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Pest categorisation of *Phymatotrichopsis omnivora*

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Abstract

The Panel on Plant Health performed a pest categorisation of *Phymatotrichopsis omnivora*, the causal agent of Phymatotrichum root rot of more than 2,000 dicotyledonous plant species, for the EU. The pest is listed as *Trechispora brinkmannii* in Annex IAI of Directive 2000/29/EC. *P. omnivora* is a well-defined fungal species and reliable methods exist for its detection and identification. It is present in south-western USA, northern Mexico, Libya and Venezuela. The pest is not known to occur in the EU. *P. omnivora* has an extremely wide host range; quantitative impacts have been documented for *Gossypium* spp. (cotton), *Medicago sativa* (alfalfa), *Malus domestica* (apple), *Prunus persica* (peach) and *Vitis vinifera* (grapevine) as the major cultivated hosts. All major hosts and pathways of entry of the pest into the EU are currently regulated, except for soil and growing media attached or associated with plants originating in Libya. Host availability and climate and edaphic matching suggest that *P. omnivora* could establish in parts of the EU and further spread mainly by human-assisted means. The pest infects the roots causing wilting and death of its host plants. The introduction of the pest in the EU territory would potentially cause direct and indirect impacts at least to cotton, alfalfa, apple, peach and grapevine production. The main uncertainties concern the host range, the extrapolation to the EU of the climatic and edaphic conditions favouring the disease in some of the infested areas, the role of conidia in the epidemiology of the disease and the magnitude of potential impacts to the EU. *P. omnivora* meets all the criteria assessed by EFSA for consideration as potential Union quarantine pest. The criteria for considering *P. omnivora* as a potential Union regulated non-quarantine pest are not met, since the pest is not known to occur in the EU.

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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.....	5
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.....	9
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.....	13
3.2.1. Pest distribution outside the EU.....	13
3.2.2. Pest distribution in the EU.....	14
3.3. Regulatory status.....	14
3.3.1. Legislation addressing the hosts of <i>Phymatotrichopsis omnivora</i>	15
3.4. Entry, establishment and spread in the EU.....	16
3.4.1. Host range.....	16
3.4.2. Entry.....	17
3.4.3. Establishment.....	18
3.4.3.1. EU distribution of main host plants.....	18
3.4.3.2. Climatic conditions affecting establishment.....	20
3.4.4. Spread.....	23
3.5. Impacts.....	23
3.6. Availability and limits of mitigation measures.....	24
3.6.1. Identification of additional measures.....	24
3.6.1.1. Biological or technical factors limiting the effectiveness of measures to prevent the entry, establishment and spread of the pest.....	24
3.7. Uncertainty.....	25
4. Conclusions.....	25
References.....	27
Abbreviations.....	30
Glossary.....	30
Appendix A – Host range of <i>Phymatotrichopsis omnivora</i>	31

1. Introduction

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

1.1.1. Background

Council Directive 2000/29/EC¹ 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) 2016/2031² 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 178/2002,³ to provide scientific opinion in the field of plant health.

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

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

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

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

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

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

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

1.1.2.1. Terms of Reference: Appendix 1

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

Annex IIAI

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

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

(b) Bacteria

Citrus variegated chlorosis	<i>Xanthomonas campestris</i> pv. <i>oryzae</i> (Ishiyama)
<i>Erwinia stewartii</i> (Smith) Dye	Dye and pv. <i>oryzicola</i> (Fang, et al.) Dye

(c) Fungi

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

(d) Virus and virus-like organisms

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

Annex IIB

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

<i>Anthonomus grandis</i> (Boh.)	<i>Ips cembrae</i> Heer
<i>Cephalcia lariciphila</i> (Klug)	<i>Ips duplicatus</i> Sahlberg
<i>Dendroctonus micans</i> Kugelán	<i>Ips sexdentatus</i> Börner
<i>Gilpinia hercyniae</i> (Hartig)	<i>Ips typographus</i> Heer
<i>Gonipterus scutellatus</i> Gyll.	<i>Sternochetus mangiferae</i> Fabricius
<i>Ips amitinus</i> Eichhof	

(b) Bacteria

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

(c) Fungi

Glomerella gossypii Edgerton

Hypoxylon mammatum (Wahl.) J. Miller

Gremmeniella abietina (Lag.) Morelet

1.1.2.2. 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) <i>Carneocephala fulgida</i> Nottingham | 3) <i>Graphocephala atropunctata</i> (Signoret) |
| 2) <i>Draeculacephala minerva</i> Ball | |

Group of Tephritidae (non-EU) such as:

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

(c) Viruses and virus-like organisms

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

- | | |
|----------------------------------|--|
| 1) Andean potato latent virus | 4) Potato black ringspot virus |
| 2) Andean potato mottle virus | 5) Potato virus T |
| 3) Arracacha virus B, oca strain | 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 | 8) Peach yellows mycoplasma |
| 2) Cherry rasp leaf virus (American) | 9) Plum line pattern virus (American) |
| 3) Peach mosaic virus (American) | 10) Raspberry leaf curl virus (American) |
| 4) Peach phony rickettsia | 11) Strawberry witches' broom mycoplasma |
| 5) Peach rosette mosaic virus | 12) Non-EU viruses and virus-like organisms of <i>Cydonia</i> Mill., <i>Fragaria</i> L., <i>Malus</i> Mill., <i>Prunus</i> L., <i>Pyrus</i> L., <i>Ribes</i> L., <i>Rubus</i> L. and <i>Vitis</i> L. |
| 6) Peach rosette mycoplasma | |
| 7) Peach X-disease mycoplasma | |

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

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

(b) Fungi

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

(c) Viruses and virus-like organisms

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

(d) Parasitic plants

Arceuthobium spp. (non-EU)

Annex I A I I

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

Meloidogyne fallax Karssen

Rhizoecus hibisci Kawai and Takagi

Popillia japonica Newman

(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

Trechispora brinkmannii 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 or those of a regulated non-quarantine pest for the area of the European Union (EU) excluding Ceuta, Melilla and the outermost regions of Member States (MS) referred to in Article 355(1) of the Treaty on the Functioning of the European Union (TFEU), other than Madeira and the Azores.

T. brinkmannii is a saprophytic fungal species, widespread on wood and plant debris (Farr et al., 1989). *Trechispora brinkmannii* has been reported by Baniecki and Bloss (1969) to be the teleomorph of *Phymatotrichopsis omnivora*, but this has been considered incorrect by Hennebert (1973) and Dong et al. (1981). According to the Index Fungorum database (www.indexfungorum.org), the current name of *T. brinkmannii* is *Sistotrema brinkmannii*, which, based on phylogenetic analyses (Marek et al., 2009), is a species distinct from *P. omnivora*.

The European Commission was asked to clarify the pest and its host(s) meant under the name '*Trechispora brinkmannii*', as this pest seems not to be an agricultural fungal pathogen. In an email dated 16 October 2018, the European Commission replied that the pest categorisation should address *P. omnivora* (included in the European and Mediterranean Plant Protection Organization (EPPO) A1 list) and its hosts.

2. Data and methodologies

2.1. Data

2.1.1. Literature search

A literature search on *P. omnivora* was conducted at the beginning of the categorisation in the ISI Web of Science bibliographic database, using the scientific names and synonyms of the pest (*Phymatotrichopsis omnivora*, *Phymatotrichum omnivorum* and *Ozonium omnivorum*) as search terms. Relevant papers were reviewed, and further references and information were obtained from experts, as well as 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, 2018) and relevant publications.

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

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

2.2. Methodologies

The Panel performed the pest categorisation for *P. omnivora*, following guiding principles and steps in the International Standard for Phytosanitary Measures No 11 (FAO, 2013) and No 21 (FAO, 2004).

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

Table 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 potentially qualify either as a quarantine pest or as a regulated non-quarantine pest. If one of the criteria is not met, the pest will not qualify. A pest that does not qualify as a quarantine pest may still qualify as a regulated non-quarantine pest that needs to be addressed in the opinion. For the pests regulated in the protected zones only, the scope of the categorisation is the territory of the protected zone; thus, the criteria refer to the protected zone instead of the EU territory.

