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Pest categorisation of *Ripersiella hibisci*

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Abstract

The EFSA Panel on Plant Health performed a pest categorisation of *Ripersiella hibisci* (Hemiptera: Rhizoecidae) for the EU. *R. hibisci* occurs in Japan, China and Taiwan and has spread to the USA: Florida, Hawaii and the territory of Puerto Rico. *R. hibisci* is a polyphagous mealybug recorded feeding on roots of monocotyledonous and dicotyledonous plants. Root damage reduces nutrient and water uptake, retards plant growth and may cause leaves to wilt or discolour, heavily infested plants can die. Literature most commonly refers to damage to greenhouse grown potted ornamentals such as *Cuphea, Hibiscus, Pelargonium* and *Phoenix*. All life stages occur in the soil and host plants for planting with growing media provide a pathway for eggs, nymphs and adults. Multiple overlapping generations occur in greenhouses each year. *R. hibisci* is listed in Annex IIA of EU Regulation 2016/2031, appearing with the synonym *Rhizoecus hibisci*. All plants for planting from third countries are regulated. The import of soil or growing medium attached to plants for planting from third countries (other than Switzerland) is prohibited and therefore reduces the likelihood, but does not prevent entry of *R. hibisci*, as individuals may remain attached to the roots. There have been interceptions of *R. hibisci* in the EU, usually on artificially dwarfed plants, i.e. bonsai/penjing. Findings in EU greenhouses have been eradicated. *R. hibisci* would be able to establish in the EU, greenhouse potted plant production would be most affected. Phytosanitary measures are available to lower the likelihood of introduction. *R. hibisci* satisfies the criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest. *R. hibisci* does not meet the criterion of occurring in the EU for it to be regarded as a potential Union regulated non-quarantine pest.

Keywords: bonsai, penjing, pest risk, plant pest, quarantine, *Rhizoecus hibisci*, root mealybug

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1. Introduction

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

1.1.1. Background

Council Directive 2000/29/EC[1] on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community established the previous European Union plant health regime. The Directive laid 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 was prohibited, was detailed together with specific requirements for import or internal movement.

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

1.1.2. Terms of Reference

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

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

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

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

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

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

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

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

1.1.2.1. Terms of Reference: Appendix 1

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

Annex IIAI

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

Aleurocanthus 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

Rhizoecus hibisci 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 (RNQP) for the area of the 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.

Following the adoption of Regulation (EU) 2016/2031[4] on 14 December 2019 and the Commission Implementing Regulation (EU) 2019/2072[5] for the listing of EU regulated pests, the Plant Health Panel interpreted the original request (ToR in Section 1.1.2) as a request to provide pest categorisations for the pests in the Annexes of Commission Implementing Regulation (EU) 2019/2072.

The subject of this pest categorisation is listed in Appendix 1 of the terms of reference as *Rhizoecus hibisci* Kawai & Takagi. The same name appears in Annex II A of Commission Implementing Regulation (EU) 2019/2072. However, following a taxonomic revision by Matile-Ferrero (1976) the current valid name of the organism is *Ripersiella hibisci* (Kawai & Takagi). Taxonomic work by Kozár and Konczné Benedicty (2003) supports the classification by Matile-Ferrero (1976). A more recent monograph on root mealybugs of the world (Kozár and Konczné Benedicty, 2007) also follows Matile-Ferrero (1976). For the purposes of this pest categorisation, we will use the current valid name *Ripersiella hibisci*, the name also used in the EPPO Global Database (EPPO, online).

[4] Regulation (EU) 2016/2031 of the European Parliament of the Council of 26 October 2016 on protective measures against pests of plants, amending Regulations (EU) No 228/2013, (EU) No 652/2014 and (EU) No 1143/2014 of the European Parliament and of the Council and repealing Council Directives 69/464/EEC, 74/647/EEC, 93/85/EEC, 98/57/EC, 2000/29/EC, 2006/91/EC and 2007/33/EC.

[5] Commission Implementing Regulation (EU) 2019/2072 of 28 November 2019 establishing uniform conditions for the implementation of Regulation (EU) 2016/2031 of the European Parliament and the Council, as regards protective measures against pests of plants, and repealing Commission Regulation (EC) No 690/2008 and amending Commission Implementing Regulation (EU) 2018/2019.

2. Data and methodologies

2.1. Data

2.1.1. Literature search

A literature search on the organism was conducted at the beginning of the categorisation in the ISI Web of Science bibliographic database and on Google Scholar, using the scientific name *Ripersiella hibisci* and the synonym *Rhizoeus hibisci* 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 European and Mediterranean Plant Protection Organization (EPPO) Global Database (EPPO, online) 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).

Scalenet (García Morales et al., 2016) was searched for information regarding biology and systematics.

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 *R. hibisci*, following guiding principles and steps presented in the EFSA guidance on quantitative pest risk assessment (EFSA PLH Panel, 2018) and 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 RNQP in accordance with Regulation (EU) 2016/2031 on protective measures against pests of plants, and includes additional information required in accordance with the specific 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 potentially qualify either as a quarantine pest or as a RNQP. If one of the criteria is not met, the pest will not qualify. A pest that does not qualify as a quarantine pest may still qualify as a RNQP that needs to be addressed in the opinion. For the pests regulated in the protected zones only, the scope of the categorisation is the territory of the protected zone; thus, the criteria refer to the protected zone instead of the EU territory.

