List of non-EU phytoplasmas of *Cydonia* Mill., *Fragaria* L., *Malus* Mill., *Prunus* L., *Pyrus* L., *Ribes* L., *Rubus* L. and *Vitis* L.

EFSA Panel on Plant Health (PLH),
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Abstract

Following a request from the European Commission, the EFSA Panel on Plant Health prepared a list of non-EU phytoplasmas of *Cydonia* Mill., *Fragaria* L., *Malus* Mill., *Prunus* L., *Pyrus* L., *Ribes* L., *Rubus* L. and *Vitis* L. A systematic literature review and search of databases identified 27 phytoplasmas infecting one or more of the host genera under consideration. These phytoplasmas were assigned to three categories. The first group (a) consists of 10 non-EU phytoplasmas, known to occur only outside the EU (‘*Candidatus Phytoplasma australiense*’, ‘*Ca. P. hispanicum*’, ‘*Ca. P. pruni*-related strain (NAGYIII)’, ‘*Ca. P. pyri*-related strain (PYLR) and Buckland valley grapevine yellows phytoplasma’) or having only limited presence in the EU (‘*Ca. P. aurantifolia*-related strains’, ‘*Ca. P. fraxini*’, ‘*Ca. P. phoenicium*’, ‘*Ca. P. trifolii*’ and ‘*Ca. P. ziziphi*’). The second group (b) consists of three non-EU phytoplasmas, whose presence in the target plant species is not fully supported by the available literature. The third group (c) consists of 14 phytoplasmas with substantial presence in the EU (i.e. they are originally described or reported from the EU or known to occur or be widespread in some EU Member States or frequently reported in the EU). Phytoplasmas of categories (b) and (c) were excluded at this stage from further categorisation efforts. One phytoplasma from category (a) (‘*Ca. P. phoenicium*’) was excluded from further categorisation, as a pest risk assessment has been performed by EPPO. Comments provided by the EU Member States were integrated in the opinion. The main uncertainties of this listing concern: the geographic distribution and prevalence, the taxonomy, biology and host range. The phytoplasmas considered as non-EU and whose presence in target plant species is fully supported by literature (category (a)) are categorised by the Panel in a separate opinion.

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Keywords: Crotalaria witches’ broom phytoplasma, North American grapevine yellows, peach yellow leaf roll, pear decline, pest risk, plant health, plant pest, quarantine, sweet potato little leaf

Requestor: European Commission

Question numbers: EFSA-Q-2018-00272, EFSA-Q-2018-00633, EFSA-Q-2018-00634, EFSA-Q-2018-00635, EFSA-Q-2018-00636, EFSA-Q-2018-00637, EFSA-Q-2018-00638, EFSA-Q-2018-00639

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Acknowledgments: This document was prepared in cooperation with the Istituto per la Protezione Sostenibile delle Piante, Consiglio Nazionale delle Ricerche (Italy) under the tasking grant (GP/EFSA/ALPHA/2017/02). The Panel thanks for the information provided to this scientific output: Franco Finelli (Phytosanitary Service, Italy). The Panel acknowledges all European competent institutions, Member State bodies and other organisations that provided data for this scientific output.

Competing interests: In line with EFSA’s policy on declarations of interest, Panel member Francesco Di Serio did not participate in the adoption of this scientific output.

Suggested citation: EFSA PLH Panel (EFSA Panel on Plant Health), Bragard C, Dehnen-Schmutz K, Gonthier P, 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, Bosco D, Chiumenti M, Di Serio F, Galetto L, Marzachi C, Pautasso M and Jacques M-A, 2020. Scientific Opinion on the list of non-EU phytoplasmas of Cydonia Mill., Fragaria L., Malus Mill., Prunus L., Pyrus L., Ribes L., Rubus L. and Vitis L. EFSA Journal 2020;18(1):5930, 25 pp. https://doi.org/10.2903/j.efsa.2020.5930

ISSN: 1831-4732

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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 pests 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.

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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 a pest categorisation is requested. The list below follows the annexes of Directive 2000/29/EC.

**Annex IIA**

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

| Insects, mites and nematodes, at all stages of their development |
|---------------------------------------------------------------|
| Aleurocanthus spp.                                            | Numonia pyrivorella (Matsumura) |
| Anthonomus bisignifer (Schenkling)                           | Oligonychus perditus Pritchard and Baker |
| Anthonomus signatus (Say)                                     | Pissodes spp. (non-EU) |
| Aschistonyx eppoi Inouye                                      | Scirtothrips aurantii Faure |
| Carposina niponensis Walsingham                               | Scirtothrips citri (Moultex) |
| Enarmonia packardi (Zeller)                                    | Scolytidae spp. (non-EU) |
| Enarmonia prunivora Walsh                                     | Scrobipalpopsis solanivora Povolny |
| Grapholitha inopinata Heinrich                                | Tachypterellus quadrigibbus Say |
| Hisshomonos phycitis                                          | Toxoptera citricida Kirk. |
| Leucaspis japonica Ckll.                                      | Unasps citri Comstock |
| Listronotus bonariensis (Kuschel)                             |                                |