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

Table 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)

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
Regulatory status (Section 3.3)	If the pest is present in the EU but not widely distributed in the risk assessment area, it should be under official control or expected to be under official control in the near future	The protected zone system aligns with the pest-free area system under the International Plant Protection Convention (IPPC). The pest satisfies the IPPC definition of a quarantine pest that is not present in the risk assessment area (i.e. protected zone)	Is the pest regulated as a quarantine pest? If currently regulated as a quarantine pest, are there grounds to consider its status could be revoked?
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Is the pest able to enter into, become established in and spread within the EU territory? If yes, briefly list the pathways!	Is the pest able to enter into, become established in and spread within the protected zone areas? Is entry by natural spread from EU areas where the pest is present possible?	Is spread mainly via specific plants for planting, rather than via natural spread or via movement of plant products or other objects? Clearly state if plants for planting is the main pathway!
Potential for consequences in the EU territory (Section 3.5)	Would the pests' introduction have an economic or environmental impact on the EU territory?	Would the pests' introduction have an economic or environmental impact on the protected zone areas?	Does the presence of the pest on plants for planting have an economic impact, as regards the intended use of those plants for planting?
Available measures (Section 3.6)	Are there measures available to prevent the entry into, establishment within or spread of the pest within the EU such that the risk becomes mitigated?	Are there measures available to prevent the entry into, establishment within or spread of the pest within the protected zone areas such that the risk becomes mitigated? Is it possible to eradicate the pest in a restricted area within 24 months (or a period longer than 24 months where the biology of the organism so justifies) after the presence of the pest was confirmed in the protected zone?	Are there measures available to prevent pest presence on plants for planting such that the risk becomes mitigated?
Conclusion of pest categorisation (Section 4)	A statement as to whether (1) all criteria assessed by EFSA above for consideration as a potential quarantine pest were met and (2) if not, which one(s) were not met	A statement as to whether (1) all criteria assessed by EFSA above for consideration as potential protected zone quarantine pest were met, and (2) if not, which one(s) were not met	A statement as to whether (1) all criteria assessed by EFSA above for consideration as a potential 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. The identity of the pest is well-established.

The causal agent of Phymatotrichum root rot was first cited by Pammel (1888) as *Ozonium auricomum* Lk. based on non-sporulating mycelium associated with diseased cotton roots. Later, Shear (1907) associated the disease with *O. omnivorum* Shear, which was distinguished from the type culture of *O. auricomum* based on its parasitic lifestyle and mycelial morphology. Shear (1907) considered *O. auricomum* only as a saprophyte. On identification of the conidial stage forming spore mats on soil surrounding diseased plants, Duggar (1916) renamed the pest *P. omnivorum* (Shear) Duggar. Although Duggar (1916) deposited additional specimens in herbaria, a type was not designated, since he only transferred Shear's species to a new genus.

The observation of hydroid homobasidiomycete fruiting bodies on the plants infected by *P. omnivorum* has led to the misidentification of the sexual stage as *Hydnum omnivorum* Shear by Shear (1925). Later, Baniecki and Bloss (1969) found a homobasidiomycete fruiting body in a culture of *P. omnivorum* and identified *S. brinkmannii* (Bres.) J. Erikss. as its sexual morph. However, this was later considered a contaminant by Weresub and Leclair (1971). The taxonomic connection between *P. omnivorum* and *S. brinkmannii* was further refuted by Dong et al. (1981). Hennebert (1973) renamed the pest causing root rot of cotton *P. omnivora* (Duggar) Hennebert to reassert its mitosporic affinity to *Botrytis*-like species and attributed the species solely to Duggar because conidia were absent in the specimen originally described by Shear (1907).

In 2009, the molecular systematics of *P. omnivora* was determined using the ribosomal DNA and RNA polymerase II subunit 2 loci (Marek et al., 2009). This study confirmed *P. omnivora* as member of the phylum *Ascomycota* not *Basidiomycota*. These authors also decided that that attribution solely to Duggar that was done by Hennebert (1973) should be regarded as an error since they considered it in conflict with the 'one fungus one name' concept, and left the taxon without a type specimen. Their proposal was that the attribution should be to Shear (1907), with his type specimen as holotype. The Panel notes that this proposal has not been taken into account by indexfungorum.org and mycobank.org, which still use *P. omnivora* (Duggar) Hennebert.

P. omnivora is a fungus of the family Rhizinaceae. The Index Fungorum database (www.indexfungorum.org) provides the following taxonomical identification:

Current scientific name: *Phymatotrichopsis omnivora* (Duggar) Hennebert

Family – Rhizinaceae

Genus – *Phymatotrichopsis*

Species – *omnivora*

Other reported synonyms (EPPO, 2018): *Ozonium omnivorum* Shear; *Phymatotrichum omnivorum* Duggar

Common disease name (EPPO, 2018): Phymatotrichum root rot

Other common names (EPPO, 1997, 2018; CABI, online): cotton root rot; Texas root rot of cotton; soft rot of cotton; Texas root rot of alfalfa; Texas root rot of grapevine; Texas root rot of bean; root rot of soybean; root rot of conifers

3.1.2. Biology of the pest

Phymatotrichopsis omnivora survives in the soil as rhizomorph-like mycelial strands on the surface of roots or as sclerotia (Alderman and Hine, 1982; EPPO, 1997). The fungus is not seedborne (EPPO, 1997). The role of mycelial strands as survival structures has been a topic of debate (Uppalapati et al.,

2010). Older studies found that even after several years of clean fallow or cultivation of non-susceptible plants, viable strands were still present in the soil (McNamara et al., 1934). Later, studies have shown that strands can only survive on live cotton roots (Alderman and Hine, 1982), and strands on dead cotton roots may survive for a maximum of 9 months at 10–30°C and 12–45% soil moisture (Wheeler and Hine, 1972). However, type of soil, nutrient sources and other factors may also influence survival of strands (Wheeler and Hine, 1972). Under favourable conditions, sclerotia can survive up to 12 years in the soil (McNamara et al., 1934; Streets and Bloss, 1973). In cotton fields, mycelial strands and sclerotia have been found at depths down to 2.4 m (Rogers, 1942). Upon contact with the roots, the strands entwine the roots and grow towards the soil surface (Lyda, 1978). When reaching the upper part of the root, the fungus forms a mycelial mantle, which envelopes the plant root. Below this mycelial mantle, the tissues collapse (rot). The fungal strands spread from plant to plant via the contiguous root system (Koch et al., 1987; Watson et al., 2000). After periods of frequent rains and cloudy days, the pest frequently forms mycelial mats containing masses of conidia (spore mats) on the surface of the soil (Streets and Bloss, 1973; Lyda, 1978). According to Lyda (1978), spore mats more commonly occur in fields with dense vegetation than in fields with row crops. The role of these spores in the life cycle of the pest is unknown. No sexual stage of *P. omnivora* is known (Marek et al., 2009).

The fungus is often associated with alkaline calcareous soils. The optimal pH for growth and survival is 7.2–8.0 (Percy, 1983). Wheeler and Hine (1972) found that mycelial strands are formed at soil temperatures between 27°C and 32°C and soil moisture levels of 22–30%. Strand formation was sparse below 16 and above 35°C and absent at 10°C and 40°C. Although the pest can grow in acidic soils, it does not produce sclerotia in soils with pH < 4.8, thus limiting its ability to survive in these soils (Lyda, 1978). The production of *P. omnivora* sclerotia was also negatively correlated with exchangeable sodium in the soil (Lyda, 1978; Percy, 1983). The pathogen cannot develop in highly aerobic soils, but it grows readily in enhanced carbon dioxide environment, such as poorly drained soils and at high depths up to 240 cm or even greater (Lyda, 1978). Sclerotia formation is favoured by temperatures ranging from 21°C to 32°C; sclerotia germinate and infect roots readily at 27°C (Dana, 1931; Lyda and Burnett, 1971). These findings are in line with Rush et al. (1984) who found that root rot symptoms on cotton are favoured by soil temperatures above 22°C and relatively high-water content in the soil.

3.1.3. Detection and identification of the pest

Are detection and identification methods available for the pest?

Yes. For a reliable detection and identification of *Phymatotrichopsis omnivora* on host plants, molecular methods should be considered in addition to symptomatology and morphological characteristics of the pest. Molecular methods have also been developed for its detection and identification in soil.

Phymatotrichopsis omnivora is difficult to be reliably detected and identified on host plants based only on host association and above-ground symptoms, as (i) the pest has a very wide host range (see Section 3.4.1), and (ii) similar symptoms are caused by other wilt pathogens (e.g. *Verticillium* spp., *Fusarium oxysporum*) or abiotic agents (e.g. drought), although in the case of wilting cotton plants (Ezekiel and Taubenhau, 1932) and trees (Streets and Bloss, 1973) infected by *P. omnivora*, the leaf temperature has been reported to be 2–5°C higher than that of leaves of healthy plants and trees. However, this difference in leaf temperature may go undetected (Streets and Bloss, 1973). The pest can be detected by visual inspection of the surface of the roots of its host plants for the presence of the characteristic network of brown rhizomorph-like mycelial strands (EPPO, 1997). Observation of the strands under the microscope reveals the presence of mycelium with characteristic cruciform branches (EPPO, 1997). The creamy-yellow cushion-like spore masses (spore mats) formed by the pest on the soil surface near the dying plants could also be used for the detection of the pest, but they are not always formed, particularly in row crops (Streets and Bloss, 1973; Lyda, 1978; EPPO, 1997). The pest can be readily isolated from diseased host plants using the method described by Lyda and Kenerley (1992). The species can be identified based on Polymerase chain reaction (PCR) amplification and DNA sequence analysis of ribosomal DNA from purified cultures (Marek et al., 2009).

