Pest categorisation of *Unaspis citri*

**EFSA Panel on Plant Health (PLH),**
Michael Jeger, Claude Bragard, David Caffier, Thierry Candresse, Elisavet Chatzivassiliou, Katharina Dehnen-Schmutz, Gianni Gilioli, Jean-Claude Grégoire, Josep Anton Jaques Miret, Maria Navajas Navarro, Björn Niere, Stephen Parnell, Roel Potting, Trond Rafoss, Vittorio Rossi, Gregor Urek, Ariena Van Bruggen, Wopke Van der Werf, Jonathan West, Stephan Winter, Ciro Gardi and Alan MacLeod

**Abstract**

The Panel on Plant Health performed a pest categorisation of the citrus snow scale, *Unaspis citri* (Comstock) (Hemiptera: Diaspididae), for the European Union (EU). This is a well-defined and distinguishable species, native to south-eastern Asia, which has spread to many tropical and subtropical regions. *U. citri* can be a pest of citrus and has been cited on over 28 different species in 16 plant families. In the EU, *U. citri* occurs in the Azores. There is uncertainty as to whether it occurs in continental Portugal. Reports of it occurring in Greece and Spain are likely to be invalid and based on interception records from these countries. An old Italian record is a misidentification. *U. citri* is listed in Annex IIAI of 2000/29/EC as a harmful organism. The international trade of hosts, as either plants for planting, fruit or cut flowers, provide potential pathways into the EU. However, current EU legislation prohibits the import of citrus plants for planting from third countries. *U. citri* is mostly confined to coastal humid tropical areas and does not occur in semi-arid areas that are irrigated. Nevertheless, given that it occurs in the Azores and that there are regional climatic similarities between places where *U. citri* occurs and climates within the EU, and taking EU host distribution into account, *U. citri* has the potential to establish in the EU, especially in citrus-growing regions around the Mediterranean where losses in quality and yield of citrus could occur. Phytosanitary measures are available to inhibit the likelihood of introduction of *U. citri*. Considering the criteria within the remit of EFSA to assess the status as a potential Union quarantine pest (QP), or as a potential regulated non-quarantine pest (RNQP), *U. citri* meets the criteria assessed by EFSA for consideration as a potential Union QP.

© 2018 European Food Safety Authority. *EFSA Journal* published by John Wiley and Sons Ltd on behalf of European Food Safety Authority.

**Keywords:** Citrus snow scale, white louse scale, citrus, pest risk, plant health, plant pest, quarantine

**Requestor:** European Commission

**Question number:** EFSA-Q-2017-00368

**Correspondence:** alpha@efs.europa.eu
Panel members: Claude Bragard, David Caffier, Thierry Candresse, Elisavet Chatzivassiliou, Katharina Dehnen-Schmutz, Gianni Gilioli, Jean-Claude Gregoire, Josep Anton Jaques Miret, Michael Jeger, Alan MacLeod, Maria Navajas Navarro, Björn Niere, Stephen Parnell, Roel Potting, Trond Rafoss, Vittorio Rossi, Gregor Urek, Ariena Van Bruggen, Wopke Van der Werf, Jonathan West and Stephan Winter.

Suggested citation: EFSA Panel on Plant Health (PLH), Jeger M, Bragard C, Caffier D, Candresse T, Chatzivassiliou E, Dehnen-Schmutz K, Gilioli G, Grégoire J-C, Jaques Miret JA, Navarro MN, Niere B, Parnell S, Potting R, Rafoss T, Rossi V, Urek G, Van Bruggen A, Van der Werf W, West J, Winter S, Gardi C and MacLeod A, 2018. Scientific Opinion on the pest categorisation of Unaspis citri. EFSA Journal 2018;16(3):5187, 26 pp. https://doi.org/10.2903/j.efsa.2018.5187

ISSN: 1831-4732

© 2018 European Food Safety Authority. EFSA Journal published by John Wiley and Sons Ltd on behalf of European Food Safety Authority.

This is an open access article under the terms of the Creative Commons Attribution-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited and no modifications or adaptations are made.

The EFSA Journal is a publication of the European Food Safety Authority, an agency of the European Union.
# Table of contents

Abstract .................................................................................................................................................. 1  
1. Introduction ...................................................................................................................................... 4  
  1.1. Background and Terms of Reference as provided by the requestor ........................................... 4  
  1.1.1. Background ............................................................................................................................ 4  
  1.1.2. Terms of reference ................................................................................................................ 4  
  1.1.2.1. Terms of Reference: Appendix 1 ......................................................................................... 4  
  1.1.2.2. Terms of Reference: Appendix 2 ......................................................................................... 6  
  1.1.2.3. Terms of Reference: Appendix 3 ......................................................................................... 7  
  1.2. Interpretation of the Terms of Reference ....................................................................................... 8  
2. Data and methodologies .................................................................................................................... 8  
  2.1. Data ........................................................................................................................................ 8  
  2.1.1. Literature search .................................................................................................................... 8  
  2.1.2. Database search .................................................................................................................... 8  
  2.2. Methodologies ........................................................................................................................... 9  
3. Pest categorisation ............................................................................................................................ 11  
  3.1. Identity and biology of the pest .................................................................................................... 11  
  3.1.1. Identity and taxonomy ........................................................................................................... 11  
  3.1.2. Biology of the pest .................................................................................................................. 11  
  3.1.3. Detection and identification of the pest ................................................................................... 12  
3.2. Pest distribution ............................................................................................................................ 12  
  3.2.1. Pest distribution outside the EU ............................................................................................ 12  
  3.2.2. Pest distribution in the EU .................................................................................................... 16  
3.3. Regulatory status ........................................................................................................................ 17  
  3.3.1. Council Directive 2000/29/EC ................................................................................................. 17  
  3.3.2. Legislation addressing plants and plant parts on which Scirtothrips citri is regulated .......... 17  
3.4. Entry, establishment and spread in the EU .................................................................................... 18  
  3.4.1. Host range ............................................................................................................................. 18  
  3.4.2. Entry .................................................................................................................................. 19  
  3.4.3. Establishment ....................................................................................................................... 18  
  3.4.3.1. EU distribution of main host plants ..................................................................................... 19  
  3.4.3.2. Climatic conditions affecting establishment ....................................................................... 20  
  3.4.4. Spread .................................................................................................................................. 21  
3.5. Impacts ...................................................................................................................................... 21  
  3.5.1. Potential pest impacts ............................................................................................................ 21  
  3.5.1.1. Direct impacts of the pest .................................................................................................. 21  
3.6. Availability and limits of mitigation measures .............................................................................. 21  
  3.6.1. Phytosanitary measures ........................................................................................................ 22  
  3.6.2. Biological or technical factors affecting the feasibility and effectiveness of measures to prevent the entry, establishment and spread of the pest ................................................................. 22  
  3.6.3. Control methods .................................................................................................................. 22  
3.7. Uncertainty .................................................................................................................................. 22  
4. Conclusions .................................................................................................................................... 22  
References ........................................................................................................................................... 24  
Abbreviations ..................................................................................................................................... 24  
Appendix A – Reported host plants of *Unaspis citri* ......................................................................... 26
1. Introduction

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

1.1.1. Background

Council Directive 2000/29/EC 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 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 categorizations 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, 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.