(b) Bacteria

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

(c) Fungi

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

(d) Virus and virus-like organisms

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

**Annex IIB**

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

| Insect mites and nematodes, at all stages of their development |
|---------------------------------------------------------------|
| Anthonomus grandis (Boh.)                                     | Ips cembrae Heer |
| Cephalcia lariciphila (Klug)                                   | Ips duplicatus Sahlberg |
| Dendroctonus micans Kugelan                                   | Ips sexdentatus Börner |
| Gilphinia hercyniae (Hartig)                                   | Ips typographus Heer |
| Gonipterus scutellatus Gyll.                                  | Sternochetus mangiferae Fabricius |
| Ips amitinus Eichhof                                         |                                |
(b) Bacteria

*Curtobacterium flaccumfaciens* pv. *flaccumfaciens* (Hedges) Collins and Jones

(c) Fungi

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

1.1.2. Terms of Reference: Appendix 2

List of harmful organisms for which a 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  

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 indifferentes* Curran  
19) *Rhagoletis mendax* Curran  
20) *Rhagoletis pomonella* Walsh  
21) *Rhagoletis suavis* (Loew)

(b) 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 II A1

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

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

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

1.1.2.3. Terms of Reference: Appendix 3

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

Annex I A1

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

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

(b) Fungi

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

(c) Viruses and virus-like organisms

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

(b) Bacteria

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

1.1.3. Interpretation of the Terms of Reference

This opinion provides a list of non-EU phytoplasmas of Cydonia Mill., Fragaria L., Malus Mill., Prunus L., Pyrus L., Ribes L., Rubus L. and Vitis L. (from now on: ‘the host plants’), for which the EFSA Plant Health Panel (from now on: ‘the Panel’) then conducted a pest categorisation in a separate opinion (EFSA PLH Panel, 2020). This list is based on information collected from databases up to June 2018, as well as information received from EU Member States (MS) during the period February-March 2019.

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

As a first step towards this goal, the Panel prepared a list of phytoplasmas infecting the host plants. In the process, three groups of phytoplasmas were distinguished:

(a) non-EU phytoplasmas with presence in the host plants fully supported by literature,
(b) non-EU phytoplasmas with presence in the host plants not fully supported by literature, and
(c) phytoplasmas (affecting the host plants) with widespread presence in the EU (known to occur in several MS, frequently reported in the EU, widespread in some MS) or originally described or reported from the EU.

A non-EU phytoplasma is defined by its geographical origin outside of the EU. Therefore, phytoplasmas not reported from the EU and occurring only outside of the EU are considered as non-EU phytoplasmas. Likewise, phytoplasmas occurring outside the EU and having only a limited presence in the EU (reported in only one or few MSs, with restricted distribution) are also considered as non-EU phytoplasmas.

This opinion provides the methodology and results for this classification, thus preparing the ground for the pest categorisation linked to the present mandate (EFSA PLH Panel, 2020). This means that the Panel then performed a pest categorisation for the non-EU phytoplasmas with confirmed ability to infect the host plants. The phytoplasmas with uncertain ability to infect the host plants and the phytoplasmas with significant presence in the EU or originally described or reported from the EU are excluded from further categorisation efforts, unless this will be requested by the risk managers in the future.

In this opinion, to capture the broadest possible range of phytoplasmas, even the poorly characterised ones for which very partial molecular or biological data are available, were considered. In particular, as in some cases there are uncertainties about the ‘Ca. P. species definition’, related strains will be considered if they infect any of the host plants. Instead, phytoplasma-like diseases of unknown
aetiology or caused by viruses and formerly associated to mycoplasma-like organisms (MLO) or by other graft-transmissible bacteria are not addressed in this opinion.

2. Data and methodologies

2.1. Data

2.1.1. Literature search

The literature considered to generate the list of phytoplasmas infecting the host plants (see Section 1.1.3) and to fill in the extraction tables on their distribution (see Appendixes A–C and Annex A) was obtained from expert knowledge and extensive literature searches performed in Web of Science (WoS, last access June 2018). For each host plant genus, searches in WoS were performed using as keywords: phytoplasma/mycoplasma/witch/spiroplasma combined with the scientific name of the genus OR the common name(s) of the crops. Therefore, for each host plant genus, searches in WoS were performed according to the following strategy:

\[ \text{TS} = \left( \text{Phytoplasma* OR mycoplasma* OR witch* OR spiroplasma*} \right) \text{AND (latin name of the host genus – e.g. Vitis – OR common name in English of the crop – e.g. grapevine)} \]

All the references were screened by title, by abstract, and, if needed, by full paper with the specific objective of selecting those providing additional information regarding distribution and host range of the phytoplasmas included in the list or not yet included.

Extensive literature searches in Google Scholar using as keyword the name of a single phytoplasma were also performed for all the phytoplasmas listed in the EPPO Global Database (EPPO GD) (EPPO, 2019), and for all ‘Candidatus Phytoplasma species’ described up to 2017 (Naderali et al., 2017).