Specific primers and probes are also available for conventional and real-time PCR-based detection and identification of the pest directly on symptomatic and asymptomatic host plants and in soil (Arif et al., 2013, 2014).

For a reliable detection and identification of the pest on host plants, molecular methods should also be considered, in addition to symptomatology and morphology.

Symptoms

Initial root infections occur when soil temperatures and moisture rise in late spring to early summer and are usually symptomless (Arif et al., 2014). The first symptom on cotton and alfalfa plants is slight yellowing or bronzing of the leaves followed by wilting within the first few days (1–3 days) and eventually death of the plants without abscission of the leaves (Streets and Bloss, 1973). The leaf temperature of cotton plants infected by *P. omnivora* has been reported to be 2–5°C higher than that of healthy plants (Ezekiel and Taubenhaus, 1932). Differences in the leaf temperature between infected and non-infected trees have been reported by Streets and Bloss (1973). In the field, diseased plants usually form circular patterns of wilting and dead plants that progressively expand to form large patches (Streets and Bloss, 1973). In infected trees of apple and stone fruit, leaves often dry and brittle quickly and remain attached without showing any yellowing or bronzing. Only roots in one side of the tree may be infected leading to the wilting and death of that side of the tree (Streets and Bloss, 1973). Trees may show signs of stress and slight wilting for several growing seasons before they die. At the time of wilting, the roots are often covered with strands, at first hyaline but later of cinnamon-brown colour. The cortical layer of the roots is decayed, appears dark brown and peels off (Streets and Bloss, 1973).

Morphology

Initial hyphae emerging from the sclerotia are septate and consist of multinucleate cells with a diameter of 6–12 µm. The hyphae have right-angled branch cells that resemble those of *Rhizoctonia* spp. (Alderman and Stowel, 1986; Uppalapati et al., 2010). Thin runner hyphae (5 µm in diameter) wrap around the initial hyphae and form mycelial strands consisting of 2–4 tightly woven layers (Alderman and Stowel, 1986). Hyphae emerge perpendicular to the strand and form the cruciform branches, which is characteristic of the fungus. Strands are also formed *in vitro* when the fungus is grown in nutrient-poor medium (Alderman and Stowel, 1986; Uppalapati et al., 2010).

Sclerotia consist of tightly packed hyphae and appear first as spherical swellings on the strands, in the beginning white and later tan to brown. They are irregular in shape and their size varies between 1 and 5 mm in diameter, depending on the soil texture (Streets and Bloss, 1973; Graham et al., 1979; Lyda, 1981). Every cell in the sclerotium can germinate when incubated *in vitro* (Lyda, 1978; Uppalapati et al., 2010).

Spore mats vary in size, usually from 3 to 40 cm in diameter and 0.3–2 cm in thickness (Streets and Bloss, 1973). Initially, the mats appear white and fluffy; later, the colour turns creamy to light brown. Conidiophores are formed on the surface of the mats. They are spheroid to ellipsoid, 20–30 µm long and 15–20 µm in diameter. Conidia are formed on numerous sterigmata on the surface of the conidiophores. The conidia are spheroid, 4.8–5.5 µm in diameter or ovoid, 5–6 × 6–8 µm. Germination of the conidia has rarely been observed and their role in the life cycle is unknown (Streets and Bloss, 1973).

3.2. Pest distribution

3.2.1. Pest distribution outside the EU

Phymatotrichopsis omnivora is indigenous to south-western USA (Arizona, Arkansas, California, Louisiana, Nevada, New Mexico, Oklahoma, Texas, Utah) and northern Mexico (Percy, 1983; EPPO, 2018) where it affects mainly plants grown in alkaline and calcareous soils that rarely freeze (Percy, 1983). The pest is also present in Venezuela and Libya (EPPO, 2018) (Figure 1 and Table 2).

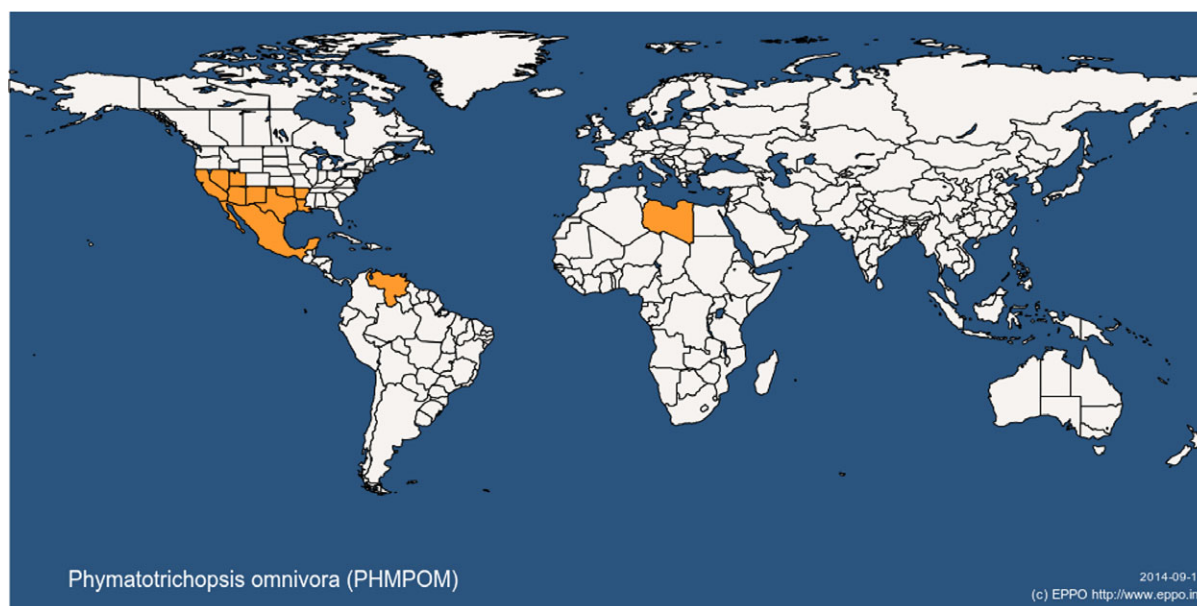


Figure 1: Global distribution map of *Phymatotrichopsis omnivora* (extracted from the EPPO Global Database accessed on 5/11/2018)

Table 2: Global distribution of *Phymatotrichopsis omnivora* based on information extracted from the EPPO Global Database (last updated: 29/6/2010; last accessed: 5/11/2018)

Continent	Country	Status
Africa	Libya	Present, no details
America	United States of America	Present, restricted distribution
	Mexico	Present, restricted distribution
	Venezuela	Present, restricted distribution

There have been reports on the occurrence of *P. omnivora* in India and Pakistan (Vasudeva, 1935), Hawaii (Chung, 1923) and Russia (Dounine and Poner, 1936), but according to Streets and Bloss (1973), these reports have not been adequately substantiated.

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 known to be present in the EU territory.

3.3. Regulatory status

As per the clarification provided by the European Commission (see Section 1.2), *P. omnivora* is listed as *T. brinkmannii* in Council Directive 2000/29/EC. Details are presented in Tables 3 and 4.

Table 3: *Phymatotrichopsis omnivora* as *Trechispora brinkmannii* in Council Directive 2000/29/EC

Annex I, Part A	Harmful organisms whose introduction into, and spread within, all member states shall be banned
Section I	Harmful organisms not known to occur in any part of the community and relevant for the entire community
(c)	Fungi
16.	<i>Trechispora brinkmannii</i> (Bresad.) Rogers

3.3.1. Legislation addressing the hosts of *Phymatotrichopsis omnivora*

As explained in Section 3.4.1, this pest categorisation focuses on the following major cultivated hosts of *P. omnivora*: *Gossypium* spp. (cotton), *Medicago sativa* (alfalfa), *Malus domestica* (apple), *Prunus persica* (peach) and *Vitis vinifera* (grapevine).

