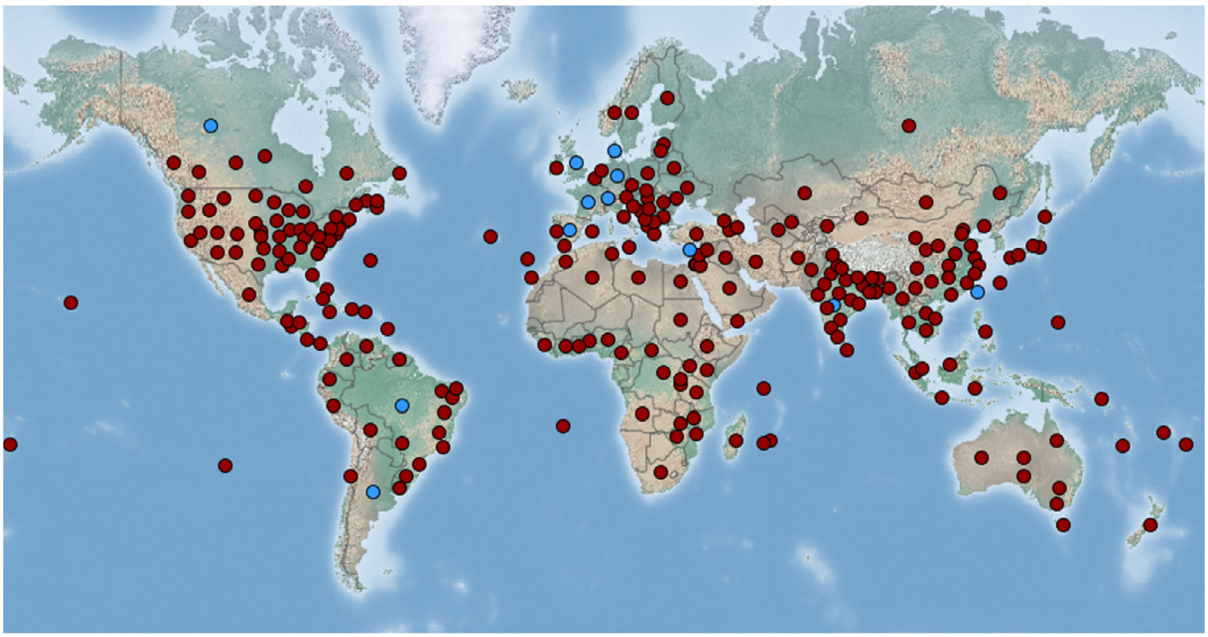
B.1. Distribution map of *Bemisia tabaci* (last updated: 2019-04-05)

Global distribution map extracted from the EPPO Global database on 26-4-2019.



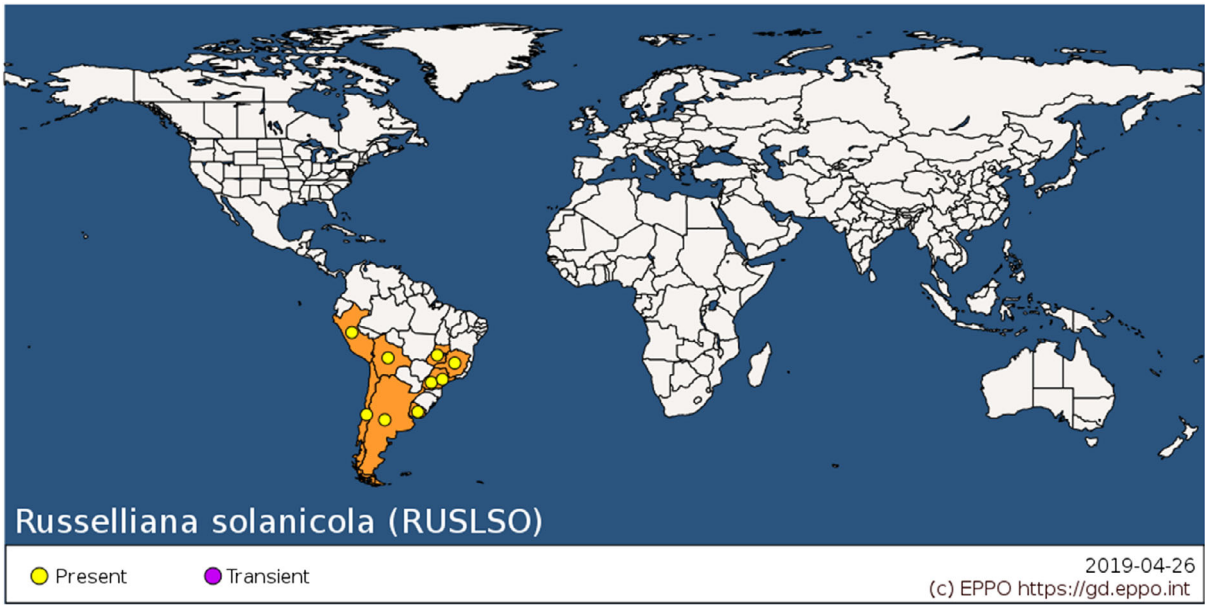
B.2. Distribution map of *Myzus persicae* (last updated: 2018-09-14)

Global distribution map extracted from CABI cpc, accessed on 26-4-2019.



