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Pest categorisation of *Scirtothrips aurantii*

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Abstract

The Panel on Plant Health performed a pest categorisation of the South African citrus thrips, *Scirtothrips aurantii* Faure (Thysanoptera: Thripidae), for the European Union (EU). This is a well-defined and distinguishable species, recognised as a pest of citrus and mangoes in South Africa, which has been cited on more than 70 different plants, including woody and herbaceous species. It feeds exclusively on young actively growing foliage and fruit. *S. aurantii* is not known to occur in the EU and is listed in Annex IIAI of 2000/29/EC as a harmful organism presenting a risk to EU plant health. The international trade of hosts as either plants for planting or cut flowers provide potential pathways into the EU. However, current EU legislation prohibits the import of citrus plants. Furthermore, measures aimed at the import of plants for planting in a dormant stage (no young foliage or fruits present) with no soil/growing medium attached, decreases the likelihood of the pest entry with such plants. Interceptions have occurred on *Eustoma grandiflorum* cut flowers. Considering climatic similarities between some of the countries where *S. aurantii* occurs (South Africa, Australia) and the EU, its thermal biology and host distribution in the EU, *S. aurantii* has the potential to establish, especially in citrus-growing regions of the EU. *S. aurantii* would most probably breed all year long around the Mediterranean and could cause crop losses in citrus, especially oranges. Phytosanitary measures are available to inhibit the introduction of *S. aurantii*. Considering the criteria within the remit of EFSA to assess its status as a potential Union quarantine pest (QP) or as a potential regulated non-quarantine pest (RNQP), *S. aurantii* meets with no uncertainties the criteria assessed by EFSA for consideration as a potential Union QP.

Keywords: South African citrus thrips, Thysanoptera, Thripidae, pest risk, plant health, plant pest, quarantine

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1. Introduction

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

1.1.1. Background

Council Directive 2000/29/EC 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

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

(b) Bacteria

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

(c) Fungi

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

(d) Virus and virus-like organisms

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

Annex IIB

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

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

(b) Bacteria

Curtobacterium flaccumfaciens pv. flaccumfaciens (Hedges) Collins and Jones

(c) Fungi

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

1.1.2.2. Terms of Reference: Appendix 2

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

Annex IAI

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

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

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

Group of Tephritidae (non-EU) such as:

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

(c) Viruses and virus-like organisms

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

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

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

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

Annex IIAI

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

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

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

1.1.2.3. Terms of Reference: Appendix 3

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

Annex IAI

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

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

(b) Fungi

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

(c) Viruses and virus-like organisms

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

(d) Parasitic plants

Arceuthobium spp. (non-EU)

Annex IAII

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

Meloidogyne fallax Karssen
Popillia japonica Newman
Rhizoecus hibisci Kawai and Takagi

(b) Bacteria

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

(c) Fungi

Melampsora medusae Thümen
Synchytrium endobioticum (Schilbersky) Percival

Annex I B

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

Leptinotarsa decemlineata Say
Liriomyza bryoniae (Kaltenbach)

(b) Viruses and virus-like organisms

Beet necrotic yellow vein virus

1.2. Interpretation of the Terms of Reference

Scirtothrips aurantii 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.

2. Data and methodologies

2.1. Data

2.1.1. Literature search

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

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

The South African citrus thrips, *Scirtothrips aurantii* Faure (Thysanoptera: Thripidae) (synonym: *S. acaciae* Moulton), was initially described by Faure (1929) from specimens collected in South Africa after assuming economic importance in citrus in the 1920s (Gilbert and Bedford, 1998). The genus *Scirtothrips* comprises over 100 described species worldwide which can easily be distinguished from other genera within the same family (CABI, 2017). Keys exist for the adults (winged males and females) of the different species within this genus. Both morphological and molecular data can be used to distinguish them (EPPO, 2005; Hoddle et al., 2008; CABI, 2017).