Table 4: Regulated hosts and commodities that may involve *Phymatotrichopsis omnivora* 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
9.	Plants of <i>Chaenomeles</i> Ldl., <i>Cydonia</i> Mill., <i>Crataegus</i> L., <i>Malus</i> Mill., <i>Prunus</i> L., <i>Pyrus</i> L., and <i>Rosa</i> L., intended for planting, other than dormant plants free from leaves, flowers and fruit	Non-European countries
14.	Soil and growing medium as such, which consists in whole or in part of soil or solid organic substances such as parts of plants, humus including peat or bark, other than that composed entirely of peat	Turkey, Belarus, Moldavia, Russia, Ukraine and third countries not belonging to continental Europe, other than the following: Egypt, Israel, Libya, Morocco, Tunisia
15.	Plants of <i>Vitis</i> L., other than fruits	Third countries other than Switzerland
18.	Plants of <i>Cydonia</i> Mill., <i>Malus</i> Mill., <i>Prunus</i> L. and <i>Pyrus</i> L. and their hybrids, and <i>Fragaria</i> L., intended for planting, other than seeds	Without prejudice to the prohibitions applicable to the plants listed in Annex III A (9), where appropriate, non-European countries, other than Mediterranean countries, Australia, New Zealand, Canada, the continental states of the USA
Annex IV, Part A		
Special requirements which must 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		
	Plant, plant products and other objects	Special requirements
34.	Soil and growing medium, attached to or associated with plants, consisting in whole or in part of soil or solid organic substances such as parts of plants, humus including peat or bark or consisting in part of any solid inorganic substance, intended to sustain the vitality of the plants, originating in: <ul style="list-style-type: none"> — Turkey, — Belarus, Georgia, Moldova, Russia, Ukraine, — non-European countries, other than Algeria, Egypt, Israel, Libya, Morocco, Tunisia 	Official statement that: <ul style="list-style-type: none"> (a) the growing medium, at the time of planting, was: <ul style="list-style-type: none"> — either free from soil, and organic matter, or — found free from insects and harmful nematodes and subjected to appropriate examination or heat treatment or fumigation to ensure that it was free from other harmful organisms, or — subjected to appropriate heat treatment or fumigation to ensure freedom from harmful organisms, and (b) since planting: <ul style="list-style-type: none"> — either appropriate measures have been taken to ensure that the growing medium has been maintained free from harmful organisms, or — within two weeks prior to dispatch, the plants were shaken free from the medium leaving the minimum amount necessary to sustain vitality during transport, and, if replanted, the growing medium used for that purpose meets the requirements laid down in (a).

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 Cruciferae, Gramineae, <i>Trifolium</i> spp., originating in Argentina, Australia, Bolivia, Chile, New Zealand and Uruguay, genera <i>Triticum</i> , <i>Secale</i> and <i>X Triticosecale</i> from Afghanistan, India, Iran, Iraq, Mexico, Nepal, Pakistan, South Africa and the USA, <i>Citrus</i> L., <i>Fortunella</i> Swingle and <i>Poncirus</i> Raf., and their hybrids, <i>Capsicum</i> spp., <i>Helianthus annuus</i> L., <i>Solanum lycopersicum</i> L., <i>Medicago sativa</i> L., <i>Prunus</i> L., <i>Rubus</i> L., <i>Oryza</i> spp., <i>Zea mays</i> L., <i>Allium ascalonicum</i> L., <i>Allium cepa</i> L., <i>Allium porrum</i> L., <i>Allium schoenoprasum</i> L. and <i>Phaseolus</i> L.
7.	(a) Soil and growing medium as such, which consists in whole or in part of soil or solid organic substances such as parts of plants, humus including peat or bark, other than that composed entirely of peat. (b) Soil and growing medium, attached to or associated with plants, consisting in whole or in part of material specified in (a) or consisting in part of any solid inorganic substance, intended to sustain the vitality of the plants, originating in: <ul style="list-style-type: none"> — Turkey, — Belarus, Moldova, Russia, Ukraine, — non-European countries, other than Algeria, Egypt, Israel, Libya, Morocco, Tunisia.

It should be noted that, as per Commission Implementing Regulation (EU) 2018/2019 of 18 December 2018, applying to all EU MS as from 14 December 2019, the introduction into the EU territory of plants for planting, other than seeds, *in vitro* material and naturally or artificially dwarfed woody plants for planting of *Malus* Mill. and *Prunus* L. shall be provisionally prohibited, pending a risk assessment.

3.4. Entry, establishment and spread in the EU

3.4.1. Host range

The pest has an extremely wide host range, infecting more than 2,000 species of dicotyledonous plants (Taubenhaus et al., 1929; Streets and Bloss, 1973; EPPO, 2018), the largest host range of any plant pathogen according to Marek et al. (2009). Monocotyledonous plants are not known to be affected (Taubenhaus and Ezekiel, 1936; Streets and Bloss, 1973; Uppalapati et al., 2010; EPPO, 2018), although it has been shown that they can harbour the pest (King and Loomis, 1929). The pest affects agricultural crops and forest plants, both native and introduced to several regions of the USA and Mexico (Cook and White, 1977; Medina and Lagarda, 1979), as well as weeds (Streets and Bloss, 1973; Percy, 1983). Because of the wide host range of *P. omnivora* (see Appendix A), the PLH Panel decided to focus this pest categorisation on *Gossypium* spp. (cotton), *M. sativa* (alfalfa), *M. domestica* (apple), *P. persica* (peach) and *V. vinifera* (grapevine) as the major hosts of *P. omnivora* commercially grown in the EU, and for which quantitative information for impacts exists in the literature (Table 5). *Glycine max* (soybean), which is commercially grown in the EU, is also reported to be an important host of the pest in the south-western USA and northern Mexico (Arif et al., 2014). However, soybean is not considered in the current pest categorisation as major host of *P. omnivora* because there is no quantitative information on impacts in the available literature.

Table 5: Major cultivated hosts of *Phymatotrichopsis omnivora*

Host plant species	Literature sources reporting on impacts	EPPO Global Database*
<i>Gossypium</i> spp.	Arif et al. (2014) Colmenares (2016) Kenerley and Jeger (1990) Kenerley and Jeger (1992) Kenerley et al. (1998) Lyda (1978) Marek et al. (2009) Streets and Bloss (1973) Uppalapati et al. (2009) Uppalapati et al. (2010)	Major
<i>Medicago sativa</i>	Colmenares (2016) Lyda (1978) Samaniego-Gaxiola (2007) Streets and Bloss (1973) Uppalapati et al. (2009) Uppalapati et al. (2010)	Minor
<i>Malus domestica</i>	Kenerley et al. (1994) Todd-Watson et al. (2007)	Minor
<i>Prunus persica</i>	Colmenares (2016)	Minor
<i>Vitis vinifera</i>	Colmenares (2016) Smith (2015)	Minor

*: Classification of hosts of *Phymatotrichopsis omnivora* according to EPPO Global Database.

3.4.2. Entry

Is the pest able to enter into the EU territory? If yes, identify and list the pathways!

Yes. However, except for soil and growing media attached to host and non-host plants for planting originating in Libya, all the pathways associated with host plants for planting and soil and growing media as commodity originating in infested third countries are either prohibited or regulated under the current EU legislation (Council Directive 2000/29/EC).

Phymatotrichopsis omnivora is not known to be seedborne or to infect fruits of its hosts. Moreover, the pest is unlikely to enter the EU territory by natural means (e.g. water) because of the distance between the infested third countries and the risk assessment area.

Therefore, the PLH Panel identified the following pathways for the entry of the pest from infested third countries into the EU territory, in the absence of the current EU legislation:

- 1) Host plants for planting, excluding seeds, but including dormant plants, and
- 2) Soil and growing media associated or not with plants for planting.

The following pathways of entry of *P. omnivora* into the risk assessment area are closed (prohibited) by the current EU legislation (Tables 3 and 4):

- 1) Plants for planting of the genera *Malus* and *Prunus*, other than dormant plants (free from leaves, flowers and fruit), originating in non-European countries.
- 2) Plants for planting of the genera *Malus* and *Prunus*, excluding seeds, originating in non-European countries, other than Mediterranean countries, Australia, New Zealand, Canada, the continental states of the USA.
- 3) Plants of the genus *Vitis* originating in third countries other than Switzerland.
- 4) Soil and growing media attached to or associated with plants originating in Turkey, Belarus, Georgia, Moldova, Russia, Ukraine and non-European countries, other than Algeria, Egypt, Israel, Libya, Morocco and Tunisia.
- 5) Soil and growing media not attached to or associated with plants originating in Turkey, Belarus, Moldavia, Russia, Ukraine and third countries not belonging to continental Europe other than Egypt, Israel, Libya, Morocco and Tunisia.

Special requirements (i.e. plant health inspection) exist in the EU legislation (Council Directive 2000/29/EC) for the following open pathways of entry of *P. omnivora* into the risk assessment area:

- 1) Dormant plants for planting of the genera *Malus* and *Prunus*,
- 2) Soil and growing media not attached to or associated with plants (soil/growing media as commodity), and
- 3) Soil and growing media attached to or associated with plants originating from Turkey, Belarus, Moldova, Russia, Ukraine and non-European countries, other than Algeria, Egypt, Israel, Libya, Morocco and Tunisia.

The following potential pathways of entry of *P. omnivora* into the risk assessment area are open and not regulated by the EU legislation:

- 1) Soil and growing media attached to or associated with host and non-host plants for planting originating in Libya
- 2) Infected host plant roots and sclerotia of the pest carried in soil adhering to agricultural machinery and implements, footwear and vehicles originating in infested third countries.