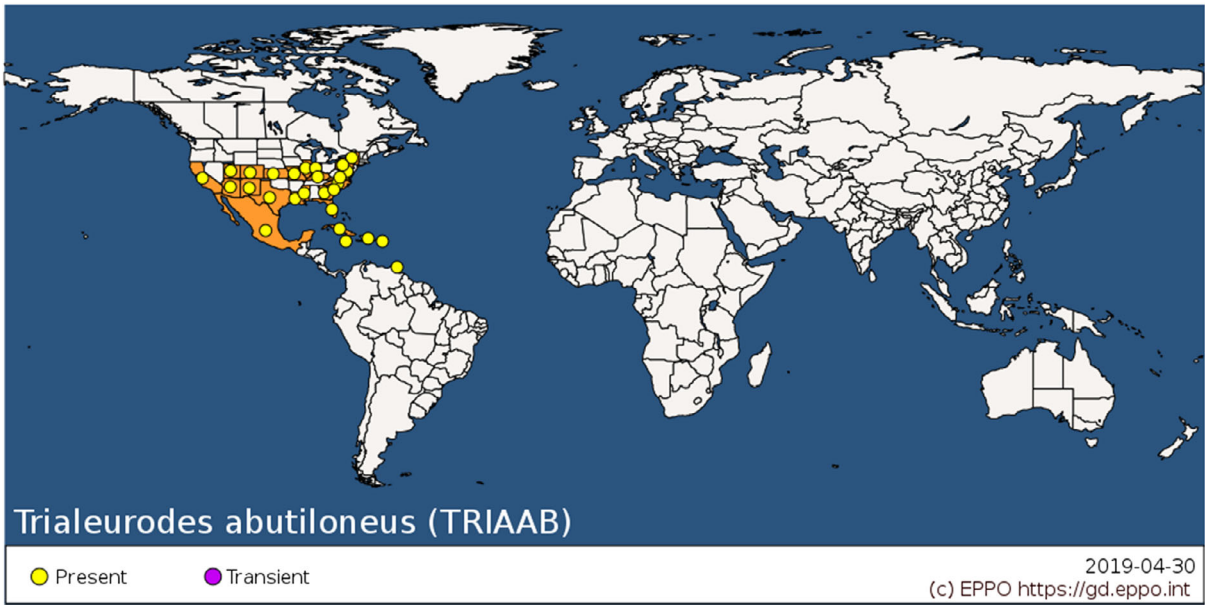
B.3. Distribution map of *Russelliana solanicola* (last updated: 2017-07-19)

Global distribution map extracted from the EPPO Global database on 26-4-2019.



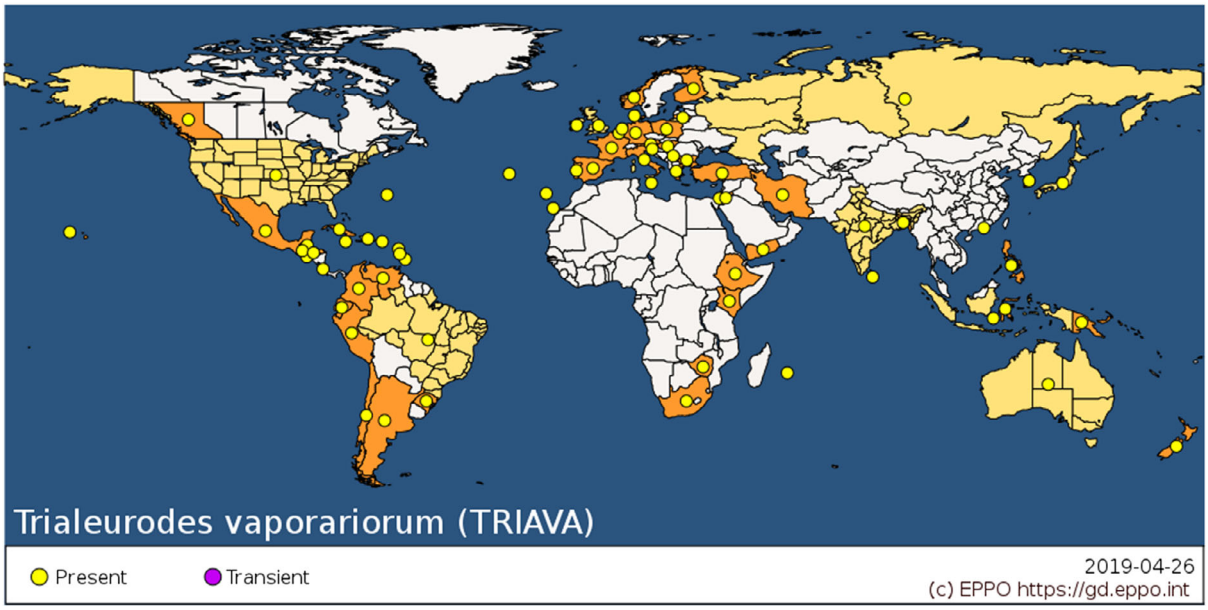
B.4. Distribution map of *Trialeurodes abutiloneus* (last updated: 2015-12-01)