3.1.2. Biology of the pest

All *Scirtothrips* spp. go through five developmental stages (Gilbert and Bedford, 1998; Grové et al., 2000; EPPO, 2005; CABI 2017): the egg, two actively feeding immature instars (usually known as first and second instar larvae), two non-feeding immature instars (usually known as prepupa and pupa) and the winged feeding adults. As all thrips belonging to the Terebrantia suborder, *Scirtothrips* spp. females insert the eggs separately into young and soft tissues of leaves, stems and fruit with their distinctive saw-like ovipositor. Adults and larvae feed on epidermal or palisade cells of young leaves and on the apex of young fruit, often concealed under the calyx (Milne and Manicom, 1978), as this thrips requires rapidly dividing plant cells in order to reproduce satisfactorily (Freebairn, 2008; Rafter et al., 2008). Upon completion of the second instar, larvae seek refuge, usually on the ground amongst leaf litter, where they pupate. This phenomenon may sometimes occur beneath the calyx of fruits. As a consequence, although only the youngest fruits can be attacked, there is a small probability for *S. aurantii* to occur on harvested fruits. Breeding is almost continuous, with no diapause, although development is slow in winter. Therefore, larvae and adults are present all year round in the orchard if food is available. In South Africa, more than nine generations per year can occur in citrus and mangoes, the populations decline through autumn and winter due to cooler weather and diminishing food supply, i.e. the decline of actively growing leaf shoots. Indeed, *S. aurantii* populations in citrus closely follow the flushing patterns of the trees (Grové et al., 2000). The life cycle of *S. aurantii* can be completed in 18–44 days in summer and winter, respectively (Gilbert and Bedford, 1998). Mean fecundity ranges from 0.4 to 1.2 eggs per female per day in winter and summer, respectively, and the pre-ovipositional period lasts about 2.5 days (Gilbert and Bedford, 1998). Although adults most likely disperse downwind, observations in South Africa suggest that early season infestations in citrus orchards mostly originate from thrips overwintering within the same orchard, rather than from adults flying in from wild hosts (Gilbert, 1990). Later in the season, though, wild hosts probably assume greater importance as a source of the pest because citrus trees close to windbreaks made of host plants usually suffer more severe fruit scarring, which is the typical symptom produced by this thrips in citrus, than those close to non-host windbreaks (Grout and Richards, 1990a; Grout and Stephen, 1995).

3.1.3. Intraspecific diversity

Since its first detection in Australia in 2002, *S. aurantii*, which is presumed to be polyphagous in its area of origin in Africa, had only been found infesting the crassulaceous pasture weed *Kalanchoe* (= *Bryophyllum) delagoense* (Eckl. and Zeyh.) Schinz, with no reports of damage to commercial plantings (Rafter et al., 2008; Garms et al., 2013; Rafter and Walter, 2013a). This fact posed questions to whether this species was actually a cryptic species complex. However, the results of both molecular analyses (Morris and Mound, 2004; Hoddle et al., 2008) and host adaptation assays, where specimens of this species collected in Australia on *K. delagoense* succeeded in forming self-sustaining populations on mango, grape, chilli, pea, green bean and blueberry (Garms et al., 2013), can be taken as evidence that the polyphagous native South African population of *S. aurantii* and the presumed monophagous population invasive to Australia are the same species.

3.1.4. 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 *S. aurantii* (EPPO, 2005).

Detection: eggs (bean-shaped, < 0.2 mm long), larvae (colourless when recently hatched but yellowish afterwards, cigar-shaped and visible naked eye) and adults (winged, reddish-orange, < 1 mm long) of *S. aurantii* feed on young leaves and fruit. Therefore, motiles can be detected on plants for planting, in particular seedlings or cuttings with young growing leaf buds. Prepupae, which possess short wing pads, and pupae, which exhibit larger pads (Grové et al., 2000), usually but not only, occur on the ground amongst leaf litter. Therefore, these two stages can be found in the soil or growing media accompanying plants for planting. Because only young fruits are attacked, this species is not common on harvested fruits (Grové et al., 2000; EPPO, 2005). Adults can also be monitored/detected using yellow sticky traps and dispersal/emergence traps (Grout and Richards, 1990b; Grové et al., 2000). Unlike other thrips species, *S. aurantii* has not been recovered from flowers (Grové et al., 2000).