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

- Aleurocanthus spp.
- Anthonomus bigignifer (Schenkling)
- Anthonomus signatus (Say)
- Aschistonyx eppoi Inouye
- Carposina niponensis Walsingham
- Enarmonia packardi (Zeller)
- Enarmonia prunivora Walsh
- Grapholita inopinata Heinrich
- Hisphonous phycitis
- Leucaspis japonica Ckll.
- Listronotus bonariensis (Kuschel)

- Numonia pyrivorella (Matsumura)
- Oligonychus perditus Pritchard and Baker
- Pissodes spp. (non-EU)
- Scirtothrips aurantii Faure
- Scirtothrips citri (Moulteaux)
- 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 campesiris pv. oryzae (Ishiyama)
- Dye and pv. oryzicola (Fang. et al.) Dye

(c) Fungi

- Alternaria alternata (Fr.) Keissler (non-EU pathogenic isolates)
- Anisogamella anomaly (Peck) E. Müller
- Apsiosporina morbosa (Schwein.) v. Arx
- Ceratocystis virescens (Davidson) Moreau
- Cercoseptoria pini-dendri florae (Hori and Nambu) Deighton
- Cercospora angolensis Carv. and Mendes

- Elsinoe spp. Bitanc. and Jenk. Mendes
- Fusarium oxysporum f. sp. albedinis (Killian and Maire) Gordon
- Guignardia piricola (Nosa) Yamamoto
- Puccinia pittiiarena Henings
- 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 cembrae Heer
- Ips duplicatus Sahlberg
- Ips sexdentatus Börner
- Ips typographus Heer
- Sternochetus mangiferae Fabricius

(b) Bacteria

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

www.efsa.europa.eu/efsajournal 5 EFSA Journal 2018;16(3):5187
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

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 mycoplasm
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)
Anomalal orientalis Waterhouse
Arrhenodes minutus Drury
Choristoneura spp. (non-EU)
Conotrachelus nenuphar (Herbst)
Dendrolimus sibiricus Tschetterverikov
Diabrotica barberi Smith and Lawrence
Diabrotica undecimpunctata howardi Barber
Diabrotica undecimpunctata undecimpunctata Mannerheim
Diabrotica virgifera zeae Krysan & Smith
Diaphorina citri Kuway
Heliothis zeae (Boddie)
Hirschmanniella spp., other than Hirschmanniella gracilis (de Man) Luc and Goodey
Liriomyza sativae Blanchard

(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 weiri (Murril) Kotlaba and Pouzar
Melampsora farlowii (Arthur) Davis

Mycochaearella larii-leptolepis Ito et al.
Mycosphaerella populae G. E. Thompson
Phoma andina Turkenstein
Phyllosticla solitaris Ell. and Ev.
Septoria lycopersici Speg. var. malagutii Ciccarone and Boerema
Thecaphora solani Barrus
Treichispora 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 IIAII

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

*Meloidogyne fallax* Karssen  
*Rhizococcus hibisci* Kawai and Takagi

*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

1.2. Interpretation of the Terms of Reference

*Unaspis citri* Comstock is one of a number of pests listed in the Appendices to the Terms of Reference (ToR) to be subject to pest categorisation to determine whether it fulfils the criteria of a quarantine pest (QP) or those of a regulated non-quarantine pest (RNQP) for the area of the European Union (EU) excluding Ceuta, Melilla and the outermost regions of Member States (MSs) referred to in Article 355(1) of the Treaty on the Functioning of the European Union (TFEU), other than Madeira and the Azores. However, the current valid name of the organism is *Unaspis citri* (Comstock). The brackets around the authority are not present in the ToR. Comstock originally named and described the organism as *Chionaspis citri* in 1883. Ferris (1937) moved the organism into the genus *Unaspis* to create a new combination which stands as the valid name. The correct name and authority is therefore *Unaspis citri* (Comstock).

2. Data and methodologies

2.1. Data

2.1.1. Literature search

A literature search on *U. citri* was conducted at the beginning of the categorisation in the ISI Web of Science bibliographic database, using the scientific name of the pest as search term. Relevant papers were reviewed, further references and information were obtained from experts, from citations within the references and grey literature.

2.1.2. Database search

Pest information, on host(s) and distribution, was retrieved from the EPPO Global Database (EPPO 2017).

Data about the area of hosts grown in the EU were obtained from EUROSTAT (http://ec.europa.eu/eurostat/web/agriculture/data/database).

The Europhyt database was consulted for pest-specific notifications on interceptions and outbreaks. Europhyt is a web-based network launched by the Directorate General for Health and Consumers (DG SANCO), 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 MSs and the phytosanitary measures taken to eradicate or avoid their spread.

2.2. Methodologies

The Panel performed the pest categorisation for *U. citri*, following guiding principles and steps presented in the EFSA guidance on the harmonised framework for pest risk assessment (EFSA PLH Panel, 2010) and as defined in the International Standard for Phytosanitary Measures No 11 (FAO, 2013) and No 21 (FAO, 2004).

In accordance with the guidance on a harmonised framework for pest risk assessment in the EU (EFSA PLH Panel, 2010), this work was initiated following an evaluation of the EU’s 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 QP and for a Union RNQP in accordance with Regulation (EU) 2016/2031 on protective measures against pests of plants, and includes additional information required as per the specific terms of reference received by the European Commission. In addition, for each conclusion, the Panel provides a short description of its associated uncertainty.

Table 1 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 qualify either as a QP or as a RNQP. If one of the criteria is not met, the pest will not qualify. In such a case, the working group should consider the possibility to terminate the assessment early and be concise in the sections preceding the question for which the negative answer is reached. Note that a pest that does not qualify as a QP may still qualify as a RNQP which needs to be addressed in the opinion.

It should be noted that the Panel’s conclusions are formulated respecting its remit and particularly with regards to the principle of separation between risk assessment and risk management (EFSA founding regulation\(^1\)); 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, while addressing social impacts is outside the remit of the Panel, in agreement with EFSA guidance on a harmonised framework for pest risk assessment (EFSA PLH Panel, 2010).

Table 1: 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 Union regulated non-quarantine pest | Criterion in Regulation (EU) 2016/2031 regarding protected zone quarantine pest (articles 32–35) |
|---------------------------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| 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 regulated non-quarantine pest. (A regulated non-quarantine pest must be present in the risk assessment area) | Is the pest present in the EU territory? If not, it cannot be a protected zone quarantine organism |

---

\(^1\) 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.
| Criterion of pest categorisation | Criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest | Criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest | Criterion in Regulation (EU) 2016/2031 regarding protected zone quarantine pest (articles 32–35) |
|----------------------------------|-------------------------------------------------|-------------------------------------------------|-----------------------------------------------|
| 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 | 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? | 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 PRA area (i.e. protected zone) |
| 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 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! | Is the pest able to enter into, become established in, and spread within, the protected zone areas? |
| Potential for consequences in the EU territory (Section 3.5) | Would the pests’ introduction have an economic or environmental impact on the EU territory? | Does the presence of the pest on plants for planting have an economic impact, as regards the intended use of those plants for planting? | Would the pests’ introduction have an economic or environmental impact on the protected zone areas? |
| 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 pest presence on plants for planting such that the risk becomes mitigated? | 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? |
| Conclusion of pest categorisation (Section 4) | A statement as to whether (1) all criteria 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 above for consideration as a potential regulated non-quarantine pest were met, and (2) if not, which one(s) were not met | A statement as to whether (1) all criteria above for consideration as potential protected zone quarantine pest 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.
3. **Pest categorisation**

3.1. **Identity and biology of the pest**

3.1.1. **Identity and taxonomy**

Is the identity of the pest established, or has it been shown to produce consistent symptoms and to be transmissible?  
Yes, *U. citri* is a well-defined insect in the order Hemiptera, family Diaspididae.

The citrus snow scale, also known as white louse scale, *U. citri* (Comstock) (Hemiptera: Diaspididae) was initially described as *Chionaspis citri* from specimens collected on *Citrus* sp. in Louisiana (USA) by Comstock in 1883 (Comstock, 1883). Other former scientific names include: *Chionaspis annae*, *Dinaspis annae*, *Dinaspis veitchi*, *Howardia citri*, *Prontaspis citri*, *Trichomytilus veitchi* and *Unaspis annae* (Buckley and Hodges, 2017; CABI, 2017).