Global distribution map extracted from EPPO global database, accessed on 30-4-2019.



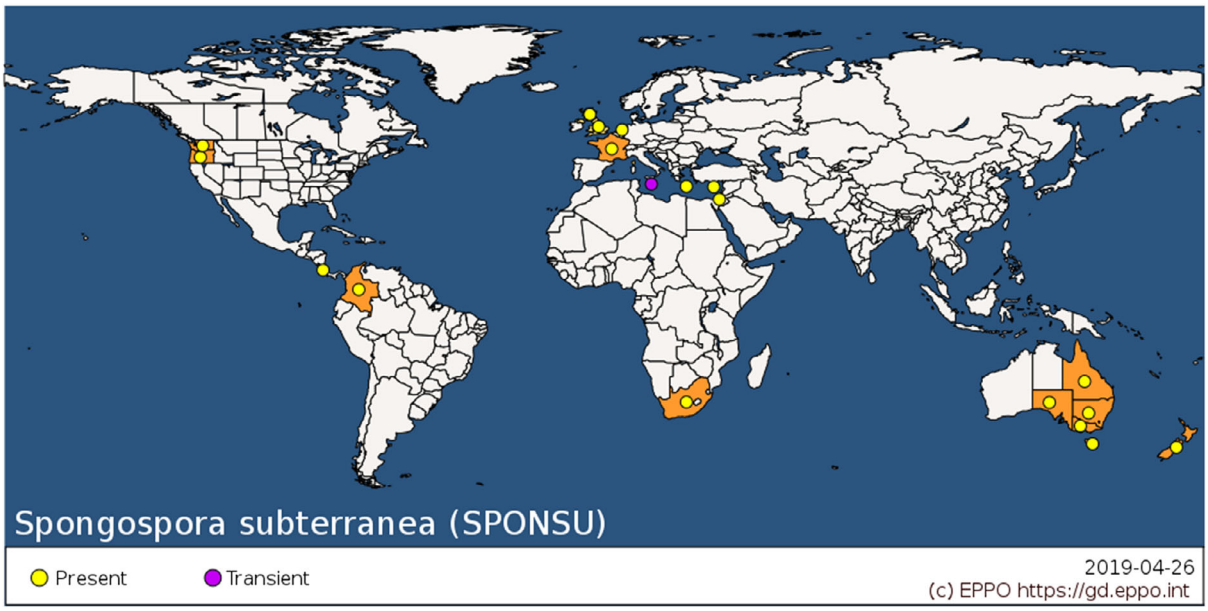
B.5. Distribution map of *Trialeurodes vaporariorum* (last updated: 2017-05-22)

Global distribution map extracted from the EPPO Global database on 26-4-2019. EPPO note on website: 'Incomplete world distribution'.