Information on phytoplasma taxonomy was gathered from either the original reference to species description or IRPCM (International Research Programme on Comparative Mycoplasmology) Phytoplasma/Spiroplasma Working Team–Phytoplasma Taxonomy Group (IRPCM, 2004).

Further references and data were obtained from experts, EU National Plant Protection Organisations and from citations within primary references.

2.1.2. Database search

Data on host(s) and distribution of the phytoplasmas were retrieved from the EPPO GD (EPPO, 2019), the Centre for Agriculture and Biosciences International Crop Protection Compendium (CABI, 2019) and relevant publications.

GenBank accessions referring to phytoplasmas were added.

2.2. Methodology

A preliminary list of phytoplasmas infecting the host plants (see Section 1.1.3) was generated by screening for phytoplasma diseases of the host plants present in the EPPO Lists A1 and A2. Further, all phytoplasma diseases listed in the EPPO GD were also screened for their association with the host plants. Then, all phytoplasmas listed in the most recent ‘Ca. P. phytoplasma’ species description (Naderali et al., 2017) were screened for their association with the host plants. Finally, the relevant phytoplasmas resulting from the literature search in WoS (as previously described) were included in the list.

The collected information was used to fill an extraction table (Annex A) with data regarding the taxonomy, geographical distribution and host range of each phytoplasma and key references and sources used to obtain that information. Taxonomy, distribution and host range are reported in the table using the following scheme:

– the taxonomy was reported according to ‘Ca. P. species’ description, when available. Although phytoplasmas have not yet been cultivated \textit{in vitro}, phylogenetic analyses based on various conserved genes have shown that they represent a distinct, monophyletic clade within the class Mollicutes. Phytoplasmas are therefore accommodated within the ‘Candidatus Phytoplasma’ genus. Within this genus, several subtaxa have been described to accommodate organisms sharing less than 97.5% similarity among their 16S rRNA gene sequences. Additional species are described to accommodate organisms that, despite their 16S rRNA gene sequence being > 97.5 % similar to those of other ‘Ca. Phytoplasma’ species, are characterised by distinctive biological, phytopathological and genetic properties. Conversely, some organisms, despite their 16S rRNA gene sequence being < 97.5 % similar to that of any other ‘Ca. Phytoplasma’ species, are not presently
described as *Candidatus* species, due to their poor overall characterisation (IRPCM, 2004). When a phytoplasma was not classified yet, information on a tentative classification was included based on the original literature source in which the pathogen was reported; to facilitate data retrieval from the literature and available databases, also the 16S rRNA group and subgroups were reported. – data on distribution and host range of phytoplasmas were first searched in EPPO (2019) and in CABI (2019). Whenever conclusive information was not identified in the two databases or the information retrieved was at odds with expert knowledge, or in the absence of any information, extensive literature searches according to the protocol reported in Section 2.1 were performed.

Because only the non-EU phytoplasmas were subject of further categorisation efforts in the frame of the present mandate, it was decided to have consultation phases with EU MS so that they could provide additional input if necessary. The information provided by EU MS was then considered by the Panel to determine the non-EU phytoplasmas that were further categorised (Section 3.1). The phytoplasmas excluded from this group are referred to here as phytoplasmas excluded from further categorisation in the frame of the present mandate (Section 3.2).

### 3. Listing of phytoplasmas

#### 3.1. Phytoplasmas considered as non-EU

The phytoplasmas considered as non-EU (Appendix A) belong to two sub-categories:

- Phytoplasmas not known to be present in the EU (‘Ca. P. australiense’, ‘Ca. P. hispanicum’, ‘Ca. P. pruni’-related strain (NAGYIII), ‘Ca. P. pyri’-related strain (PYLR) and Buckland valley grapevine yellows phytoplasma)
- Phytoplasmas known to be present outside the EU and with only limited presence (i.e. reported in only one or few MSs or known to have a restricted distribution) in the EU (‘Ca. P. aurantifolia’-related strains, ‘Ca. P. fraxini’, ‘Ca. P. phoenicium’, ‘Ca. P. trifolii’ and ‘Ca. P. ziziphi’).

These phytoplasmas are categorised in EFSA PLH Panel (2020), with the exception of ‘Ca. P. phoenicium’, for which a pest risk assessment is already available (EPPO, 2017).

#### 3.2. Phytoplasmas excluded from further categorisation in the frame of the present mandate

The phytoplasmas excluded from further categorisation in the frame of the present mandate are listed in Appendices B and C. The phytoplasmas listed in Appendix B are considered as non-EU, but their ability to infect the host plants was not conclusively supported by the available literature, and belong to two subcategories:

- Phytoplasmas not known to be present in the EU,
- Phytoplasmas known to be present outside the EU and with only limited presence (i.e. reported in only one or few MSs or known to have restricted distribution) in the EU.

Phytoplasmas listed in Appendix C belong to two sub-categories:

- Phytoplasmas originally described or reported from the EU,
- Phytoplasmas known to be present outside the EU, but with a substantial presence also in the EU (known to occur in several MSs, frequently reported in the EU, widespread in some MSs).