The Panel considers the latter potential pathway as uncertain because of the absence of import data in the Eurostat database (accessed on 27/11/2018) and/or the distance between some of the infested countries and the risk assessment area. Therefore, this pathway is not considered as a major pathway of entry and is not further addressed in the following sections.

There is no record of interception of *P. omnivora* in the Europhyt database (online; search performed on 6/11/2018).

No data exists in Eurostat on imports of dormant host plants for planting of the genera *Malus* and *Prunus* from third countries into the EU territory (Source: Eurostat, search done on 27/11/2018).

The ISEFOR database on EU import of plants for planting (Eschen et al., 2017, updated with data from the NPPPO of NL) reports a few shipments of small quantities of *Malus* spp. and *Prunus* spp. plants for planting from the USA to the EU during the period 2000–2015; potential pathways of entry therefore exist for *P. omnivora*. Nevertheless, the data are aggregated, and thus, it is not possible to know whether plants for planting of the species of interest (*M. domestica*, *P. persica*) are imported into the risk assessment area from infested third countries.

Although there are no records of EU imports of *Malus* and *Prunus* plants for planting from infested countries other than USA (i.e. Mexico, Libya and Venezuela), such trade cannot be ruled out, as the available data are not for all years and EU MS.

3.4.3. Establishment

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

Yes. The biotic (host availability) and abiotic (climate and edaphic suitability) factors occurring in parts of the risk assessment area are favourable for the establishment of *Phymatotrichopsis omnivora*

3.4.3.1. EU distribution of main host plants

The pest has a very wide host range among cultivated and wild plant species (see Section 3.4.1). The major cultivated hosts of *P. omnivora* considered in this pest categorisation, i.e. *Gossypium* spp., *M. sativa*, *M. domestica*, *P. persica* and *V. vinifera*, are widely grown in the risk assessment area (Tables 6–10).

Table 6: Area cultivated with *Gossypium* spp. (cotton) for seed and fibre production in the EU between 2013 and 2017 (in 1,000 ha)

Countries	2013	2014	2015	2016	2017	Mean of EU area grown with <i>Gossypium</i> spp. (in 1,000 ha)
EU 28	–	355	349	301	326	333 ^(a)
Greece	243	280	283	236	258	260
Spain	64	74	63	61	63	65

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

–: No data available.

(a): Mean calculated for 4 years (2014–2017).

Table 7: Area cultivated with *Medicago sativa* (alfalfa) in the EU between 2013 and 2017 (in 1,000 ha). Source: Eurostat, extracted on 26/11/2018; alfalfa recorded as 'Lucerne'

Countries	2013	2014	2015	2016	2017
EU 28	Not available due to lack of data for several member states				
Italy	–	704	670	681	–
Romania	341	362	365	380	391
Spain	–	–	257	271	266
Hungary	–	123	134	190	194
Bulgaria	–	–	65	85	88
Czechia	56	57	57	60	63
Poland	–	–	44	52	61
Slovakia	–	–	49	47	47
Croatia	26	22	18	24	26
Greece	16	14	19	26	35
Austria	13	13	11	12	13

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

–: Data not available.

Alfalfa is also grown, but to a lesser extent, in Belgium, Cyprus, Denmark, Ireland, Latvia, Lithuania and Slovenia. There were no data reported for Germany, Estonia, France, Luxembourg, the Netherlands and Portugal.

Table 8: Area cultivated with *Malus domestica* (apple) in the EU between 2013 and 2017 (in 1,000 ha). Source: Eurostat, extracted on 26/11/2018

Countries	2013	2014	2015	2016	2017	Mean of EU area grown with <i>Malus domestica</i> (in 1,000 ha)
EU 28	537	525	539	524	522	529
Poland	162	163	180	165	163	167
Romania	60	56	56	56	56	57
Italy	53	52	52	56	57	54
France	51	50	50	50	50	50
Hungary	33	33	33	33	32	33
Germany	32	32	32	32	34	32
Spain	31	31	31	31	31	31
United Kingdom	20	16	16	17	17	17
Portugal	14	14	14	15	15	14
Greece	13	12	12	10	10	11
Lithuania	12	11	11	10	10	11

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

Apples are also grown, but to a lesser extent, in Czech Republic, the Netherlands, Belgium, Austria, Croatia, Bulgaria, Slovakia, Latvia, Slovenia, Denmark, Sweden, Estonia, Cyprus, Ireland, Finland and Luxembourg.

Table 9: Area cultivated with *Prunus persica* (peach, nectarine) in the EU between 2013 and 2017 (in 1,000 ha). Source: Eurostat, extracted on 26/11/2018

Countries	2013	2014	2015	2016	2017	Mean of EU area grown with <i>Prunus persica</i> (in 1,000 ha)
EU 28	–	–	228.74	224.85	221.78	225 ^(a)
Spain	–	–	86.51	85.32	84.22	85 ^(a)
Italy	–	–	67.51	69.01	67.02	68 ^(a)
Greece	45.72	46.63	44.43	41.06	41.38	44
France	10.49	10.41	9.89	9.41	9.32	10

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

–: Data not available.

(a): Mean calculated for 3 years (2015–2017).

Peaches and nectarines are also grown, but to a lesser extent, in Austria, Bulgaria, Croatia, Cyprus, Czechia, Hungary, Poland, Portugal, Romania, Slovakia and Slovenia.

Table 10: Area cultivated with *Vitis vinifera* (grapevine) in the EU between 2013 and 2017 (in 1,000 ha). Source: Eurostat, extracted on 26/11/2018

Countries	2013	2014	2015	2016	2017	Mean of EU area grown with <i>Vitis vinifera</i> (in 1,000 ha)
EU 28	–	–	3,168	3,142	3,143	3,151 ^(a)
Spain	947	947	941	935	938	942
France	761	757	752	752	750	754
Italy	702	682	679	674	675	682
Portugal	180	179	179	179	179	179
Romania	177	175	176	174	175	175
Greece	111	111	109	98	102	106
Hungary	69	71	72	72	69	71
Austria	44	45	44	46	48	45
Bulgaria	50	32	39	37	34	38
Croatia	26	26	26	23	22	25
Slovenia	16	16	16	16	16	16
Czechia	16	16	16	16	16	16

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

–: Data not available.

(a): Mean calculated for 3 years (2015–2017).

Grapevine is also grown, but to a lesser extent, in Belgium, Cyprus, Luxemburg, Malta, Netherlands, Poland, Slovakia, Sweden and UK. There were no data reported for Germany.

3.4.3.2. Climatic conditions affecting establishment

Lyda (1978) indicated that *P. omnivora* survives only in particular edaphic environments and there are factors that restrict its ability to form sclerotia in specific soil types. Indeed, despite of its broad host range, the geographical distribution of the pathogen is mainly restricted to the south-western USA and northern Mexico (Percy, 1983).

Lyda (1978) reported that the prevalence of *P. omnivora* was markedly influenced by soil pH. The disease was rarely observed in acid soils (pH < 6) and seldom found in soils with less than 1% calcium carbonate. The pathogen was mostly found in alkaline (pH > 7), calcareous, clay soils. As indicated in Section 3.1.2, *P. omnivora* cannot produce sclerotia in acidic soils limiting therefore its ability to survive in such soils. The pest grows readily in enhanced carbon dioxide environment, such as poorly drained soils and at depths up to 240 cm or even greater (Lyda, 1978). Vertisols, with a high content of expansive clay that readily shrink and swell with water content, are considered particularly conducive for *Phymatotrichum* root rot (Percy, 1983).

Jeger and Lyda (1986) associated increments of *Phymatotrichum* root rot incidence in Texas, USA, with preceding increments in precipitation, but only when the latter were large. Disease incidence was

directly related to precipitation in the range of 360–1,000 mm and inversely related to air temperatures higher than 34°C. It was postulated that *P. omnivora* cannot persist in regions where the annual mean air temperature is lower than 16°C (Percy, 1983).

Percy (1983) identified a set of soil types from the FAO-UNESCO classification system (FAO-UNESCO, 1974) having 35–40% clay as compatible with the development of *P. omnivora*. In addition, Percy (1983) excluded areas outside of the 15°C annual mean temperature isotherm, as they were considered not suitable for the pest. Based on these edaphic and climatic factors, Percy (1983) was able to correctly predict the potential geographic distribution of *P. omnivora* in North America (Figure 2).