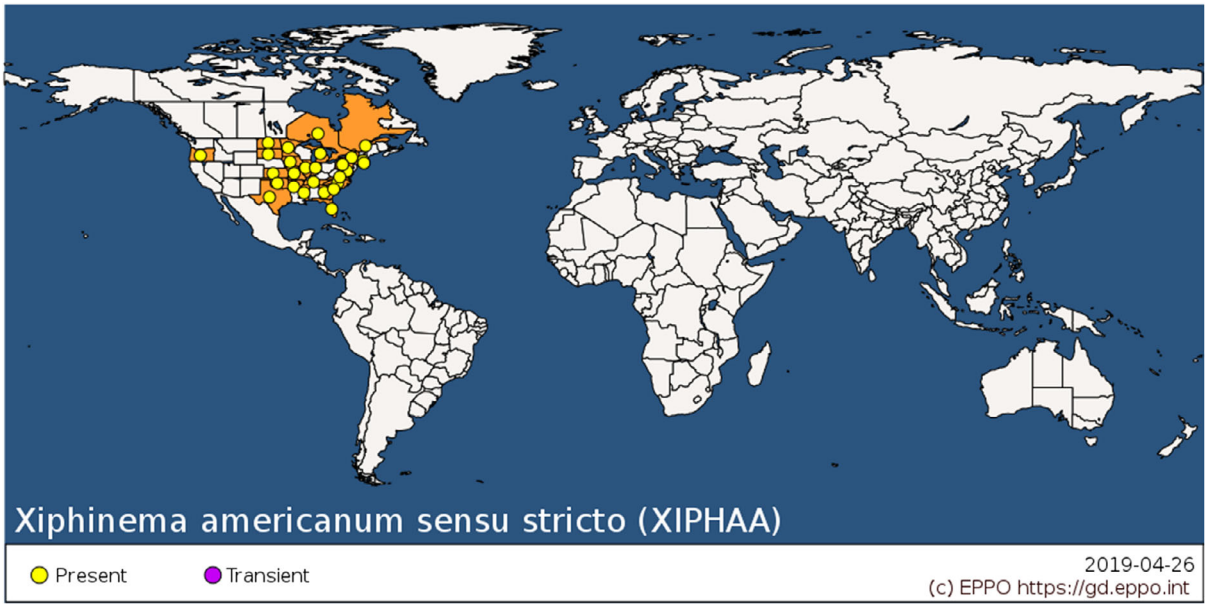
B.6. Distribution map of *Spongospora subterranea* (last updated: 2018-06-20)

Global distribution map extracted from the EPPO Global database on 26-4-2019. EPPO note on website: 'Incomplete world distribution'.



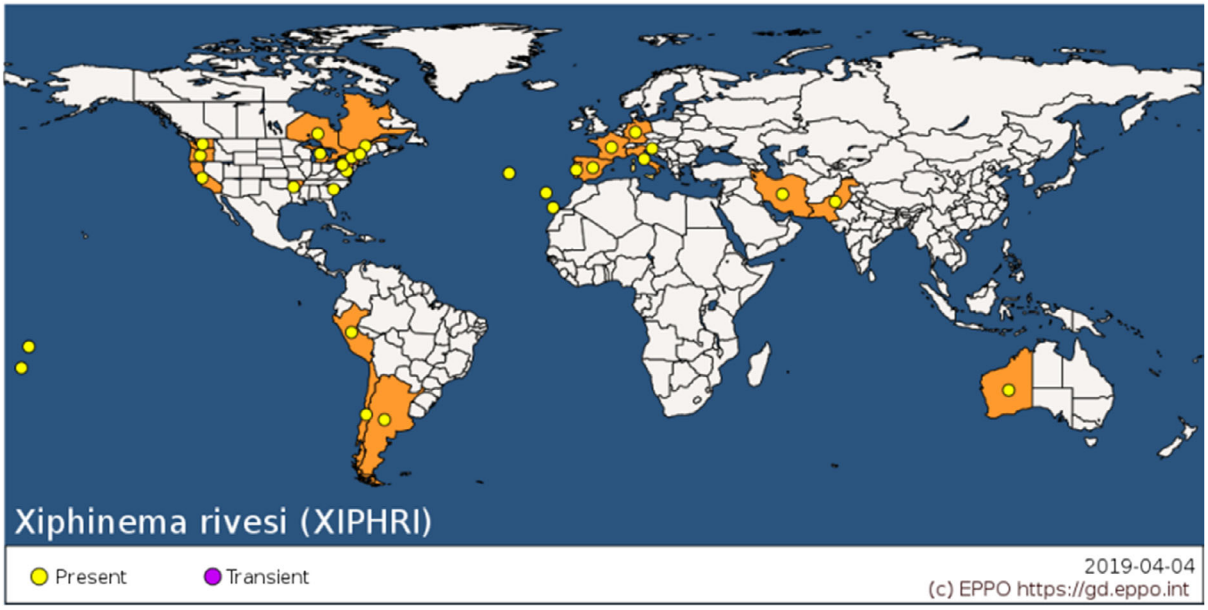
B.7. Distribution map of *Xiphinema americanum sensu stricto* (last updated: 2018-05-29)

Global distribution map extracted from the EPPO Global database on 26-4-2019.



B.8. Distribution map of *Xiphinema rivesi* (last updated: 2019-04-05)

Global distribution map extracted from the EPPO Global database on 4-4-2019.



B.9. Distribution map of *Xiphinema californicum* (last updated: 2018-05-29)

Global distribution map extracted from the EPPO Global database on 26-4-2019.