Detailed morphological descriptions, illustrations and keys to the genus *Unaspis* can be found in Balachowsky (1954), Ferris (1937) and Williams and Watson (1988). Watson (2015) provides an identification key to the 19 species of the genus *Unaspis*.

The species *U. citri* and *Unaspis yanonensis* (Kuwana), which can be found on citrus and differ by the numbers of macroducts on the pygidium (EPPO, 2004), were confused over the years making some host and distribution records erroneous (García Morales et al., 2016). Unfortunately, García Morales et al. (2016) do not provide information about the precise erroneous host and distribution records, so the incorrect records cannot be easily identified and discarded.

3.1.2. **Biology of the pest**

*Unaspis citri* reproduces sexually. Mated females (sessile, larviform, bright orange in colour and protected under a 2 cm long mussel-shell shaped waxy cover, brown or brown-black, with a distinct longitudinal dorsal ridge) oviposit up to 170 eggs, from which an average of 80 offspring is produced, over a period of 2–3 months. The eggs (ovoid, bright orange in colour, about 0.30 mm long), which remain protected under the female scale, hatch almost immediately, from 30 min to 3 h after oviposition. First instar nymphs (ovoid, bright yellow in colour, with six legs, two-five-segmented antennae and two laterally opposed eye spots), also known as crawlers as this is the only immature stage with functional legs, are attracted to light and move upwards towards the apical twigs or onto the fruit, especially if leaf fall has occurred. Once a feeding site has been selected, the nymphs settle and become sessile for the rest of their development, which differs between males and females. For females, development includes two additional instars with increasingly larger body and cover sizes, similar in shape and colour to the adult female, before reaching the adult stage. For males, there is only one extra nymphal stage plus a preupal and a pupal stages, which are protected under a white cover (thus, the common name citrus snow scale) about 1 mm long, with three longitudinal ridges. The adult male is yellow to orange in colour, winged, and about 1 mm long. It has long 10-segmented filiform antennae, four dark purple eye spots and no functional mouthparts. They are short-lived and actively fly to locate a mate (EPPO, 1997; Smith et al., 1997; García Morales et al., 2016; Buckley and Hodges, 2017; CABI, 2017).

In *Citrus* spp., *U. citri* feeds primarily on the trunk and tree limbs of older trees, feeding on plant juices, through its long piercing-sucking mouthparts. High populations may also invade leaves and fruit (Russo and Longo 2004; Buckley and Hodges, 2017). In Australia, crawlers may be produced all year round, with the largest numbers appearing in autumn. They are dispersed mainly by wind, but also on farm machinery, clothing and plants (Smith et al., 1997). Optimal temperatures for development range between 25°C and 38°C and developmental thresholds are set at 12°C, with no differences in developmental time between sexes (Arias-Reverón and Browning, 1995). The life cycle takes about 8 weeks in summer (Miller and Davidson, 2005) and, in citrus, there is a variable number of generations per year depending on latitude (García Morales et al., 2016). Two to three discrete generations have been reported in Japan (Mamet, 1943) and Armenia (Ter-Grigorian, 1969). In Australia, 3–4 overlapping generations occur in New South Wales and up to 5–6 in Queensland and the Northern Territory (Smith et al., 1997), the same as in Florida (Bullock and Brooks, 1975).
### 3.1.3. Detection and identification of the pest

Are detection and identification methods available for the pest?

Yes, EPPO produced a standard addressing the detection and identification of *U. citri* (EPPO, 2004).

Detection: all developmental stages of *U. citri* can be found on fruit, bark and leaves of their host plants. Heavy field infestations can be easily detected because of the snowy appearance of the plants, resulting from the presence of the numerous white scale covers of immature male stages. Infestation begins on the trunk and quickly spreads to branches and twigs (EPPO, 2004; Buckley and Hodges, 2017). Sticky cards can be used to detect crawlers, adult males and *U. citri* adult parasitoids (Arias-Reverón and Browning, 1995).

Symptoms: early symptoms include reduced tree vigour and fruit production. Leaves show chlorotic areas where the scales are feeding. Heavily spotted leaves may drop prematurely. Infested fruits are stunted and have a pitted appearance. Twigs and even large limbs in the centre of the canopy may die causing weakening of the tree and dieback of branches. Normal growth of the bark is prevented, making the trees become ‘hidebound’. Although increase of trunk and limb diameter is resumed when *U. citri* population density decreases, the toughened bark may not be able to follow it, and may split, thus allowing access to borers and pathogens.

Identification: Diaspididae (armoured scales) are identified first by studying the shape, dimension and colour of the scale cover under a stereomicroscope. For species identification, the body of adult females should be studied. Specimens removed from under the cover have to be cleared and prepared for morphological study under a microscope and can be identified to species level using existing keys (EPPO, 2004).

### 3.2. Pest distribution

#### 3.2.1. Pest distribution outside the EU

*Unaspis citri* is native to South-East Asia in the continental region between south-eastern India and eastern China (Smith et al., 1997), and has spread widely in many citrus growing areas, including other countries in Asia, North, Central and South America, Africa and Oceania (see Table 2, Figure 1).

The inclusion of Turkey and Uzbekistan in Table 2 results from *U. citri* being intercepted in Belgium on *Vitis vinifera* fruit (grapes) imported from Turkey but originally produced in Uzbekistan, two countries and a host plant not previously reported. There is uncertainty regarding whether *U. citri* occurs in both Turkey and Uzbekistan or only in one of them.