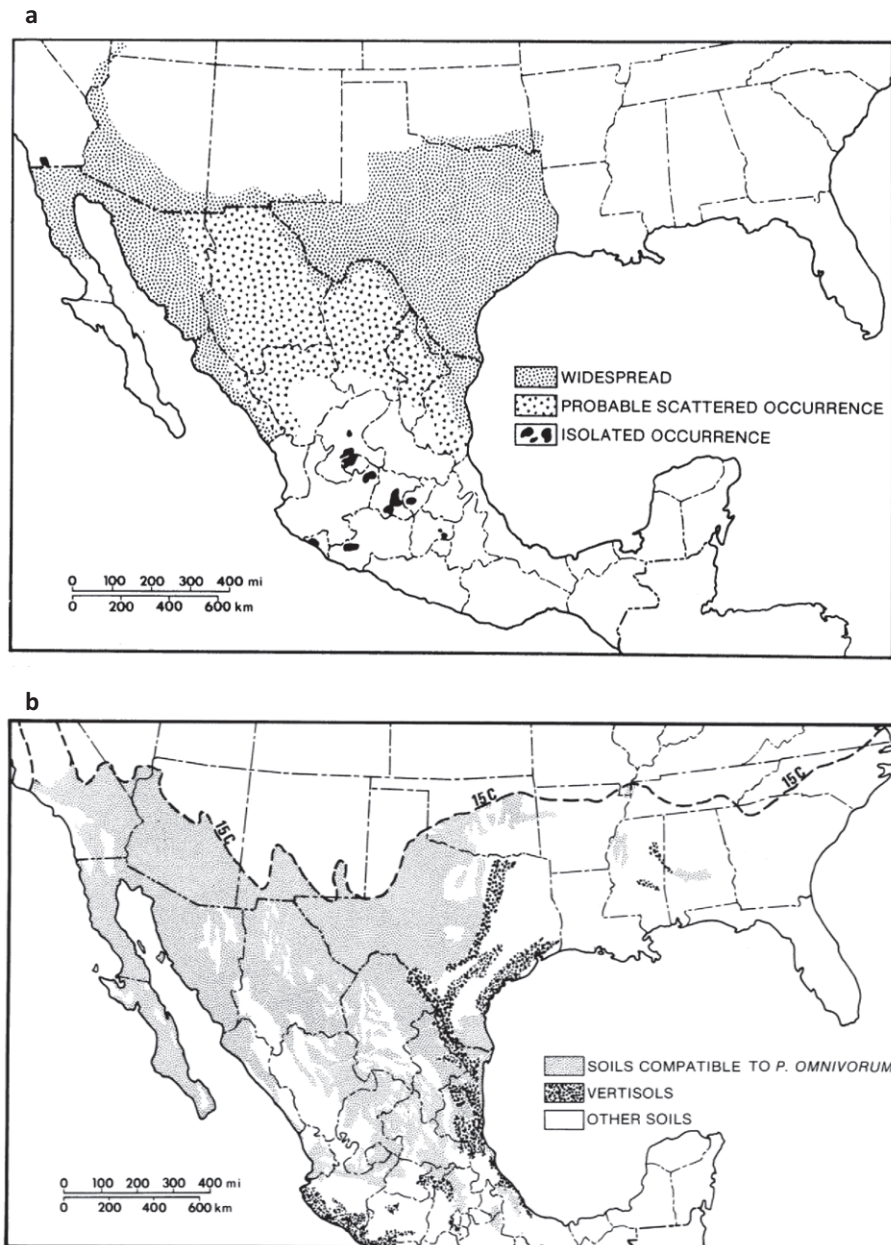


Figure 2: (a) Reported distribution of *Phymatotrichopsis omnivora* in North America as per Streets and Bloss (1973), and (b) theoretical North American range potential of *P. omnivora* (right). Maps from Percy (1983) © American Phytopathological Society

For Europe, Figure 3a shows the areas with alkaline soils (pH > 7), which are generally considered suitable for *P. omnivora* (Lyda, 1978). Soil types in Europe from the FAO-UNESCO classification system (FAO-UNESCO, 1974) identified by Percy (1983) as compatible with the development of *P. omnivora* are shown in Figure 3b. Areas in Europe with annual mean temperature higher than 15°C, favourable for *P. omnivora*, are represented in Figure 3c. Areas in Europe with the soil types from the FAO-

UNESCO classification system and annual mean temperature higher than 15°C, favourable for *P. omnivora* (Percy, 1983), are represented in Figure 3d.

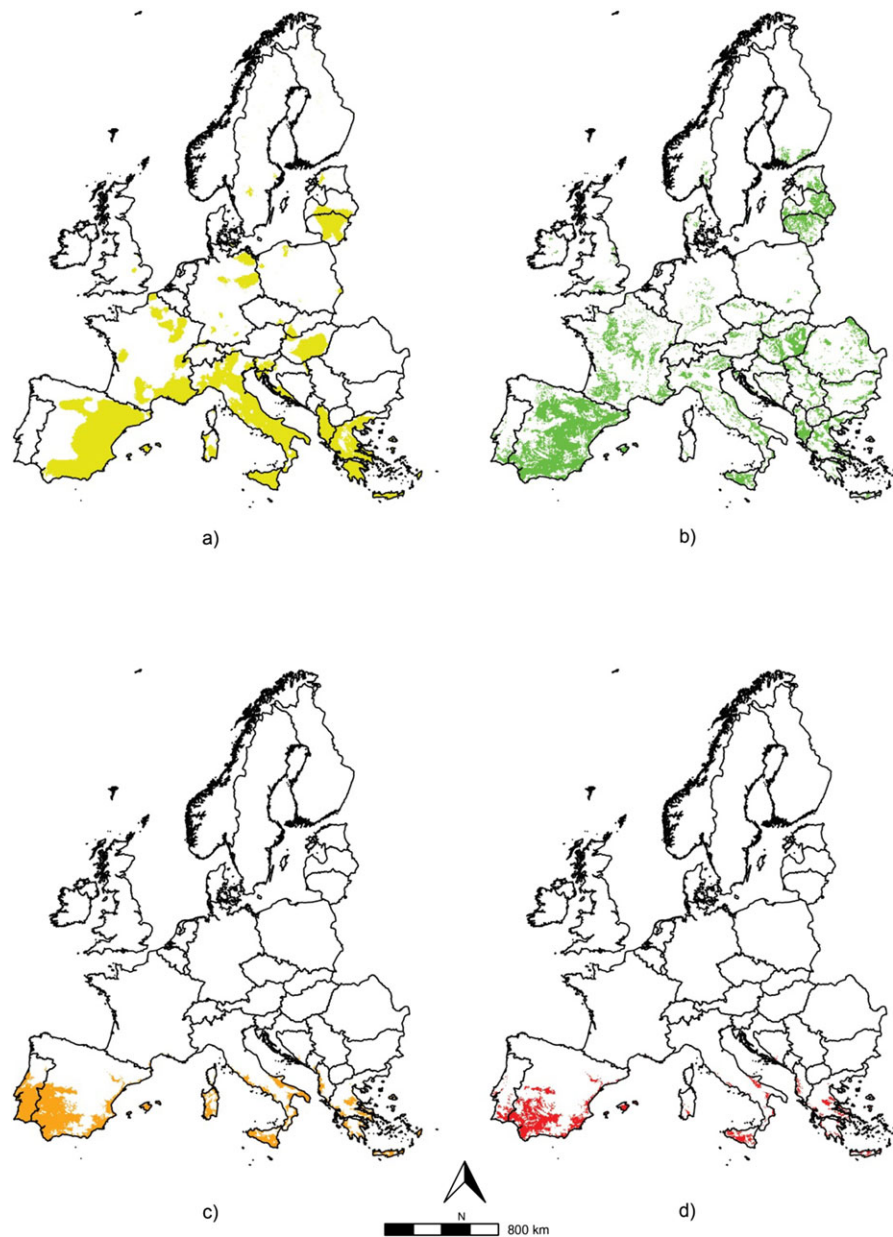


Figure 3: Areas in Europe with (a) alkaline soils ($\text{pH} > 7$)⁴; (b) soil types from the FAO-UNESCO classification system⁵ proposed by Percy (1983) to be suitable for *P. omnivora*; (c) annual mean temperature higher than 15°C⁶ and (d) soil types from the FAO-UNESCO classification system and annual mean temperature higher than 15°C⁶, favourable for *P. omnivora* (Percy, 1983). No data was available on (i) soil pH for Romania, Montenegro, Bosnia, Serbia, Bulgaria and North Macedonia, and (ii) soil pH, annual mean temperature and soil types for Cyprus

⁴ Based on the 'Map of Soil pH in Europe', Land Resources Management Unit, Institute for Environment & Sustainability, European Commission, Joint Research Centre; 2010. European Soil Data Centre (ESDAC), esdac.jrc.ec.europa.eu, European Commission, Joint Research Centre (Panagos et al., 2012).

⁵ Based on ESDBv2 Raster Library - a set of rasters derived from the European Soil Database distribution v2.0 (published by the European Commission and the European Soil Bureau Network); M. Van Liedekerke, A. Jones, P. Panagos; 2006. European Soil Data Centre (ESDAC), esdac.jrc.ec.europa.eu, European Commission, Joint Research Centre (Panagos et al., 2012).