#### 3.3. Uncertainties

Uncertainties potentially affecting the current list of non-EU phytoplasmas include:

- The geographic distribution and prevalence of the phytoplasmas.
- The taxonomy and biological status of poorly characterised phytoplasmas.
- The host status of particular plant genera for some phytoplasmas.

### 4. Conclusions

The Panel was requested by the European Commission to produce a categorisation of 133 harmful organisms or groups listed in annexes of Directive 2000/29/EC. One of the groups for which a categorisation was prepared is non-EU phytoplasmas of *Cydonia, Fragaria, Malus, Prunus, Pyrus,*
Ribes, Rubus and Vitis. As a first step, a systematic approach identified 27 phytoplasmas reported to naturally infect one or more of these genera (Annex A).

Among these phytoplasmas, based on information on distribution and prevalence both inside and outside the EU, the Panel identified 10 non-EU phytoplasmas, known to occur only outside the EU or having only a limited presence in the EU (Appendix A). These phytoplasmas are categorised in EFSA PLH Panel (2020), with the exception of ‘Ca. P. phoenicium’, for which a pest risk assessment is already available (EPPO, 2017).

The remaining 17 phytoplasmas (non-EU phytoplasmas, known to occur only outside the EU or having only a limited presence in the EU, whose ability to infect the host species is not fully confirmed by available literature (Appendix B, 3 phytoplasmas), or which have a substantial presence in the EU or are originally described or reported from the EU (Appendix C, 14 phytoplasmas)) were not categorised within the current mandate. However, the European Commission may, at any time, request EFSA to categorise some or all the phytoplasmas excluded from the present exercise.

The main uncertainties of this listing concern the geographic distribution, taxonomy, biology and host range of some phytoplasmas.

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Abbreviations

Ca. P. *Candidatus* Phytoplasma
CrWB Crotalaria witches’-broom
EPPO European and Mediterranean Plant Protection Organization
GD Global Database
**List of non-EU fruit phytoplasmas**

| Code   | Description                                                                 |
|--------|-----------------------------------------------------------------------------|
| IRPCM  | International Research Programme on Comparative Mycoplasmology             |
| KAP    | Knautia arvensis phyllody                                                   |
| MLO    | mycoplasma-like organisms                                                   |
| MS     | Member State                                                                |
| NAGYIII| North American Grapevine Yellows                                             |
| PCR    | polymerase chain reaction                                                   |
| PDTWII | Pear decline Taiwan II                                                       |
| PEY    | Picris echioides yellows                                                    |
| PHYPAA | *Candidatus* Phytoplasma australasia                                        |
| PHYPAS | *Candidatus* Phytoplasma asteris                                             |
| PHYPAU | *Candidatus* Phytoplasma australiense                                        |
| PHYPBR | *Candidatus* Phytoplasma brasiliense                                         |
| PHYPFG | *Candidatus* Phytoplasma fragariae                                          |
| PHYPFR | *Candidatus* Phytoplasma fraxini                                             |
| PHYPPA | *Candidatus* Phytoplasma mali                                                |
| PHYPBH | *Candidatus* Phytoplasma phoenicum                                           |
| PHYPFN | *Candidatus* Phytoplasma pruni                                              |
| PHYPPR | *Candidatus* Phytoplasma prunorum                                            |
| PHYPY  | *Candidatus* Phytoplasma pyri                                               |
| PHYPRU | *Candidatus* Phytoplasma rubi                                               |
| PHYPYS | *Candidatus* Phytoplasma solani                                              |
| PHYPTR | *Candidatus* Phytoplasma trifolii                                            |
| PHYPUL | *Candidatus* Phytoplasma ulmi                                               |
| PHYPZI | *Candidatus* Phytoplasma ziziphii                                            |
| PHYP01 | Tomato big bud                                                               |
| PHYP07 | *Candidatus* Phytoplasma hispanicum                                         |
| PHYP19 | Clover yellow edge phytoplasma                                              |
| PHYP39 | Sweet potato little leaf                                                     |
| PHYP42 | Pigeon pea witches’ broom                                                   |
| PHYP45 | Knautia phyllody phytoplasma                                                |
| PHYP64 | Grapevine Flavescence dorée phytoplasma                                     |
| PHYP65 | German flavescence dorée phytoplasma                                        |
| PHYP74 | Alder yellows phytoplasma                                                   |
| PLH    | Plant Health                                                                |
| PYLR   | Peach yellow leaf roll                                                      |
| RFLLP  | Restriction Fragment Length Polymorphism                                    |
| SPLL   | Sweet potato little leaf                                                    |
| TBB    | Tomato big bud                                                              |
| TFEU   | Treaty on the Functioning of the European Union                             |
| The host plants | *Cydonia, Fragaria, Malus, Prunus, Pyrus, Ribes, Rubus and Vitis* |
| ToR    | Terms of Reference                                                          |
| WoS    | Web of Science                                                              |
## Appendix A – Non-EU phytoplasmas of *Cydonia, Fragaria, Malus, Prunus, Pyrus, Ribes, Rubus and Vitis*