**Table 2:** Distribution of *Unaspis citri* outside the EU

| Region | Country | Subnational distribution | Status | Reference | Remarks |
|--------|---------|--------------------------|--------|-----------|---------|
| Asia   | Armenia | Present                  |        | Garcia Morales et al. (2016), Buckley and Hodges (2017) |         |
|        |         |                          | Present| CABI (2017) |         |
| China  | Guangdong| Present                  |        | Garcia Morales et al. (2016), Buckley and Hodges (2017) |         |
|        | Guangxi  | Present                  |        | Garcia Morales et al. (2016), Buckley and Hodges (2017) |         |
|        | Hainan   | Present                  |        | Garcia Morales et al. (2016), Buckley and Hodges (2017) |         |
|        | Hong Kong| Present                  |        | CABI (2017) |         |
|        | Hubei    | Present                  |        | Garcia Morales et al. (2016), Buckley and Hodges (2017) |         |
|        | Shaanxi  | Present                  |        | Garcia Morales et al. (2016) |         |
| Region | Country       | Subnational distribution | Status | Reference                                      | Remarks                           |
|--------|---------------|---------------------------|--------|-----------------------------------------------|-----------------------------------|
| Asia   | Sichuan       | Present                   | García Morales et al. (2016), Buckley and Hodges (2017) |
|        | Zhejiang      | Present                   | García Morales et al. (2016), Buckley and Hodges (2017) |
|         | Indonesia     | Java                      | Present | CABI (2017)                                  |
|         |               | Kalimantan                | Present | García Morales et al. (2016), Buckley and Hodges (2017) |
|         | Japan         | Present                   | CABI (2017)                                  |
|         | Malaysia      | Malaya                    | Present | García Morales et al. (2016)                  |
|         |               | Peninsular Malaysia       | Present | CABI (2017)                                  |
|         | Philippines   | Luzon                     | Present | García Morales et al. (2016)                  |
|         |               | Mindanao                  | Present | García Morales et al. (2016), Buckley and Hodges (2017) |
|         | Singapore     | Present                   | CABI (2017)                                  |
|         | Syria         | Present                   | CABI (2017)                                  |
|         | Taiwan        | Present                   | García Morales et al. (2016), Buckley and Hodges (2017) |
|         | Thailand      | Present                   | García Morales et al. (2016), Buckley and Hodges (2017) |
|         | Turkey        | Unconfirmed               | Europhyt (see Section 3.4.2)                 |
|         | Uzbekistan    | Unconfirmed               | Europhyt (see Section 3.4.2)                 |
|         | Vietnam       | Present                   | CABI (2017)                                  |
|         | Yemen         | Widespread                | CABI (2017)                                  |
|         | Africa        | Algeria                   | Present | García Morales et al. (2016), Buckley and Hodges (2017) |
|         |               | Benin                     | Present | CABI (2017)                                  |
|         |               | Cameroon                  | Present | CABI (2017)                                  |
|         |               | Comoros                   | Present | CABI (2017)                                  |
|         |               | Congo                     | Present | CABI (2017)                                  |
|         |               | Congo Dem. Rep.           | Present | CABI (2017)                                  |
|         |               | Côte d’Ivoire             | Present | CABI (2017)                                  |
|         |               | Egypt                     | Present | CABI (2017)                                  |
|         |               | Gabon                     | Present | CABI (2017)                                  |
|         |               | Guinea                    | Present | García Morales et al. (2016), Buckley and Hodges (2017) |
|         |               | Liberia                   | Present | García Morales et al. (2016), Buckley and Hodges (2017) |
|         |               | Madagascar                | Present | CABI (2017)                                  |
|         |               | Mali                      | Present | García Morales et al. (2016), Buckley and Hodges (2017) |
|         |               | Mauritius                 | Present | CABI (2017)                                  |
| Region                  | Country               | Subnational distribution | Status | Reference                                      | Remarks                          |
|------------------------|-----------------------|--------------------------|--------|-----------------------------------------------|----------------------------------|
| Africa                 | Niger                 |                          | Present| CABI (2017)                                  |                                  |
|                        | Nigeria               |                          | Present| CABI (2017)                                  |                                  |
|                        | Senegal               |                          | Present| CABI (2017)                                  |                                  |
|                        | Seychelles            |                          | Present| Garcia Morales et al. (2016)                 |                                  |
|                        | Sierra Leone          |                          | Present| CABI (2017)                                  |                                  |
|                        | South Africa          |                          | Present| Garcia Morales et al. (2016), Buckley and Hodges (2017) |                                  |
|                        | Togo                  |                          | Present| CABI (2017)                                  |                                  |
|                        | Zaire                 |                          | Present| Garcia Morales et al. (2016), Buckley and Hodges (2017) |                                  |
|                        | Bermuda               |                          | Present| CABI (2017)                                  |                                  |
|                        | Mexico                |                          | Present| CABI (2017)                                  |                                  |
|                        | Tamaulipas            |                          | Present| Garcia Morales et al. (2016)                 |                                  |
|                        | Veracruz              |                          | Present| Garcia Morales et al. (2016), Buckley and Hodges (2017) |                                  |
|                        | USA                   | California              | Present| CABI (2017)                                  |                                  |
|                        |                      | Florida                 | Present| CABI (2017)                                  |                                  |
|                        |                      | Georgia                 | Present| CABI (2017)                                  |                                  |
|                        |                      | Louisiana               | Present| CABI (2017)                                  |                                  |
|                        |                      | Mississippi             | Present| Garcia Morales et al. (2016), Buckley and Hodges (2017) |                                  |
|                        |                      | Virginia                | Present| Garcia Morales et al. (2016), Buckley and Hodges (2017) |                                  |
| Central America and Caribbean | Antigua and Barbuda |                          | Present| CABI (2017)                                  |                                  |
|                        | Barbados              |                          | Present| CABI (2017)                                  |                                  |
|                        | Costa Rica            |                          | Present| CABI (2017)                                  |                                  |
|                        | Cuba                  |                          | Present| CABI (2017)                                  |                                  |
|                        | Curacao               |                          | Present| Garcia Morales et al. (2016)                 |                                  |
|                        | Dominica              |                          | Present| CABI (2017)                                  |                                  |
|                        | Dominican Rep.        |                          | Present| CABI (2017)                                  |                                  |
|                        | El Salvador           |                          | Present| CABI (2017)                                  |                                  |
|                        | France                | Guadeloupe              | Present| CABI (2017)                                  |                                  |
|                        |                      | Martinique              | Present| CABI (2017)                                  |                                  |
|                        | Grenada               |                          | Present| CABI (2017)                                  |                                  |
|                        | Haiti                 |                          | Present| CABI (2017)                                  |                                  |
|                        | Honduras              |                          | Present| CABI (2017)                                  |                                  |
|                        | Jamaica               |                          | Present| CABI (2017)                                  |                                  |
|                        | Panama                |                          | Present| CABI (2017)                                  |                                  |
|                        | Puerto Rico           |                          | Present| CABI (2017)                                  |                                  |
|                        | St. Kitts and Nevis   |                          | Restricted distribution| CABI (2017) |                                  |
|                        | St. Lucia             |                          | Present| CABI (2017)                                  |                                  |
| Region         | Country                        | Subnational distribution | Status     | Reference                     | Remarks                                      |
|---------------|--------------------------------|---------------------------|------------|-------------------------------|----------------------------------------------|
|               | St. Vincent and the Grenadines | Present                   | Present    | CABI (2017)                   |                                              |
|               | Trinidad and Tobago            | Present                   | Present    | CABI (2017)                   |                                              |
|               | British Virgin Islands         | Present                   | Present    | CABI (2017)                   |                                              |
|               | Montserrat                     | Present                   | Present    | CABI (2017)                   |                                              |
|               | Ste. Croix                      | Present                   | Present    | Garcia Morales et al. (2016) |                                              |
|               | US Virgin Islands              | Present                   | Present    | CABI (2017)                   |                                              |
| South America | Argentina                      | Present                   | Present    | CABI (2017)                   |                                              |
|               | Bolivia                        | Present                   | Present    | CABI (2017)                   |                                              |
|               | Brazil                         | Espírito Santo            | Present    | CABI (2017)                   |                                              |
|               |                                | Mato Grosso                | Present    | Garcia Morales et al. (2016) |                                              |
|               |                                | Rio de Janeiro            | Present    | CABI (2017)                   |                                              |
|               |                                | Rio Grande do Sul         | Present    | CABI (2017)                   |                                              |
|               |                                | São Paulo                 | Present    | CABI (2017)                   |                                              |
|               | Chile                          | Present                   | Present    | CABI (2017)                   |                                              |
|               | Colombia                       | Present                   | Present    | CABI (2017)                   |                                              |
|               | Ecuador                        | Present                   | Present    | CABI (2017)                   |                                              |
|               | French Guyana                  | Present                   | Present    | Garcia Morales et al. (2016) |                                              |
|               | Guyana                         | Present                   | Present    | CABI (2017)                   |                                              |
|               | Paraguay                       | Present                   | Present    | CABI (2017)                   |                                              |
|               | Peru                           | Present                   | Present    | CABI (2017)                   |                                              |
|               | Uruguay                        | Present                   | Present    | CABI (2017)                   |                                              |
|               | Venezuela                      | Present                   | Present    | CABI (2017)                   |                                              |
| Oceania       | Australia                      | New South Wales           | Restricted | CABI (2017)                   |                                              |
|               |                                | Northern Territory        | Present    | Smith et al. (1997)           |                                              |
|               |                                | Queensland                | Present    | CABI (2017)                   |                                              |
|               |                                | Victoria                  | Present    | CABI (2017)                   |                                              |
|               | Cook Islands                   | Present                   | Present    | CABI (2017)                   |                                              |
|               | Fiji                           | Present                   | Present    | CABI (2017)                   |                                              |
|               | New Caledonia                  | Present                   | Present    | CABI (2017)                   |                                              |
|               | Wallis and Futuna Islands      | Present                   | Present    | CABI (2017)                   |                                              |
|               | Kiribati                       | Present                   | Present    | CABI (2017)                   |                                              |
|               | Federated states of Micronesia | Present                   | Present    | CABI (2017)                   |                                              |
|               |                                | Ponape Island             | Present    | Garcia Morales et al. (2016) |                                              |
|               |                                | Truk Islands              | Present    | Garcia Morales et al. (2016); Buckley and Hodges (2017) |                                              |
|               | New Zealand                    | Absent, invalid record    | Absent     | CABI (2017)                   |                                              |
|               | Niue                           | Present                   | Present    | CABI (2017)                   |                                              |
|               | Papua New Guinea               | Present                   | Present    | CABI (2017)                   |                                              |
|               | Solomon Islands                | Present                   | Present    | CABI (2017)                   |                                              |
According to CABI (2017), *U. citri* is present in Malta as well as Portugal. However, Mifsud et al. (2014) carried out extensive field surveys in the Maltese Archipelago and did not find any evidence of *U. citri*. In addition, there appears to be no slide-mounted material deposited in museum collections to support the report of *U. citri* being present in Malta. *U. citri* is now regarded as absent from Malta (C. Malumphy pers comm, January 2018).