Symptoms: because of the typical asymmetrical piecing-sucking mouthparts of thrips, their feeding on leaves results in silvering of the leaf surface and linear thickenings of the leaf lamina. On fruit, feeding marks usually form a ring of scarred tissues around the apex that enlarges as fruit grows. In both cases, brown frass markings can be observed. Eventually, these injuries can result in fruit distortion and early leaf senescence (EPPO, 2005). Fruit of the Navel orange cultivars are considered the most susceptible to this thrips (Gilbert and Bedford, 1998).

Identification: morphological identification of immature stages of *Scirtothrips* spp. is impossible and male or female adults are needed. Cleared specimens mounted on microscopic slides can be identified at a magnification factor between 100x and 600x. Characters allowing species determination based on Palmer et al. (1989) can be found in the EPPO diagnostic standard (EPPO, 2005).

3.2. Pest distribution

3.2.1. Pest distribution outside the EU

Scirtothrips aurantii is probably native to southern Africa, where it occurs on many different plant species (Tables 2 and 5). Although not in the northwest of the continent, it occurs in several African countries including Cape Verde and Réunion Islands (Figure 1). *S. aurantii* is perhaps under-reported in Africa. It also occurs in Yemen and Australia (Rafter et al., 2008; Garms et al., 2013; Rafter and Walter, 2013a) (Figure 1).

Table 2: Global distribution of *Scirtothrips aurantii*

Region	Country	Subnational distribution	Reference
Africa	Angola		EPPO (2017)
	Cape Verde		EPPO (2017)
	Egypt		EPPO (2017)
	Ethiopia		EPPO (2017)
	Ghana		EPPO (2017)
	Kenya		EPPO (2017)
	Malawi		EPPO (2017)
	Mauritius		EPPO (2017)
	Nigeria		EPPO (2017)
	Réunion		EPPO (2017)
	South Africa		EPPO (2017)
	Sudan		EPPO (2017)
	Swaziland		EPPO (2017)
	Tanzania		EPPO (2017)
	Uganda		EPPO (2017)
	Zimbabwe		EPPO (2017)
Asia	Yemen		EPPO (2017)
Oceania	Australia	New South Wales	Rafter et al. (2008)
		Queensland	Anonymous (2003)

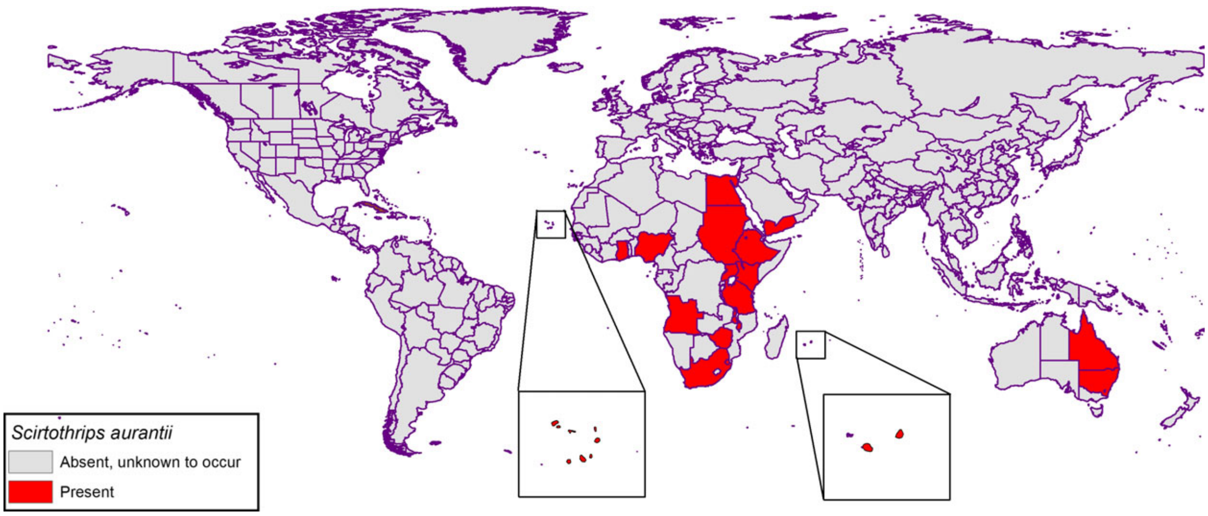

Figure 1: Global distribution of *S. aurantii* based on references provided in Table 2

3.2.2. Pest distribution in the EU

Is the pest present in the EU territory? If present, is the pest widely distributed within the EU?