| ID | Phytoplasma name | Related strain name(1) | Abbreviation (EPPO code) | 16S rRNA | Cydonia | Fragaria | Malus | Prunus | Pyrus | Ribes | Rubus | Vitis | Reasoning for considering non-EU | Uncertainties | References |
|----|-----------------|------------------------|--------------------------|---------|---------|---------|-------|-------|-------|-------|-------|-------|-------|--------------------------------|-------------|-----------|
| 1  | Candidatus Phytoplasma aurantifolia | 'Ca. P. australasia, pear decline Taiwan II (PDTWII); Crotalaria witches'-broom phytoplasma (CrWB); sweet potato little leaf (SPLL) | PHYPAA, PHYP39 | II | – | – | Yes | Yes | Yes | – | – | Yes | Only one report in *Fallopia japonica* in UK(2); Greek report of TBB (tomato big bud) (listed in EPPO) is most probably to be assigned to either 'Ca. P. asteris' or 'Ca. P. solani'; Italian reports refer to few infected individuals | Hashemi-Tameh et al., 2014 (4 infected *Malus* plants); Ghayeb Zamharir et al., 2017 (4 *Vitis* plants); Reeder et al., 2010a (only one report from UK, 4 plants detected by nested PCR (polymerase chain reaction) out of 4 tested ones); [PHYP01]: in Tomato in Greece following EPPO (Alivizatos, 1993; only EM), but Vellios and Lioliopoulou, 2007 identified only 16SrI and XII in tomato in Greece. No record of its presence in Portugal (2) Absence of PHYPAA distribution map | Species description: (White et al., 1998; Liu et al., 2011; IRPCM, 2004) *Malus*: (Hashemi-Tameh et al., 2014); *Pyrus*: (Zirak et al., 2009, 2010a,b); *Vitis*: (Constable et al., 2003; Ghayeb Zamharir et al., 2017); *Punica*: (Schneider and Gibb, 1997; Liu et al., 2011); *Fallopia japonica* in UK (Reeder et al., 2010a); *Solanum tuberosum* in Italy (Paltrinieri and Bertaccini, 2007); *Empoasca decipiens* in Italy (Parrella et al., 2008); *Calendula arvensis, Solanum nigrum*, and *Chenopodium* spp. in Italy (Tolu et al., 2006); *Matthiola incana* in Italy (Davino et al., 2007) |
| 2  | Candidatus Phytoplasma australiense | – | PHYPAU | XII-B | – | Yes | – | Yes | – | – | Yes | Yes | Not reported to be present in the EU | – | Species description: (Davis et al., 1997); *Pyrus*: (Jones et al., 2005) |
# List of non-EU fruit phytoplasmas

| ID | Phytoplasma name | Related strain name (EPPO code) | Abbreviation (16S rRNA) | Cydonia | Fragaria | Malus | Prunus | Ribes | Rubus | Vitis | Reasoning for considering non-EU | Uncertainties | References |
|----|-----------------|--------------------------------|-------------------------|---------|----------|-------|--------|-------|-------|------|-------------------------------|---------------|------------|
| 3  | Candidatus Phytoplasma fraxini | – | PHYPFR | VII-A | – | Yes | – | Yes | – | – | Yes | Only two reports in Italy | Zambon et al., 2018 (9 plants detected in Italy by nested PCR out of 161 tested ones); Bruni et al., 2005 (Hypericum perforatum in Italy: it is not known on how many plants the phytoplasma was identified) | Species description: (Griffiths et al., 1999); Fragaria: (Fernandez et al., 2013); Prunus: (Zunnoon-Khan et al., 2010); Vitis: (Gajardo et al., 2009; Ghayeb Zamharir et al., 2017; Zambon et al., 2018); Italy: (Bruni et al., 2005; Zambon et al., 2018) |
| 4  | Candidatus Phytoplasma hispanicum | – | PHYP07 | XIII | – | Yes | – | – | – | – | – | Not reported to be present in the EU | – | Species description: (Davis et al., 2016); Fragaria: (Jomantiene et al., 1998; Fernandez et al., 2015) |
| 5  | Candidatus Phytoplasma phoenicium | – | PHYPPH | IX-B, D, F, G | – | – | – | Yes | – | – | Yes | Only one report in Italy | Ghayeb Zamharir et al., 2017 (3 Vitis plants with probable mixed infections) | Species description: (Verdin et al., 2003; EPPO, 2017); Vitis: (Ghayeb Zamharir et al., 2017); Prunus in Italy: (Nigro et al., 2020) |
| 6  | Candidatus Phytoplasma pruni | North American Grapevine Yellows - NAGYII | – | III | – | – | – | – | – | – | Yes | Not reported to be present in the EU | – | Species description: (Davis et al., 2015) |
| 7  | Candidatus Phytoplasma pyri | Peach yellow leafroll | – | X | – | – | – | Yes | – | – | – | Not reported to be present in the EU | – | Species description: (Morton et al., 2003; Seemuller and Schneider, 2004); Prunus: (Marcone et al., 2014) |
| ID | Phytoplasma name | Related strain name(1) | Abbreviation (EPPO code) | 16S rRNA | Cydonia | Fragaria | Malus | Prunus | Pyrus | Ribes | Rubus | Vitis | Reasoning for considering non-EU | Uncertainties | References |
|----|-----------------|------------------------|--------------------------|-----------|---------|----------|-------|--------|-------|-------|-------|-------|-----------------------------|--------------|------------|
| 8  | *Candidatus Phytoplasma trifolii* | – | PHYPTR | VI-A | – | Yes | Yes | – | – | – | Yes | Reports from the EU MS refer to few infected plants | [PHYPTR]: Pribylova et al., 2009; Borroto Fernandez et al., 2007 (Reports from the EU MS refer to few infected plants, ranging from 1 to 28); Zirak et al., 2010b (only in one Prunus plant out of 91 tested plants) | Species description and *Fragaria*: (Hiruki and Wang, 2004); *Prunus*: (Zirak et al., 2010b); Czech Republic: (Pribylova et al., 2009); Austria: (Borroto Fernandez et al., 2007) |
| 9  | *Candidatus Phytoplasma ziziphi* | – | PHYPZI | V-B | – | – | Yes | Yes | – | – | – | – | One report from Italy is related to mixed infections with 'Ca. P. solani' and 'Ca. P. asteris' and the other one has no further characterization beside PCR and RFLP (restriction fragment length polymorphism) analyses | Paltrinieri et al., 2006 (*Prunus* in Italy: only a Congress abstracts, no further details); Pasquini et al., 2000 (*Olea europea* in Italy: phytoplasma detected based only on PCR and RFLP analyses of ribosomal operon) | Species description: (Jung et al., 2003); *Malus*: (Li et al., 2014); *Prunus*: (Zhu et al., 1998; Wang et al., 2014, 2018); *Prunus* in Italy: (Paltrinieri et al., 2006); *Olea europea* in Italy: (Pasquini et al., 2000) |
| 10 | Unclassified | Buckland valley grapevine yellows phytoplasma | – | XXIII | – | – | – | – | – | – | – | Yes | Not reported to be present in the EU | – | Species description: (Constable et al., 2002) |