| Region               | Country                   | Subnational distribution | Status | Reference                                      | Remarks                                      |
|----------------------|---------------------------|--------------------------|--------|-----------------------------------------------|----------------------------------------------|
| Tonga                | Present                   |                          | CABI (2017)                            |                                               |
| American Samoa       | Present                   |                          | Garcia Morales et al. (2016), Buckley and Hodges (2017) |                                               |
| Hawaii: Oahu island   | Present                   |                          | Garcia Morales et al. (2016); Buckley and Hodges (2017) |                                               |
| Vanuatu              | Present                   |                          | CABI (2017)                            |                                               |
| Western Samoa (known as Samoa until 1997) | Present                   |                          | CABI (2017)                            |                                               |
A recent compilation about \textit{U. citri} by Garcia Morales et al. (2016) state that it is present in Greece, Italy and Spain, based on information from Nakahara (1982) for Greece and Spain and Newstead (1907) for Italy. Records from Greece and Spain in Nakahara (1982) refer to interceptions of \textit{U. citri} reported by Greece and Spain and are not considered as true records of the pest being established in those countries. In addition, the Spanish reference laboratory in Madrid was consulted and the absence of \textit{U. citri} records from Spain has been confirmed (P. Del Estal, pers. comm. January 2018).

Data from Newstead (1907) for Italy actually refers to findings on \textit{Euonymus}, the host for the closely related \textit{Unaspis} (= \textit{Chionaspis}) \textit{euonymi} (Comstock), which is present in EU and not a QP. Therefore, the Newstead (1907) report of \textit{U. citri} is considered a misidentification (C. Malumphy, pers. comm., January 2018).

Kozár and Franco (1995) report \textit{U. citri} from mainland Portugal. However, their report is based on a single sample from Vila Nova de Gaia taken in 1889 and found in a slide collection of the British Museum in London. \textit{U. citri} has not been found in mainland Portugal again since then (Franco et al., 2011).

The absence of \textit{U. citri} from the Netherlands has been confirmed by surveys (CABI, 2017).

Overall we conclude that \textit{U. citri} has a restricted distribution in the EU, occurring in the Azores (Franco et al., 2011). There is uncertainty as to whether it also occurs in mainland continental Portugal.

### 3.3. Regulatory status

#### 3.3.1. Council Directive 2000/29/EC

The organism subject to pest categorisation is listed in Council Directive 2000/29/EC as \textit{Unaspis citri}. Details are presented in Tables 3 and 4.

**Table 3:** \textit{Unaspis citri} in Council Directive 2000/29/EC

| Annex II, Part A | Harmful organisms whose introduction into, and spread within, all Member States shall be banned if they are present on certain plants or plant products |
|------------------|------------------------------------------------------------------------------------------------------------------|
| **Section I**    | Harmful organisms not known to occur in the Community and relevant for the entire Community |
| (a)              | Insects, mites and nematodes, at all stages of their development |
|                  | Species Subject of contamination |
| 32.              | \textit{Unaspis citri} Comstock Plants of \textit{Citrus} L, \textit{Fortunella} Swingle, \textit{Poncirus} Raf., and their hybrids, other than fruit and seeds |

(Note that the authority Comstock is interpreted as being (Comstock) - see 1.2)

#### 3.3.2. Legislation addressing plants and plant parts on which \textit{Scirtothrips citri} is regulated

**Table 4:** Regulated hosts and commodities that may involve \textit{U. citri} in Annexes III, IV, and V of Council Directive 2000/29/EC

| 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 |
| 16                | Plants of \textit{Citrus} L, \textit{Fortunella} Swingle, \textit{Poncirus} Raf., and their hybrids, other than fruit and seeds | Third countries |

| 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 |
| Description       | Special requirements |
| Plants, plant products and other objects | |
### 3.4. Entry, establishment and spread in the EU

#### 3.4.1. Host range

The main hosts of primary concern for *U. citri* worldwide are citrus. However, the reported host range of *U. citri* is fairly broad with more than 28 species from 16 plant families (Garcia Morales et al., 2016; CABI, 2017). Appendix A provides a list of plant species reported to be *U. citri* hosts. Most of them correspond to tropical crops, both woody (e.g. *Citrus* spp. (citrus), *Pisidium* (guava)) and herbaceous (e.g. *Tillandsia*). Some host plants can be used as ornamentals (e.g. *Hibiscus, Tillandsia*).

Current European Commission legislation does not regulate *U. citri* by name on all of its hosts.

---

| Number | Description | Note |
|--------|-------------|------|
| 16.1   | Fruits of *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf., and their hybrids, originating in third countries | The fruits should be free from peduncles and leaves and the packaging should bear an appropriate origin mark. |
| 16.5   | Fruits of *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf., and their hybrids, originating in third countries | Without prejudice to the provisions applicable to the fruits in Annex IV(A)(I) (16.1), (16.2) and (16.3), official statement that: a) the fruits originate in areas known to be free from the relevant organism; or, if this requirement cannot be met; b) no signs of the relevant organism have been observed at the place of production and in its immediate vicinity since the beginning of the last complete cycle of vegetation, on official inspections carried out at least monthly during the three months prior to harvesting, and none of the fruits harvested at the place of production has shown, in appropriate official examination, signs of the relevant organism, or if this requirement can also not be met; c) the fruits have shown, in appropriate official examination on representative samples, to be free from the relevant organism in all stages of their development; or, if this requirement can also not be met; d) the fruits have been subjected to an appropriate treatment, any acceptable vapour heat treatment, cold treatment, or quick freeze treatment, which has been shown to be efficient against the relevant organism without damaging the fruit, and, where not available, chemical treatment as far as it is acceptable by Community legislation. |

---

**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 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**

1. Plants, intended for planting, other than seeds but including seeds of [...] *Citrus* L., *Fortunella* Swingle and *Poncirus* Raf., and their hybrids [...]  
2. Fruits of:  
   - *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf., *Microcitrus* Swingle, *Naringi* Adans., *Swinglea* Merr. and their hybrids [...]
3.4.2. Entry

Is the pest able to enter into the EU territory? (Yes or No)

Yes, pathways that could allow *U. citri* to enter the EU exist.

The pest is already present in the EU, in the Azores (Soares et al., 1997; Franco et al., 2011). There is uncertainty as to whether it also occurs in mainland Portugal (see Section 3.2.2).

EUROPHYT records indicate that *U. citri* has been intercepted three times in the EU:

- in 2009 in the UK on *Citrus sinensis* fruit (sweet oranges) imported from China
- in 2011 in Spain on *Citrus aurantium* fruit (sour oranges) from the Dominican Republic, and
- in 2012 in Belgium on *Vitis vinifera* fruit (grapes) imported from Turkey but originally produced in Uzbekistan, (see Section 3.2.1).