No, the pest is not present in the EU

The pest is not known to occur in the EU. Its absence in three EU countries (Belgium, Slovenia and the Netherlands) has been confirmed by surveys (EPPO, 2017).

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 *Scirtothrips aurantii*. Details are presented in Tables 3 and 4.

Table 3: *Scirtothrips aurantii* 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
25.	*Scirtothrips aurantii* Faure	Plants of *Citrus* L, *Fortunella* Swingle, *Poncirus* Raf., and their hybrids, other than fruit and seeds

3.3.2. Legislation addressing plants and plant parts on which *Scirtothrips aurantii* is regulated

Table 4: Regulated hosts and commodities that may involve *S. aurantii* 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 *Citrus* L, *Fortunella* Swingle, *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**	
	Plants, plant products and other objects	Special requirements
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 [. . .]	
3	Fruits of: '— *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf., *Microcitrus* Swingle, *Naringi* Adans., *Swinglea* Merr. and their hybrids,[. . .]	

3.4. Entry, establishment and spread in the EU

3.4.1. Host range

Scirtothrips aurantii is highly polyphagous and has been reported on more than 70 plant species in several botanical families (Gilbert, 1990; CABI, 2017). However, incidence of adults feeding on a plant does not constitute evidence that the plant is a true host; some reports may be records of winged adults only and this does not provide conclusive evidence about the suitability of that plant to allow reproduction and sustain development of all life stages of *S. aurantii*. Table 5 provides a list of plant species where both larvae and adults of *S. aurantii* have been found, suggesting that they are true hosts.

Table 5: Plants where both larvae and adults of *Scirtothrips aurantii* have been found

Family	Host (common name)	Reference
Anacardiaceae	*Mangifera indica* (mango)	Gilbert (1990)
Asparagaceae	*Asparagus officinalis* (asparagus)	CABI (2017)
Euphorbiaceae	*Ricinus communis* (castor bean)	Gilbert (1990)
Fabaceae	*Acacia karroo*	Gilbert (1990)
	Acacia polyacantha subsp. *campylacantha*	Gilbert (1990)
	Arachis hypogaea (peanut)	CABI (2017)
	Bauhinia galpinii	Gilbert (1990)
	Caesalpinia pulcherrima	Gilbert (1990)
	Dichrostachys cinerea subsp. *nyacantha*	Gilbert (1990)
	Mucuna coriacea Bak. subsp. *irritans*	Gilbert (1990)
Colchicaceae	*Gloriosa superba*	Rafter and Walter (2013b)
Crassulaceae	*Kalanchoe (=Bryophyllum) delagoense*	Rafter et al. (2008)
Lythraceae	*Punica granatum* (pomegranate)	Rafter and Walter (2013b)
Malvaceae	*Gossypium* spp. (cotton)	CABI (2017)
Musaceae	*Musa* spp.	CABI (2017)
	Musa paradisiaca (banana)	CABI (2017)
Proteaceae	*Grevillea robusta*	Grout and Richards (1990a)
	Macadamia integrifolia (macadamia)	Rafter and Walter (2013b)
Rutaceae	*Citrus*	Gilbert (1990)
	Citrus sinensis (orange)	Rafter and Walter (2013b)
Theaceae	*Camellia sinensis* (camellia, thea)	CABI (2017)
Vitaceae	*Vitis vinifera* (grapevine)	CABI (2017)

Given that *S. aurantii* is regulated on *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf. and their hybrids (Dir. 2000/29/EC), but there are other hosts, as listed in Table 6, it is clear that *S. aurantii* is not currently regulated by EU plant health legislation on all of its hosts.

3.4.2. Entry

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

Yes, pathways exist that could allow *S. aurantii* to enter the EU.

Up to November 2017, there is one record of interception of *S. aurantii* in the Europhyt database. This thrips was intercepted in 2001 in the UK on a consignment of *Eustoma grandiflorum* (common name: lisianthus) cut flowers originating in Kenya. *S. aurantii* had also previously been intercepted in the UK on the same host, also from Kenya in 1999 (MacLeod, 2002).