(1): Reference isolate of 'Candidatus Phytoplasma species' is indicated by ‘–’;
(2): Information provided by MS during commenting phase.
### Appendix B – Phytoplasmas of *Cydonia, Fragaria, Malus, Prunus, Pyrus, Ribes, Rubus* and *Vitis* excluded from further categorisation as their presence in the species is not fully supported by available literature

| ID | Phytoplasma name | Related strain name(1) | Abbreviation (EPPO code) | 16S rRNA | *Cydonia* | *Fragaria* | *Malus* | *Prunus* | *Pyrus* | *Ribes* | *Rubus* | *Vitis* | Reasoning for considering non-EU | Uncertainties | References |
|----|------------------|------------------------|--------------------------|----------|-----------|------------|--------|---------|---------|--------|--------|--------|--------------------------------|--------------|------------|
| 11 | *Candidatus Phytoplasma brasiilense* | – | PHYPBR | XV-A | – | – | – | Yes | – | – | – | – | Not reported to be present in the EU. Excluded from further categorisation as its presence in *Prunus* is not fully supported by available literature | | Balakishiyeva et al., 2011 (only in 1 *Prunus* plant) |
| 12 | *Candidatus Phytoplasma pruni* | Clover yellow edge, CYE (CYE-C; CYE-L) | PHYP19 | III-B | – | Yes | – | – | – | – | – | – | In the EU reported only in two clover plants and in mixed infections. Excluded from further categorisation as its presence in *Fragaria* is not fully supported by available literature | | Staniulis et al., 2000 (Only in two clover plants and in mixed infections); Jomantiene et al., 2002 (Reported in *Fragaria* in a unique report of a maximum of 5 tested symptomatic plants) |
| 13 | Unclassified | Pigeon pea witches’ broom | PHYP42 | IX-A | – | – | – | – | – | – | – | Yes | Not reported to be present in the EU. Excluded from further categorisation as its presence in *Vitis* is not fully supported by available literature | | Ertunc et al., 2015 (Reported on 1 *Vitis* plant out of 289 tested plants) |

(1): Reference isolate of "Candidatus Phytoplasma species" is indicated by ‘–’.

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**List of non-EU fruit phytoplasmas**