In addition to the fruit pathway, other pathways for *U. citri* could be:

- plants for planting,
- cut flowers,

Current EU legislation prohibits the import of plants of *Citrus*, *Fortunella*, *Poncirus* and their hybrids, other than fruit and seeds from third countries. Therefore, the last two pathways can be considered as closed for citrus. However, all three pathways remain open for the other hosts (including the Rutaceae genera *Glycosmis* and *Murraya*).

Eurostat trade data poorly discriminates between species of plants for planting. Fortunately, the Netherlands NPPO kindly provided EFSA with detailed trade inspection data regarding plants for planting from 2012 to 2014. Table 5 provides some examples of *U. citri* hosts imported as plants for planting from a few of the countries where *U. citri* occurs. Given the host range and wide distribution of *U. citri*, Table 5 is not comprehensive and does not indicate all pathways but is provided to indicate that potential pathways into the EU exist via plants for planting.

| Genus    | Costa Rica | China 2012 | China 2013 | China 2014 | USA 2012 | USA 2013 | USA 2014 |
|----------|------------|------------|------------|------------|----------|----------|----------|
| Hibiscus | ✔️         | ✔️         | ✔️         | ✔️         | ✔️       | ✔️       | ✔️       |
| Tillandsia | ✔️         | ✔️         | ✔️         | ✔️         | ✔️       | ✔️       | ✔️       |
| Annona   | ✔️         | ✔️         | ✔️         | ✔️         | ✔️       | ✔️       | ✔️       |

3.4.3. Establishment

Is the pest able to become established in the EU territory?

Yes, there are hosts within suitable climatic regions in the EU, comparable to regions where *U. citri* occurs.

3.4.3.1. EU distribution of main host plants

A range of plant species reported as hosts to *U. citri* occurs in the EU. For example, cultivated fruit such as *Citrus* spp., *Mangifera indica*, *Persea americana* and *Vitis vinifera*, as well as some ornamental plants, e.g. *Hibiscus* spp., *Cocos nucifera*, *Pittosporum* spp. The main host in the EU at risk is assumed to be citrus, for which the cultivated area is shown in Table 6. Grapes, which are a new host-pest association described in this opinion (see Section 3.4.2), would be also at risk and the cultivated area is presented in Table 7.
3.4.3.2. Climatic conditions affecting establishment

Unaspis citri already occurs in the EU in the Azores. The Koppen-Geiger classification of climatic regions (Peel et al., 2007) where U. citri occurs, includes countries and regions (e.g. Algeria, Armenia, Australia, California, Egypt, Florida and South Africa) that share climate types which are also found in Europe where citrus and grapes are grown, predominantly around the Mediterranean Basin. However, elsewhere U. citri is mostly confined to coastal humid tropical areas and does not occur where there is a dry season even when these semi-arid areas are irrigated (EPPO, 1997). Although the EU does share climate types with those of countries where U. citri occurs, without a more detailed study, beyond the scope of pest categorisation, it is unclear how much of the EU would provide suitable climatic conditions that would support the establishment of U. citri. There is uncertainty as to whether U. citri could establish widely in the EU citrus growing regions.

Table 6: Citrus cultivation area (10³ ha) in the EU. Source: Eurostat (data extracted on 7 Jun 2017)

| Country     | 2011  | 2012  | 2013  | 2014  | 2015  |
|-------------|-------|-------|-------|-------|-------|
| Spain       | 317.61| 310.50| 306.31| 302.46| 298.72|
| Italy       | 160.72| 146.79| 163.59| 140.16| 149.10|
| Greece      | 52.06 | 50.61 | 49.88 | 49.54 | 46.92 |
| Portugal    | 19.59 | 19.85 | 19.82 | 19.80 | 20.21 |
| France      | 3.77  | 3.89  | 4.34  | 4.16  | 4.21  |
| Cyprus      | 3.06  | 3.21  | 2.63  | 2.69  | 2.84  |
| Croatia     | 2.12  | 1.88  | 2.17  | 2.17  | 2.21  |
| EU (28 MS)  | 558.93| 536.73| 548.75| 520.99| 524.21|

Table 7: Grape cultivation area (10³ ha) in the EU. Source: Eurostat (data extracted on 4 Jan 2018)

| Country     | 2011  | 2012  | 2013  | 2014  | 2015  |
|-------------|-------|-------|-------|-------|-------|
| Spain       | 963.10| 947.10| 946.97| 947.28| 941.06|
| France      | 763.93| 760.85| 760.55| 757.34| 752.33|
| Italy       | 717.57| 697.72| 702.11| 682.18| 678.98|
| Portugal    | 179.47| 179.47| 179.50| 178.99| 178.97|
| Romania     | 174.86| 176.47| 176.88| 174.63| 176.12|
| Greece      | 103.18| 99.24 | 110.85| 110.77| 114.39|
| Hungary     | 75.51 | 72.32 | 69.32 | 70.72 | 72.20 |
| Bulgaria    | 46.10 | 60.44 | 50.20 | 31.89 | 38.71 |
| Austria     | 43.84 | 43.62 | 44.00 | 44.79 | 43.78 |
| Croatia     | 32.47 | 29.28 | 28.00 | 25.75 | 25.59 |
| Slovenia    | 16.35 | 16.36 | 16.10 | 16.02 | 15.71 |
| Czech Republic | 16.01 | 15.67 | 15.65 | 15.78 | 15.81 |
| Slovakia    | 9.93  | 10.49 | 11.96 | 8.76  | 8.80  |
| Cyprus      | 7.71  | 6.81  | 5.92  | 6.16  | 6.60  |
| Luxembourg  | 1.22  | 1.22  | 1.24  | 1.25  | 1.25  |
| United Kingdom | 1.00 | 1.51 | 1.40 | 2.00 | 1.80 |
| Malta       | 0.61  | 0.61  | Not available | Not available | 0.68 |
| EU 28       | 3,253.19| 3,219.46| Not available | Not available | 3,173.83 |

3.4.3.2. Climatic conditions affecting establishment

Unaspis citri already occurs in the EU in the Azores. The Koppen-Geiger classification of climatic regions (Peel et al., 2007) where U. citri occurs, includes countries and regions (e.g. Algeria, Armenia, Australia, California, Egypt, Florida and South Africa) that share climate types which are also found in Europe where citrus and grapes are grown, predominantly around the Mediterranean Basin. However, elsewhere U. citri is mostly confined to coastal humid tropical areas and does not occur where there is a dry season even when these semi-arid areas are irrigated (EPPO, 1997). Although the EU does share climate types with those of countries where U. citri occurs, without a more detailed study, beyond the scope of pest categorisation, it is unclear how much of the EU would provide suitable climatic conditions that would support the establishment of U. citri. There is uncertainty as to whether U. citri could establish widely in the EU citrus growing regions.
3.4.4. Spread

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

Yes, *U. citri* can spread naturally. However, this type of spread is most likely limited.

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

Yes, the invasion of areas distant from its native range should be most probably attributed to human-assisted dispersal.

As most armoured scales (Hemiptera: Diaspididae), *U. citri* can only actively disperse as crawlers (first instar nymphs), which may also use birds or the wind to leave the original patch. However, other sessile developmental stages can be easily carried on consignments of plant material and fruit.

The potential for *U. citri*, to spread on nursery plant material can be appraised from what happened in citrus in Florida in the 1960s. The pest changed its economic status as a consequence of a devastating freeze in 1962. Many growers replaced the damaged trees with new saplings from nurseries. These new citrus trees were already infested with *U. citri*, and once transplanted within the new groves, the pest spread to already established trees. The pest became rapidly established within the state (Bullock and Brooks, 1975).