In addition to (1) cut flowers with young leaves or fruit, *S. aurantii* could also enter the EU using the following pathways:

(2) Plants for planting, on either young leaves or fruit (eggs, larvae and adults) or in the associated soil/litter (prepupae and pupae).

(3) Fruit, most likely on young fruit (eggs, larvae and adults). Very unlikely on mature commercial fruit (prepupae and pupae).

Current EU legislation prohibits the import of plants of *Citrus*, *Fortunella*, *Poncirus* and their hybrids, other than fruit and seeds from third countries. Therefore, for citrus, pathways 1 and 2 can be considered as closed. However, for some other hosts listed in Table 6, potential pathways exist.

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. These data show that *Asparagus* plants for planting from Kenya and *Kalanchoe* plants for planting from Kenya, South Africa, Tanzania, Uganda and Zimbabwe have been imported indicating that in addition to the cut flowers mentioned above, other potential pathways exist for the entry of *S. aurantii*. Nevertheless, current measures aimed at the import of plants for planting in a dormant stage (no young foliage or fruits present) with no soil/growing medium/debris attached, decreases the likelihood of *S. aurantii* being carried with imports of these plants.

The third pathway (mature commercial fruit) is considered unlikely as (i) individuals developing from eggs laid in immature fruit would have developed and emerged before fruit maturation and harvest, and (ii) *S. aurantii* do not feed or oviposit on mature commercial fruit.

3.4.3. Establishment

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

Yes, *S. aurantii* hosts are grown in the EU and there are suitable climatic regions in parts of the EU to support establishment, especially in the citrus-growing areas around the Mediterranean basin.

3.4.3.1. EU distribution of main host plants

The main host in the EU are citrus plants, for which the cultivated area is shown in Table 6. *S. aurantii* could also establish on different ornamental plants (see Section 3.4.1), as well as on grapevine, pomegranate, castor bean and mango, for which permanent plantations exist in the EU. However, from these crops, it has only reached pest status in mangoes in South Africa, when in close vicinity to citrus trees (Grové et al., 2000).

Table 6: *Citrus* cultivation area (10^3 ha) in the EU. Source: Eurostat (data extracted on 7 June 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

3.4.3.2. Climatic conditions affecting establishment

Scirtothrips aurantii occurs in areas where climate allows citrus cultivation. Climate in some of these areas (i.e., South Africa, Australia) is similar to EU areas where citrus are also grown (i.e. the Mediterranean basin). Therefore, we assume establishment in these areas would be possible outdoors. Moreover, given the polyphagy of this thrips, its establishment under protected cultivation may also be possible north of this basin.

3.4.4. Spread

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

Yes, *S. aurantii* 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 Australia should be attributed to human-assisted dispersal.

The potential of *S. aurantii* for natural spread is considered as relatively limited (CABI, 2017). Although adults most likely disperse downwind, results provided by Gilbert (1990) show the little contribution of *S. aurantii* populations in host plants in bush adjacent to citrus orchards to the build-up of the population in these orchards, especially early in the season. As a consequence, plants for planting, when traded in a non-dormant stage (i.e. with actively growing leaf flush and/or young fruit), are probably responsible for the dispersal of this thrips.

3.5. Potential or observed impacts in the EU

Sources: impact reports and other literature

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

Yes, it would most likely impact at least citrus production.

RNQPs: Does the presence of the pest on plants for planting have an economic impact, as regards the intended use of those plants for planting?[2]

Yes, the presence of *S. aurantii* on plants for planting would impact their intended use.

3.5.1. Potential pest impacts

3.5.1.1. Direct impacts of the pest

In South Africa, *S. aurantii* is considered a major economic pest of *Citrus sinensis* (sweet oranges) and *Mangifera indica* (mangoes) when the latter is grown close to citrus trees (Gilbert, 1990; Gilbert and Bedford, 1998; EPPO, 2017). It has also been reported as a pest *Camellia sinensis* and *Musa paradisiaca* (CABI, 2017). In Yemen, *S. aurantii* is considered the primary cause of banana fruit spotting (Nasseh and Mughni, 1990).