⁶ Based on the WorldClim 1.4 database (Hijmans et al., 2005).

Soil types and annual mean temperatures compatible with the development of *P. omnivora* in North America are also present in south of Europe. Therefore, the edaphic and climatic conditions occurring in parts of the EU are suitable for the establishment of *P. omnivora*. However, uncertainty exists whether soil types present in the EU but not in North America are conducive for the development of *P. omnivora*, and whether the 15°C isotherm defined in North America can be directly extrapolated to the EU. Moreover, there is no information on the association of soil types and climatic conditions with the geographic distribution of *P. omnivora* in Libya and Venezuela.

3.4.4. Spread

Is the pest able to spread within the EU territory following establishment? Yes

How? By natural and human-assisted means.

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 pest is mainly spread via the movement/trade of host plants for planting, excluding seeds but including plants at the dormant stage

Following its establishment in the EU territory, the pest could potentially spread by both natural and human-assisted means.

Spread by natural means. Locally, the pest spreads from infected to healthy roots via the mycelial strands which grow through the soil (Ezekiel and Taubenhaus, 1932; Streets and Bloss, 1973; Jeger et al., 1987). The average rate of spread was reported to be 0.6–2.4 m per month in midsummer; spread of the pest at a rate of 1.5–9.0 m per year is common in cotton fields (Streets and Bloss, 1973). Spread of *P. omnivora* in orchards varies with the susceptibility of the plants, their spacing and soil moisture and temperature (Taubenhaus and Dana, 1928). In apple and peach trees spaced 7.5 m apart, adjacent trees were generally killed the following year, whereas trees spaced 12 m or more apart did not succumb until the third year. The pest has been reported to spread by river water too (Milbrath, 1928; Peltier, 1937; Peltier et al., 1939). Neal (1949) suggested that sclerotia dispersed by river water might have been responsible for introduction of the pest into Louisiana along the Red River from Arkansas and Texas. According to Streets and Bloss (1973), conidia of the pest could potentially be disseminated by wind and irrigation water, but there is no evidence for this means of spread.

Spread by human-assisted means. The pest would potentially spread over long distances via the movement of (i) infected host plants for planting with roots, including dormant plants, and (ii) infested soil and growing media associated or not with plants for planting (Streets and Bloss, 1973). There is little evidence that the pest can spread on agricultural machinery and implements (McNamara and Hooton, 1929).

3.5. Impacts

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

Yes. The introduction of the pest in the EU territory would potentially cause direct and indirect impacts in parts of the risk assessment area.

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?⁷

Yes. The presence of the pest on host plants for planting (other than seeds) would have an economic impact.

Phymatotrichum root rot is one of the most destructive diseases causing wilting and eventually death of its host plants (see Section 3.1.3). Although the pest has been described on more than 2,000 plant species, major losses have been mostly reported for cotton, alfalfa, apple, peach and grapevine (see Section 3.4.1).

There is considerable variation in the incidence of Phymatotrichum root rot from year to year depending on soil temperature, rainfall and fluctuations in other environmental factors (Streets and Bloss, 1973). Likewise, Kenerley et al. (1998) highlighted that the incidence and severity of

⁷ See Section 2.1 on what falls outside EFSA's remit.

Phymatotrichum root rot were affected by environmental and soil conditions including pH, mineral content, soil temperature and matric potential. Disease incidences as high as 74 and 100% were reported on cotton crops in Texas and Arizona, respectively (Streets and Bloss, 1973). In Texas, Jeger and Lyda (1986) indicated that, depending on the year, the percentage of cotton plants killed by *P. omnivora* ranged from 4% to 99%. In Arizona, Mulrean et al. (1984) observed yield reductions of 10% in upland cotton (*Gossypium hirsutum*) and 13% in Pima cotton (*Gossypium barbadense*). Streets and Bloss (1973) estimated an average loss in yield of raw fibre of 3.45 and 2.24% in Texas and Arizona, respectively. In addition to the yield reduction of cotton fibre, losses also occur due to reduced quality of lint and seed. Streets and Bloss (1973) reported reductions of about 18–35% in the seed oil content in cotton plants affected by *P. omnivora*.

Streets and Bloss (1973) indicated that entire orchards and vineyards were lost in a few years due to Phymatotrichum root rot. In Texas, the disease was particularly severe in apple orchards, with a 15% of tree loss each year (Kenerley et al., 1994). In Venezuela, Colmenares (2016) observed yield losses of 20–30% on peach.

The introduction of the pest in the EU territory would potentially cause direct and indirect impacts at least to cotton, alfalfa, apple, peach and grapevine production. Because of the very wide host range and the ability of the pest to survive for many years deep into the soil, the agricultural practices and chemical control measures currently applied in the EU would not reduce the impact of the pest's introduction in the risk assessment area.

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. Please, see section 3.3. In addition, for the currently open and unregulated pathway of soil and growing media attached to, or associated with, host and non-host plants for planting originating in Libya, the PLH Panel identified the same specific requirements described in Annex IV, Part A, Section I, point 34 and the supporting measure described in Annex V, Part B, Section I, Point 7(b) of Council Directive 2000/29/EC.

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

Yes. The presence of the pest on host plants for planting could be prevented by sourcing them in pest-free areas or places of production

3.6.1. Identification of additional measures

Phytosanitary measures (sourcing plants for planting from pest-free areas or pest-free places of production, inspection and laboratory testing both at the place of origin and at the EU entry point) are currently applied to major hosts, which are all regulated (Council Directive 2000/29/EC) (see Section 3.3).

All the potential pathways of entry are either prohibited or regulated, except for soil and growing media attached to or associated with host and non-host plants for planting originating in Libya (see Section 3.4.2). For this open and unregulated pathway, the PLH Panel identified the same specific requirements described in Annex IV, Part A, Section I, point 34, as well as the supporting measure described in Annex V, Part B, Section I, Point 7(b) of Council Directive 2000/29/EC.

No additional cultivated hosts with documented quantitative impact or unregulated pathways of entry have been identified. There are no measures that could prevent the establishment of the pest in the EU territory.

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

Factors limiting the feasibility and effectiveness of measures to prevent the entry into and spread within the EU of *P. omnivora* present in soil and growing media attached to or associated with host and non-host plants for planting originating in Libya:

- The shaking of the plants free from the soil or growing medium does not guarantee the absence of sclerotia in the minimum amount of soil remaining attached to the roots of plants to sustain their vitality during transport.

3.7. Uncertainty

- 1) **Host range.** The entire host range is unknown. In the infested areas, more than 2,000 dicotyledonous plant species have been reported as hosts of the pest. However, it is unknown whether other dicotyledonous species growing in the risk assessment area could also be hosts of *P. omnivora*.
- 2) **Entry.** Uncertainty exists on whether the pest could enter the EU territory through soil adhering to agricultural machinery and implements, footwear and vehicles, due to the absence of import data in the Eurostat database and/or because of the distance between some of the infested countries and the risk assessment area.
- 3) **Entry and spread.** The effect of soil fumigation and heat treatment on the survival structures of the pest (sclerotia, mycelial strands) is not known due to lack of available information in the literature.
- 4) **Establishment.** Uncertainty exists whether edaphic and climatic conditions associated with the presence of *P. omnivora* in North America can be directly extrapolated to the EU. Moreover, there is no information on the association of soil types and climatic conditions with the geographic distribution of *P. omnivora* in Libya and Venezuela.
- 5) **Spread.** The role of the conidia produced in spore mats in the epidemiology of the disease is unknown.
- 6) **Impact:** Information on potential impacts in the risk assessment is available only for a limited number of the hosts.

4. Conclusions

Phymatotrichopsis omnivora meets all the criteria assessed by EFSA for consideration as potential Union quarantine pest (Table 5). The criteria for considering *P. omnivora* as a potential Union regulated non-quarantine pest are not met since the pest is not known to be present in the EU.