3.5. Impacts

3.5.1. Potential pest impacts

3.5.1.1. Direct impacts of the pest

*Unaspis citri* is one of the main pests of *Citrus* spp. in many of the citrus-growing regions of the world, especially in the tropics (EPPO, 1997). In Australia, *U. citri* is considered a major pest of citrus in the tropical and subtropical coastal districts of Queensland and the Northern Territory. However, it is considered as an occasionally important pest in temperate New South Wales. All citrus cultivars are attacked but Imperial mandarins are the least affected (Smith et al., 1997). Heavy infestations, which are more common in older trees, cause extensive drying and splitting of the bark on the trunk and main limbs (EPPO, 1997; Smith et al., 1997). This type of damage could be expected in the EU.

In the Azores, *U. citri* is one of the most abundant armoured scale species in citrus orchards and chemical treatments are applied regularly to minimise impacts (Soares et al., 1997).

There are no impacts described for grapevine, which is another host not previously reported (see Section 3.4.2). This may be related to the fact that grapes are not commonly grown in tropical/subtropical humid climates. Therefore, direct damage is assumed to be low but with high uncertainty.

3.6. Availability and limits of mitigation measures

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?

Yes, phytosanitary measures against *U. citri* are available to reduce the likelihood of its introduction into the EU. Further control measures are available to hamper establishment and spread of this scale.

---

2 See Section 2.1 on what falls outside EFSA’s remit.
3.6.1. Phytosanitary measures

Phytosanitary measures are currently applied to *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf. and their hybrids (see Section 3.3.2), however, pathways exist via other hosts. The following phytosanitary measures are available for them:

- Sourcing plants for planting (and cut flowers) from pest free area (PFA), pest free place of production (PFPP), pest free site (PFS)
- Introduction of plants for planting in a dormant stage with no soil attached.

Whether *U. citri* is being officially controlled in the Azores is unknown.

3.6.2. Biological or technical factors affecting the feasibility and effectiveness of measures to prevent the entry, establishment and spread of the pest

- The size and colour of *U. citri* hampers its detection, especially of small populations.
- The high polyphagy of *U. citri*, with many potential hosts remaining unregulated with respect to *U. citri*.
- Uncertainty regarding hosts and geographical distribution outside of its native range means that there may be a diversity of potential pathways that could facilitate entry into the EU.

3.6.3. Control methods

- Biological control: in its native range, *U. citri* has many natural enemies, mostly parasitic wasps (Hymenoptera: Aphelinidae and Encyrtidae) and predatory ladybirds (Coleoptera: Coccinellidae).
- Chemical control: insecticides may be applied several times in coincidence with peak production of crawlers. These pesticides should be selective for key natural enemies.
- Integrated Pest Management (IPM): economic thresholds have been established for this pest in citrus in Australia. These are based on tree for infestation.

3.7. Uncertainty

There are three main sources of uncertainty, the first regards *U. citri* host range, the second its distribution, and the third the extent of potential establishment within the EU. *U. citri* is polyphagous and phytosanitary measures are targeted on citrus. Other reported (but not confirmed) fruit hosts, e.g. grapes, mangoes, avocados and ornamentals such as hibiscus could also provide potential pathways. This uncertainty, though, does not affect the conclusions of this categorisation. Regarding the geographical distribution of *U. citri* in Europe, literature confirms its presence in the Azores (e.g. Soares et al., 1997). While Franco et al. (2011) cites references reporting *U. citri* from mainland Portugal, the original references have not been seen and there is uncertainty about the interpretation of the references. While the presence of *U. citri* in the Azores indicates that the organism can establish within the EU, there is uncertainty regarding how much further within the EU the pest could spread given the absence of tropical and subtropical humid climates.

4. Conclusions

Considering the criteria within the remit of EFSA to assess the status as a potential Union QP, or as a potential RNQP, *U. citri* meets the criteria assessed by EFSA for consideration as a potential Union QP (Table 8).
Table 8: 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)

| 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 pest is established. Conventional taxonomic keys based on morphology of adults exist | The identity of the pest is established. Conventional taxonomic keys based on morphology of adults exist | No uncertainties |
| Absence/presence of the pest in the EU territory (Section 3.2) | The pest has a restricted distribution in the EU territory (Azores). Therefore, it could be regulated as a Union quarantine pest if official measures are applied where it occurs | The pest is not widely present in the EU territory. Therefore, it fails a criterion required for it to be a regulated non-quarantine pest | There are uncertainties about the presence of this pest in mainland Portugal |
| Regulatory status (Section 3.3) | The pest has a restricted distribution in the EU and is currently regulated as a quarantine pest | The pest is currently regulated as a quarantine pest and there are no grounds to consider its status could be revoked | There are uncertainties regarding whether official measures are being applied in the Azores |
| Pest potential for entry, establishment and spread in the EU territory (Section 3.4) | The pest could enter into, become established in, and spread within, the EU territory and the main pathways would be:  
- Plants for planting  
- Fruit  
- Cut flowers | Spread is most likely mainly via plants for planting and fruit, rather than via natural spread, as only first instar nymphs (crawlers) can actively move (short distances) or be carried by air currents or birds | Given the polyphagy of *U. citri*, there is uncertainty regarding providing a comprehensive list of all pathways (i.e. which plants/plant parts could provide a pathway) |
| Potential for consequences in the EU territory (Section 3.5) | The pests’ introduction could cause quality and yield losses to citrus | The presence of the pest on plants for planting would most have an impact on plants for planting | Impact on vineyards would probably be small but this is highly uncertain |
| Available measures (Section 3.6) | There are risk reduction options available to prevent the entry into, establishment within or spread of the pest within the EU, including the sourcing of plants for planting from PFA | Risk reduction options including chemical control and the production of plants in a pest-free environment should help to prevent pest presence on plants for planting | No uncertainties |
| Conclusion on pest categorisation (Section 4) | All criteria above for consideration as a potential quarantine pest are met | As this pest has a restricted distribution in the EU, this criterion of a wider presence in the EU, which should be fulfilled for consideration as a potential regulated non-quarantine pest, is not met. As a consequence, *U. citri* does not meet all the criteria for consideration as a potential regulated non-quarantine pest | It is unknown if official measures are in place against *U. citri* in the Azores. To satisfy the criteria required for QP status, official measures should be in place where the pest occurs in the EU |
| Aspects of assessment to focus on/scenarios to address in future if appropriate | Any further assessment should gather information on (i) the geographic distribution of *U. citri* in Portugal and elsewhere in Europe, (ii) whether *U. citri* is under official control in the Azores, (iii) the endangered area within the EU and (iii) the host status and impact of *U. citri* on grapes | | |
References

Arias-Reverón JM and Browning HW, 1995. Development and mortality of the citrus snow scale (Homoptera: Diaspididae) under constant temperature and relative humidity. Environmental Entomology, 24, 1189–1195. https://doi.org/10.1093/ee/24.5.1189

Balachowsky AS, 1954. Les cochenilles paléarctiques de la tribu des Diaspidini. Institut Pasteur, Paris, France.

Buckley CR and Hodges AC, 2017. Featured Creatures: citrus snow scale. University of Florida UF-IFAS. Available online: http://entnemdept.ufl.edu/creatures/orn/scales/citrus_snow_scale.htm [Accessed: 4 January 2018].

Bullock RC and Brooks RF, 1975. Citrus pest control in the USA. In: Häfliger E (ed.). Citrus. Ciba-Geigy Agrochemicals Technical Monograph No. 4. Ciba-Geigy Ltd., Basle, Switzerland. pp. 35–37.

CABI, 2017. Unaspis citri (citrus snow scale) Datasheet 55685, CABI Crop Protection Compendium Last Modified 11th October 2017. Available online: http://www.cabi.org/cpc/datasheet/55685 [Accessed: 1 January 2018]

Comstock JH. 1883. Second report on scale insects, including a monograph of the sub-family Diaspinae of the family Coccidae and a list, with notes of the other species of scale insects found in North America. Department of Entomology Report, Cornell University Agricultural Experiment Station 2: 47–142.