In South Africa, feeding by both adults and larvae of *S. aurantii* on young citrus fruit, causes superficial scarring of the fruit epidermis which may result in cosmetic damage at harvest (Gilbert and Bedford, 1998). This damage prevents the export of fruit that may then only be acceptable for processing for juice (Gilbert, 1990). Fruit is susceptible to *S. aurantii* for up to 13 weeks after petal fall (Grout and Moore, 2015). Control measures targeting this pest can comprise a large percentage of the total pest control costs involved in producing export quality fruit (Thackeray et al., 2015). In severe cases of thrips attack, repeated damage to small apical leaf shoots may lead to multiple budding and then to the appearance of the typical 'witches broom' symptomatology which can result in a reduction in crop in the following season (Gilbert and Bedford, 1998).

Should *S. aurantii* be introduced into the EU, the impacts described on citrus above could be anticipated in the citrus growing areas of EU Member States around the Mediterranean basin.

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 *S. aurantii* are available to reduce the likelihood of its introduction into the EU. Further control measures are available to hamper establishment and spread of this thrips.

[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.

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 small size of *S. aurantii* and the almost impossibility to detect the egg stage of this species.
- The high polyphagy of *S. aurantii*, with many potential hosts remaining unlisted.

3.6.3. Biological or technical factors limiting the ability to prevent the presence of the pest on plants for planting

Not applicable as not considered to be a RNQP.

3.6.4. Pest control methods

- Biological control: in its native range, *S. aurantii* has many natural enemies including parasitoids and predators.
- Chemical control: insecticides may have to be applied 2–3 weeks after petal-fall to protect young growing citrus fruit.
- Cultural control: avoid potential hosts near (windbreaks) or in (cover-crops) the orchard.
- Integrated Pest Management (IPM): economic thresholds have been established for this pest in citrus in South Africa. These are based on the use of sticky yellow traps.

3.7. Uncertainty

The main source of uncertainty comes from the high polyphagy of this pest and the lack of clarity in literature as to whether all the plants on which adults have been found, presumably at least feeding, are also true hosts. The pathway for entry on citrus plants (*Citrus*, *Fortunella, Poncirus* and their hybrids) can be considered as closed through regulation but pathways on other plants (unknown status as hosts) remain open and unregulated with respect to *S. aurantii*. However, current measures aimed at the import of plants for planting in a dormant stage (no young foliage and/or fruits present) with no soil/growing medium can decrease the risks inherent to the import of these plants. Such uncertainties do not affect the conclusions of this pest categorisation.

4. Conclusions

Considering the criteria within the remit of EFSA to assess the status as a potential Union QP, or as a potential RNQP, *S. aurantii* meets with no uncertainties the criteria assessed by EFSA for consideration as a potential Union QP (Table 7).

Table 7: 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

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Absence/ presence of the pest in the EU territory (Section 3.2)	The pest is not present in the EU territory	The pest is not present in the EU territory. Therefore, it does not meet a criterion for it to be a regulated non-quarantine pest	No uncertainties
Regulatory status (Section 3.3)	The pest is not present 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	No uncertainties
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: • Cut flowers with young leaves or fruit • Plants for planting with either young foliage or fruit and/or soil and litter • Young fruits	Spread is most likely mainly via specific plants for planting, rather than via natural spread or via movement of plant products because young foliage or fruit is required	Given the high polyphagy of *S. aurantii*, there is uncertainty about the extent of potential pathways, e.g. (a) plants for planting, and (b) cut flowers
Potential for consequences in the EU territory (Section 3.5)	The pests' introduction would most probably have an economic impact on the EU territory, especially in its citrus growing areas	The presence of the pest on plants for planting would most likely have an economic impact on plants for planting	No uncertainties
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, starting with the sourcing of plants for planting and cut flowers from pest free countries/areas, and the introduction of dormant plants with no soil/growing medium attached to chemical control	Risk reduction options including chemical control and the trade of dormant plants with no soil/ growing/medium/debris attached may 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 is not present in the EU, this criterion, which should be fulfilled for consideration as a potential regulated non-quarantine pest, is not met. As a consequence, *S. aurantii* does not meet all the criteria for consideration as a potential regulated non-quarantine pest	No uncertainties
Aspects of assessment to focus on/ scenarios to address in future if appropriate	It would be useful to identify all hosts and pathways for entry into the EU		

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Abbreviations

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