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Appendix C – Phytoplasmas of *Cydonia, Fragaria, Malus, Prunus, Pyrus, Ribes, Rubus* and *Vitis* excluded from further categorisation

| ID | Phytoplasma name | Related strain name(14) | Abbreviation (EPPO code) | 16S rRNA | EU MS in which the pathogen has been reported | Non-EU European and neighbouring countries | Reasoning for considering as EU | Uncertainties | References |
|----|------------------|--------------------------|--------------------------|----------|---------------------------------|--------------------------------------|-------------------------------|----------------|------------|
| 14 | *Candidatus* Phytoplasma asteris | – | PHYPAS | I | Germany, Hungary, Italy (Present widespread); Czech Republic, Spain (Present, restricted distribution); France, Romania (Present, no details); Belgium(15); UK(15) | Russia (Present, restricted distribution; Belarus (Present, no details)) | – | Yes | Yes(15) | Yes | Yes | Yes | Reported in the EU (several MS) | – | Species description, *Fragaria, Prunus, Pyrus, Vitis*: (Lee et al., 2004a) and Rubus (Reeder et al., 2010b); Lithuania (Valiunas et al., 2007); UK (Jones and Arocha, 2006; Reeder and Arocha, 2008; Nisbet et al., 2014), Slovenia: (Mehle et al., 2018; Radisek et al., 2009) |
| 15 | *Candidatus* Phytoplasma fragariae | – | PHYPFG | XII-E | Slovenia (EPPO report 2018/085); UK (2015/031); Belgium(15) | – | Yes | – | – | – | – | – | Originally described in the EU | – | Species description: (Valiunas et al., 2006) |
| 16 | *Candidatus* Phytoplasma mali | – | PHYPMA | X | Czech Republic, Germany, Hungary, Italy, Slovakia, Slovenia (Present widespread); Austria, Belgium, Bulgaria, Croatia, Finland, France, Greece (Present, restricted distribution); Poland, Romania (Present, no details); Netherlands (Present, few occurrences) | Switzerland (Present widespread); Norway (Present, restricted distribution); Albania, Bosnia and Herzegovina, Moldova, Turkey, Ukraine (Present, no details) | – | Yes | Yes | Yes | – | – | Reported in the EU (several MS) | – | Species description: (Seemüller and Schneider, 2004) |
### List of non-EU fruit phytoplasmas