EFSA PLH Panel (EFSA Panel on Plant Health), 2010. PLH Guidance on a harmonised framework for pest risk assessment and the identification and evaluation of pest risk management options by EFSA. EFSA Journal 2010;8(2):1495, 66 pp. https://doi.org/10.2903/j.efsa.2010.1495

EPPO (European and Mediterranean Plant Protection Organization), 1997. Data Sheets on Quarantine Pests. Unaspis citri. (2nd), pp. 560–564. CAB International, Wallingford (GB).

EPPO (European and Mediterranean Plant Protection Organization), 2004. Normes OEPP. EPPO Standards. Diagnostic protocols for regulated pests. Protocoles de diagnostic pour les organismes réglementés PM 7/38. OEPP/EPPO, Bulletin OEPP/EPPO Bulletin 34, 155–157.

EPPO (European and Mediterranean Plant Protection Organization), 2017. EPPO Global Database. Available online: https://gd.eppo.int [Accessed: 4 January 2018]

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

Ferris GF, 1937. Atlas of the Scale Insects of North America. Stanford University Press, California. 272 pp.

Franco JC, Russo A and Marotta S, 2011. An annotated checklist of scale insects (Hemiptera: Coccidae) of Portugal, including Madeira and Azores Archipelagos. Zootaxa, 3004, 1–32.

García Morales M, Denno BD, Miller DR, Miller GL, Ben-Dov Y and Hardy NB, 2016. ScaleNet: a literature-based model of scale insect biology and systematics. Database. https://doi.org/10.1093/database/bav118. Available online: http://scalenet.info

Kozár F and Franco JC, 1995. Some new data to the scale insect fauna (Homoptera: Coccoidea) from Continental Portugal. Folia Entomologica Hungarica, 56, 69–74.

Mamet JR, 1943. A revised list of the Coccoidea of the islands of the western Indian Ocean, south of the equator. Mauritius Institute Bulletin. Port Louis, 2, 137–170.

Mifsud D, Mazzeo G, Russo A and Watson GW, 2014. The scale insects (Hemiptera: Coccoidea) of the Maltese Archipelago. Zootaxa, 3866, 499–525.

Miller DR and Davidson JA, 2005. Armored Scale Insect Pests of Trees and Shrubs. Cornell Univ, Press Ithaca, NY. 442 pp.

Nakahara S, 1982. Checklist of the armored scales (Homoptera: Diaspididae) of the conterminous United States. United States Department of Agriculture, Animal and Plant Health Inspection Service. 110 pp.

Newstead R, 1907. List of other known African species of scale pests. Notes on the Injurious Scale Insects and Agrochemicals Technical Monograph No. 4. Ciba-Geigy Ltd., Basle, Switzerland. pp. 35–37.

Miller DR and Davidson JA, 2005. Armored Scale Insect Pests of Trees and Shrubs. Cornell Univ, Press Ithaca, NY. 442 pp.

Soares AO, Elias RB and Schanderl H, 1997. Encarsia citrina (Crawford) (Hymenoptera, Aphelinidae) a parasitoid of Unaspis citri (Comstock) and Lepidosaphes beckii (Newman) (Homoptera, Diaspididae) in citrus orchards of São Miguel island (Azores). Boletín de Sanidad Vegetal. Plagas, 23, 449–456.

Ter-Grigorian MA, 1969. Pest coccids of cultivated plants in Armenia and methods of control. Hayastan, Yerevan. 118 pp.
Watson GW, 2015. *Unaspis lansivora* sp. n. (Hemiptera: Diaspididae), a new pest of *Lansium domesticum* (Meliaceae), and a key to *Unaspis* species. Zootaxa, 3905, 432–440.

Williams DJ and Watson GW, 1988. The Scale Insects of the Tropical South Pacific Region. Part 1. The Armoured Scales (Diaspididae). CAB International, Wallingford, UK.

**Abbreviations**

| Abbreviation | Description                                           |
|--------------|-------------------------------------------------------|
| DG SANCO     | Directorate General for Health and Consumers          |
| EPPO         | European and Mediterranean Plant Protection Organization |
| FAO          | Food and Agriculture Organization                     |
| IPM          | Integrated Pest Management                            |
| IPPC         | International Plant Protection Convention             |
| MS           | Member State                                          |
| PFA          | pest free area                                        |
| PFPP         | pest free place of production                         |
| PFS          | pest free site                                        |
| PLH          | EFSA Panel on Plant Health                            |
| PZ           | protected zone                                        |
| QP           | quarantine pest                                       |
| RNQP         | regulated non-quarantine pest                         |
| TFEU         | Treaty on the Functioning of the European Union       |
| ToR          | Terms of Reference                                    |
### Appendix A – Reported host plants of *Unaspis citri*

| Family            | Host (common name)                     | Reference                                      |
|-------------------|----------------------------------------|------------------------------------------------|
| Anacardiaceae     | *Mangifera sp.*                        | Garcia Morales et al. (2016)                  |
|                   | *Mangifera indica* (mango)             | Garcia Morales et al. (2016)                  |
| Annonaceae        | *Annona muricata* (soursop)            | CABI (2017)                                    |
| Arecaeeae         | *Cocos nucifera* (coconut)             | CABI (2017)                                    |
| Bromeliaceae      | *Ananas comosus* (pineapple)           | CABI (2017)                                    |
|                   | *Tillandsia usneoides* (Spanish moss)  | CABI (2017)                                    |
| Celastraceae      | *Euonymus sp.*                         | Garcia Morales et al. (2016)                  |
|                   | *Euonymus japonicus* (Japanese spindle) | Garcia Morales et al. (2016)                  |
| Fabaceae          | *Acacia oshanesii*                     | Garcia Morales et al. (2016)                  |
|                   | *Inga sp.*                             | Garcia Morales et al. (2016)                  |
| Lauraceae         | *Persea americana* (avocado)           | Garcia Morales et al. (2016)                  |
| Malvaceae         | *Hibiscus spp.* (rosemallows)          | CABI (2017)                                    |
| Moraceae          | *Artocarpus heterophyllus* (jackfruit) | CABI (2017)                                    |
| Musaceae          | *Musa sp.* (banana)                    | CABI (2017)                                    |
| Myrtaceae         | *Psidium guajava* (guava)              | CABI (2017)                                    |
| Oleaceae          | *Osmanthus sp.*                        | Garcia Morales et al. (2016)                  |
| Pittosporaceae    | *Pittosporum sp.*                      | Garcia Morales et al. (2016)                  |
| Rutaceae          | *Citrus sp.* (citrus)                  | CABI (2017)                                    |
|                   | *Citrus aurantifolia* (lime)           | CABI (2017)                                    |
|                   | *Citrus aurantium* (sour orange)       | CABI (2017)                                    |
|                   | *Citrus limon* (lemon)                 | CABI (2017)                                    |
|                   | *Citrus maxima* (pummelo)              | CABI (2017)                                    |
|                   | *Citrus reticulate* (mandarin)         | CABI (2017)                                    |
|                   | *Citrus sinensis* (sweet orange)       | CABI (2017)                                    |
|                   | *Citrus x paradisi* (grapefruit)       | CABI (2017)                                    |
|                   | *Fortunella spp.* (kumquat)            | CABI (2017)                                    |
|                   | *Glycosmis parviflora*                 | Garcia Morales et al. (2016)                  |
| Sapindaceae       | *Nephelium lappaceum*                  | Garcia Morales et al. (2016)                  |
| Vitaceae          | *Vitis vinifera* (grapes)              | This opinion, see Section 3.4.2                 |