Table 11: 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 (<i>Phymatotrichopsis omnivora</i>) is clearly defined and there are reliable methods for its detection and identification	The identity of the pest (<i>Phymatotrichopsis omnivora</i>) is clearly defined and there are reliable methods for its detection and identification	None
Absence/ presence of the pest in the EU territory (Section 3.2)	The pest is not known to be present in the EU territory	The pest is not known to be present in the EU territory	None
Regulatory status (Section 3.3)	The pest is listed as <i>Trechispora brinkmannii</i> in Council Directive 2000/29/EC (see section 1.2). The pest is currently officially regulated in the EU as a quarantine pest	The pest is listed as <i>Trechispora brinkmannii</i> in Council Directive 2000/29/EC (see Section 1.2). The pest is currently officially regulated in the EU as a quarantine pest. There are no grounds to consider its status could be revoked	None

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
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	<p><u>Entry:</u> All the potential pathways of entry are either prohibited or regulated (Council Directive 2000/29/EC), except for soil and growing media attached to or associated with host and non-host plants for planting originating in Libya</p> <p><u>Establishment:</u> The biotic (host availability) and abiotic (climate and edaphic suitability) factors occurring in parts of the risk assessment area are favourable for the establishment of the pest</p> <p><u>Spread:</u> Following introduction, the pest could potentially spread by natural and human-assisted means</p>	The pest is mainly spread via host plants for planting	<p>The entire host range is unknown (Uncertainty 1)</p> <p>It is not known whether the pest could enter the EU territory through soil adhering to agricultural machinery and implements (Uncertainty 2)</p> <p>The effect of soil fumigation and heat treatment on the survival structures of the pest (sclerotia, mycelial strands) is not known (Uncertainty 3)</p> <p>Soil and climate factors associated with <i>P. omnivora</i> in North America may not be directly extrapolated to the EU; moreover, there is a lack of information on soil types and climatic conditions associated with the distribution of the pest in Venezuela and Libya (Uncertainty 4)</p> <p>The role of the conidia in the epidemiology of the disease is unknown (Uncertainty 5)</p>
Potential for consequences in the EU territory (Section 3.5)	The introduction of the pest in the EU territory would potentially cause direct and indirect impacts in parts of the risk assessment area	The presence of the pest on host plants for planting (other than seeds) would have an economic impact	Information on potential impacts in the risk assessment is available only for a limited number of the hosts (Uncertainty 6)
Available measures (Section 3.6)	There are measures available to prevent the introduction into and spread within the EU of the pest such that the risk becomes mitigated (Council Directive 2000/29/EC). These measures do not currently apply to soil and growing media attached to or associated with host and non-host plants for planting originating in Libya	The presence of the pest on host plants for planting other than seeds could be prevented by sourcing them in pest-free areas or places of production	None
Conclusion on pest categorisation (Section 4)	<i>Phymatotrichopsis omnivora</i> meets all the criteria assessed by EFSA for consideration as potential Union quarantine pest	The criteria for considering <i>Phymatotrichopsis omnivora</i> as a potential Union regulated non-quarantine pest are not met since the pest is not known to be present in the EU	None

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
Aspects of assessment to focus on/ scenarios to address in future if appropriate	Data on the association of soil types and climatic conditions with the geographic distribution of <i>P. omnivora</i> in Libya and Venezuela may reduce the uncertainty regarding the areas where the pest could establish in the EU		

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Abbreviations

EPPO	European and Mediterranean Plant Protection Organization
FAO	Food and Agriculture Organization
IPPC	International Plant Protection Convention
ISPM	International Standards for Phytosanitary Measures
MS	Member State
PCR	Polymerase chain reaction
PLH	EFSA Panel on Plant Health
PZ	Protected Zone
TFEU	Treaty on the Functioning of the European Union
ToR	Terms of Reference

Glossary

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

Appendix A – Host range of *Phymatotrichopsis omnivora*

Host plant species	Major host*	Grown commercially in the eu	Literature sources reporting on impacts	Other literature sources	EPPO Global Database**
Dicotyledons					
<i>Arachis hypogaea</i>		+	Uppalapati et al. (2009)	Uppalapati et al. (2010)	
<i>Capsicum annuum</i>		+	No information	Colmenares (2016)	
<i>C. frutescens</i>		+	No information	Streets and Bloss (1973)	
<i>Carya illinoensis</i>	+	+	Galván (1986), Herrera and Samaniego-Gaxiola (2002) (<i>secondary source: Samaniego-Gaxiola, 2007</i>)	Hu (2018), Samaniego-Gaxiola and Herrera (2003), Samaniego-Gaxiola et al. (2003), Samaniego-Gaxiola (2009), Samaniego-Gaxiola et al. (1998), Uppalapati et al. (2010)	Minor
<i>Citrus aurantium</i>		+	No information	Streets and Bloss (1973)	
<i>Citrus medica</i>		+	No information	Streets and Bloss (1973)	
<i>Citrus sinensis</i>		+	No information	Colmenares (2016)	
<i>Citrus</i> spp.		+	No information		Incidental
<i>Coffea arabica</i>		+	No information	Colmenares (2016)	
<i>Cucumis melo</i>		+	No information	Colmenares (2016)	
<i>Cucurbita maxima</i>		+	No information	Colmenares (2016)	
<i>Daucus carota</i>		+	No information	Streets and Bloss (1973)	
<i>Glycine max</i>		+	No information	Arif et al. (2014)	
<i>Gossypium</i> spp. (<i>G. barbadense</i> ; <i>G. hirsutum</i>)	+	+	Arif et al. (2014), Colmenares (2016), Kenerley and Jeger (1990), Kenerley and Jeger (1992), Kenerley et al. (1998), Lyda (1978), Marek et al. (2009), Streets and Bloss (1973), Uppalapati et al. (2009), Uppalapati et al. (2010)		Major
<i>G. herbaceum</i>		+ (grown for medicinal use)	No information		Major
<i>Hibiscus esculentus</i>		+	No information	Streets and Bloss (1973)	
<i>Ipomoea batatas</i>		+	Uppalapati et al. (2009)	Streets and Bloss (1973)	
<i>Juglans regia</i>		+	No information	Colmenares (2016)	
<i>Lactuca sativa</i>		+	No information	Streets and Bloss (1973)	
<i>Linum usitatissimum</i>		+	No information	Isakeit (2008), Morgan et al. (2010)	
<i>Malus domestica</i>	+	+	Todd-Watson et al. (2007), Kenerley et al. (1994)	Streets and Bloss (1973), Uppalapati et al. (2010), Watson et al. (2000)	Minor
<i>Mangifera indica</i>		+	No information	Colmenares (2016)	Minor

Host plant species	Major host*	Grown commercially in the eu	Literature sources reporting on impacts	Other literature sources	EPPO Global Database**
<i>Medicago sativa</i>	+	+	Colmenares (2016), Lyda (1978), Samaniego-Gaxiola (2007), Streets and Bloss (1973), Uppalapati et al. (2009), Uppalapati et al. (2010)	Castro and Rodríguez (1970)	Minor
<i>Olea europaea</i>		+	No information	Streets and Bloss (1973)	
<i>Persea americana</i>		+	No information	Colmenares (2016)	Minor
<i>Phaseolus</i> spp.		+	Uppalapati et al. (2009)	Streets and Bloss (1973)	
<i>Pinus</i> spp.		+	No information	Colmenares (2016)	
<i>Pistacia</i> spp.		+	No information	Farr et al. (1989), Hu (2018), Samaniego-Gaxiola (2007), Samaniego-Gaxiola et al. (2010), Streets and Bloss (1973)	
<i>Poncirus trifoliata</i>		+	No information	Streets and Bloss (1973)	
<i>Prunus amygdalus</i>		+	No information	Streets and Bloss (1973)	
<i>P. armeniaca</i>		+	No information	Streets and Bloss (1973)	
<i>P. persica</i>	+	+	Colmenares (2016)	Castro and Rodríguez (1970), Streets and Bloss (1973)	Minor
<i>Punica granatum</i>		+	No information	Streets and Bloss (1973)	
<i>Pyrus communis</i>		+	No information	Streets and Bloss (1973)	
<i>Rheum rhaponticum</i>		+	No information	Streets and Bloss (1973)	
<i>Rhododendron</i> hybrids		+	No information		Incidental
<i>Rosa</i> spp.		+	No information		Incidental
<i>Solanum melongena</i>		+	No information	Streets and Bloss (1973)	
<i>Vitis vinifera</i>	+	+	Smith (2015), Colmenares (2016)	Hu (2018), Marek et al. (2009), Streets and Bloss (1973), Uppalapati et al. (2010)	Minor
Fruit and nut trees		+	No information	Colmenares (2016), Hu (2018), Marek et al. (2009), Streets and Bloss (1973), Uppalapati et al. (2010)	
Ornamental trees and shrubs		+	Uppalapati et al. (2009)	Colmenares (2016), Hu (2018), Marek et al. (2009), Streets and Bloss (1973), Uppalapati et al. (2010)	
Vegetable crops				Marek et al. (2009)	
Weeds (in general)		–	No information	Samaniego-Gaxiola (2007)	

Host plant species	Major host*	Grown commercially in the eu	Literature sources reporting on impacts	Other literature sources	EPPO Global Database**
Monocotyledons					
<i>Zea mays</i>		+	No information	Lyda (1978)	
<i>Sorghum</i> sp.		+	No information	Lyda (1978)	

*: Hosts grown commercially in the EU for which quantitative information for impacts exists in the literature.

** : Classification of hosts of *Phymatotrichopsis omnivora* according to EPPO Global Database.

In addition to the above, Streets and Bloss (1973) provide two lists of plant species that are reported as very susceptible or susceptible to *P. omnivora*; Colmenares (2016) also lists native plants of Venezuela reported as susceptible to *P. omnivora*.