| ID | Phytoplasma name | Related strain name(1) | Abbreviation (EPPO code) | 16S rRNA | EU MS in which the pathogen has been reported | Non-EU European and neighbouring countries | Cytinia | Fragaria | Malus | Prunus | Pyrus | Ribes | Rubus | Vitis | Reasoning for considering as EU | Uncertainties | References |
|----|------------------|-------------------------|--------------------------|----------|-----------------------------------------------|---------------------------------------------|---------|---------|------|-------|------|------|------|------|-----------------------------|--------------|------------|
| 17 | Candidatus Phytoplasma pruni | – | PHYPNN | III-A | Croatia, Italy, Lithuania, Poland, UK | Serbia | – | – | Yes | Yes | – | Yes | Yes | Yes | Yes | Reported in the EU (several MS) | – | Species description: (Davis et al., 2013); Pyrus in Croatia: (Jezic et al., 2016); Pyrus in Italy: (Lee et al., 1995); Rubus in UK: (Davies, 2000); Rubus in Poland: (Cieslinska, 2011); Vitis in Croatia: (Jezic et al., 2013); Prunus in Lithuania: (Valiunas et al., 2009); Prunus in Italy: (Lee et al., 1995); Celtis australis in Italy: (Bertaccini et al., 1996); Cirsium in Serbia: (Jakovljevic et al., 2015); Delphinium in UK (Harju et al., 2008)(2) |
| 18 | Candidatus Phytoplasma prunorum | – | PHYPRR | X | Slovenia (Present, widespread); Austria, Bulgaria, Croatia, Czech Republic, France, Germany, Greece, Hungary, Italy, Poland, Romania, Spain, (Present, restricted distribution); Belgium, Slovakia (Present, few details) | Albania, Bosnia and Herzegovina, Switzerland, Turkey, UK (Present, restricted distribution); Belarus, Serbia (Present, no details); Azerbaijan (Present, few details) | – | – | – | – | – | – | – | – | Reported in the EU (several MS) | – | Species description: (Seemuller and Schneider, 2004) |
| ID | Phytoplasma name | Related strain name(1) | Abbreviation (EPPO code) | 16S rRNA | EU MS in which the pathogen has been reported | Non-EU European and neighbouring countries | Cydonia | Fragaria | Malus | Prunus | Pyrus | Ribes | Rubus | Vitis | Reasoning for considering as EU | Uncertainties | References |
|----|-----------------|------------------------|--------------------------|---------|-----------------------------------------------|--------------------------------------------|---------|---------|-------|-------|-------|-------|-------|-------|-----------------------------|-------------|-----------|
| 19 | Candidatus Phytoplasma pyri | -- | PHYPPY | X | Italy, Netherlands (Present widespread); Belgium, Bulgaria, Croatia, Czech Republic, France, Germany, Greece, Poland, Slovakia, Slovenia (Present, restricted distribution); Hungary (Present, no details); Austria, Portugal, Spain (Present, few occurrences) | Switzerland (Present widespread); Norway, Serbia, Turkey (Present, restricted distribution); Albania, Bosnia and Herzegovina, Moldova (Present, no details) | Yes | -- | Yes | -- | -- | -- | -- | Reported in the EU (several MS) | -- | Species description: (Seemüller and Schneider, 2004); Prunus: (Sabate et al., 2014) |
| 20 | Candidatus Phytoplasma rubi | -- | PHYPRU | V-E | Denmark, Germany, Italy, Netherlands (Present widespread); Bulgaria, Portugal, Slovakia (Present, no details); UK (Present widespread); Belgium(2); Czech Republic(2) | Russia (Present, restricted distribution); Norway, Central Russia, Switzerland (Present, no details) | -- | -- | -- | -- | -- | -- | -- | Reported in the EU (several MS) | -- | Species description: (Malembic-Maher et al., 2011) |
| ID | Phytoplasma name | Related strain name(1) | Abbreviation (EPPO code) | 16S rRNA | EU MS in which the pathogen has been reported | Non-EU European and neighbouring countries | Cydonia | Fragaria | Malus | Prunus | Pyrus | Ribes | Rubus | Vitis | Reasoning for considering as EU | Uncertainties | References |
|----|-----------------|------------------------|--------------------------|---------|-----------------------------------------------|--------------------------------------------|---------|---------|-------|-------|-------|-------|-------|-------|-----------------------------|--------------|-----------|
| 21 | *Candidatus Phytoplasma solani* | – | PHYPSO | XI-A | Bulgaria, Croatia, France, Germany, Greece, Hungary, Italy, Slovakia, Slovenia, Spain, (Present, restricted distribution); Italy (Present, no details); Austria, Czech Republic, Poland (Present, few occurrences); UK (Transient, under eradication); Belgium (Absent, eradicated)(2); Portugal (Present, restricted distribution)(2) | Macedonia, Montenegro (Present, widespread); Russia, Serbia, Switzerland, Turkey (Present, restricted distribution); Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Georgia, Ukraine (Present, no details) | – | Yes | Yes | – | Yes | Yes | – | Reported in the EU (several MS) | – | Species description: (Quaglino et al., 2013); Malus: (Duduk et al., 2010); Prunus: (Avramov et al., 2011) |
| 22 | *Candidatus Phytoplasma ulmi* | – | PHYPUL | V-A | Croatia (Present, widespread), France, Italy, Slovenia (Present, restricted distribution), Belgium (Present, under eradication)(2), Czech Republic, Germany (Present, few occurrences), Poland (Transient, under eradication); UK (Absent, eradicated)(2) | Serbia (Present, few occurrences) | – | – | – | – | – | – | – | Yes | Reported in the EU (several MS), but not in target species. Reported only once in *Vitis* (and in 1 plant) | Zambon et al., 2018 (Detected in one *Vitis* out of 161 tested ones in Italy) | Species description: (Lee et al., 2004b); *Vitis*: (Zambon et al., 2018) |
| ID | Phytoplasma name | Related strain name(1) | Abbreviation (EPPO code) | EU MS in which the pathogen has been reported | Non-EU European and neighbouring countries | Cydonia | Fragaria | Malus | Prunus | Pyrus | Ribes | Rubus | Vitis | Reasoning for considering as EU | Uncertainties | References |
|----|-----------------|------------------------|--------------------------|-----------------------------------------------|------------------------------------------|--------|---------|-------|-------|-------|-------|-------|-------|--------------------------------|-------------|-----------|
| 23 | Unclassified    | Grapevine Flavescence dorée phytoplasma | PHYP64 | V | Croatia, France, Hungary, Italy, Portugal, Slovenia (Present, restricted distribution); Austria, Spain (Present, few occurrences); Belgium (Absent, no pest record)(2) | Serbia, Switzerland (Present, restricted distribution) | – | – | – | – | – | – | – | Yes | Reported in the EU (several MS) | – | Species description: (EFSA PLH Panel, 2014); (Lee et al., 2004b) |
| 24 | Unclassified    | German flavescence dorée phytoplasma | PHYP65 | V | Germany | – | – | – | – | – | – | Yes | Yes | Originally described in the EU | – | Species description and Vitis: (Angelini et al., 2001) |
| 25 | Unclassified    | Alder yellows phytoplasma | PHYP74 | V-C | France | – | – | – | – | – | – | Yes | Yes | Originally reported in the EU | – | Species description: (Lee et al., 2004b); Vitis (experimental transmission to): (Maixner et al., 2000); Alnus in France: (Arnaud et al., 2007) |
| 26 | Unclassified    | Knautia phyllody phytoplasma, KAP | PHYP45 | IX-C | Italy | – | – | – | Yes | Yes | – | – | Yes | Yes | Originally reported in the EU | – | Species description : (Marcone et al., 2001); Knautia arvensis in Italy: (Marcone et al., 1997); Pyrus: (Sharbatkhari et al., 2008); Prunus: (Salehi et al., 2006); |
| 27 | Unclassified    | Picris echioides yellows, PEY | IX-C | Italy | – | – | – | – | – | – | – | Yes | Yes | Originally reported in the EU | – | Species description and Argyranthemum in Italy: (Ferretti et al., 2015); Vitis: (Salehi et al., 2016); Picris echioides in Italy: (Marcone et al., 1997) |

(1): Reference isolate of ‘Candidatus Phytoplasma species’ is indicated by ‘–’. (2): Information provided by MS during commenting phase.
Annex A – List of phytoplasmas considered in the opinion

See excel file in Supplementary Information online.