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

Table 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 RNQP. (A regulated non-quarantine pest must be present in the risk assessment area)
Regulatory status (Section 3.3)	If the pest is present in the EU but not widely distributed in the risk assessment area, it should be under official control or expected to be under official control in the near future	The protected zone system aligns with the pest free area system under the International Plant Protection Convention (IPPC) The pest satisfies the IPPC definition of a quarantine pest that is not present in the risk assessment area (i.e. protected zone)	Is the pest regulated as a quarantine pest? If currently regulated as a quarantine pest, are there grounds to consider its status could be revoked?
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?

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
Conclusion of pest categorisation (Section 4)	A statement as to whether (1) all criteria assessed by EFSA above for consideration as a potential quarantine pest were met and (2) if not, which one(s) were not met	A statement as to whether (1) all criteria assessed by EFSA above for consideration as potential protected zone quarantine pest were met, and (2) if not, which one(s) were not met	A statement as to whether (1) all criteria assessed by EFSA above for consideration as a potential RNQP were met, and (2) if not, which one(s) were not met

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

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, *Ripersiella hibisci* (Kawai and Takagi, 1971) is an established and recognised species.

R. hibisci (Figure 1) is an insect in the order Hemiptera, suborder Sternorrhyncha. When originally described, Kawai and Takagi (1971) placed *R. hibisci* in the family Pseudococcidae, subfamily Rhizoecinae. Hodgson (2012) elevated the subfamily to family status, becoming the Rhizoecidae. Some subsequent literature and databases still refer to *R. hibisci* as in the family Pseudococcidae.

The EPPO code[6] (Griessinger and Roy, 2015; EPPO, 2019) for this species is RHIOHI (EPPO, online).

[6] An EPPO code, formerly known as a Bayer code, is a unique identifier linked to the name of a plant or plant pest important in agriculture and plant protection. Codes are based on genus and species names. However, if a scientific name is changed the EPPO code remains the same. This provides a harmonized system to facilitate the management of plant and pest names in computerized databases, as well as data exchange between IT systems (Griessinger and Roy, 2015; EPPO, 2019).

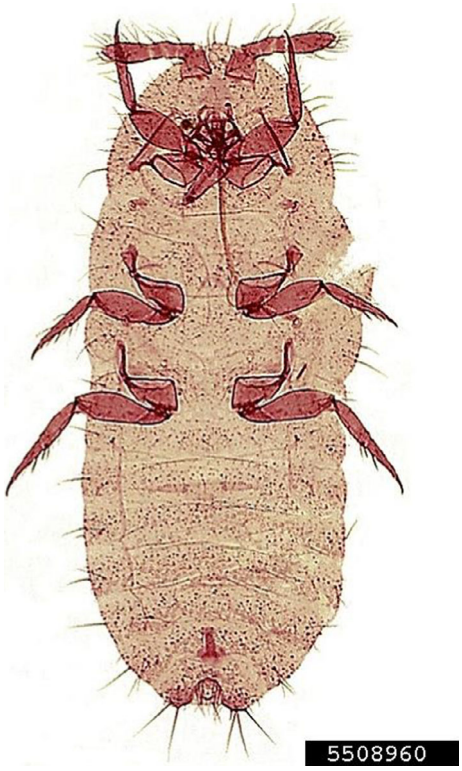


Figure 1: *Ripersiella hibisci* female ventral view (Alessandra Rung, Scale Insects, USDA APHIS PPQ, Bugwood.org). (Adult length varies from 1.2 to 2.4 mm)

3.1.2. Biology of the pest

As suggested by the generic common name, the root mealybug *R. hibisci* mostly lives in the soil where adult females and nymphs feed on the roots of host plants (Williams, 1998; Mani and Shivaraju, 2016a). *R. hibisci* reproduces sexually and parthenogenetically (Malumphy and Robinson, 2004). Eggs are laid in white waxy ovisacs. Each ovisac can contain up to approximately 80 eggs, but the number varies with the host fed upon by the female; Jansen (2001) reports ovisacs containing from 11 to 84 eggs, according to host. After hatching, first instar nymphs (crawlers) are mobile and disperse locally by crawling (Mani and Shivaraju, 2016b). In general, mealybug crawlers can live for approximately one day without feeding (Osborne, 2015). When a suitable feeding site is located, they insert their stylets to feed and generally remain anchored to the host. Only the first two of the four or five instars of male nymphs feed. Adult males emerge from a 'pupal' instar with wings but have no functional mouthparts. They live for approximately 1 or 2 days during which they can move to the soil surface to disperse by flight although they are weak flyers. They seek a female to mate with.

Females have three nymphal instars before the adult form (Malumphy and Robinson, 2004). Jansen (2001) reported one generation (egg to adult to egg) taking 61 days on *Serissa* at 21°C and 90 days on less favoured *Nerium* at the same temperature. Eggs took an average of 9 days to hatch. Female nymphs and adults feed on the roots of hosts (Mani and Shivaraju, 2016a). Smith et al. (1997) report that adult females live for about a month. Teneral (virgin) females come to the soil surface to mate.

No information could be found describing the development of *R. hibisci* on hosts in the open or at variable temperatures. This can be explained by recognising that *R. hibisci* is regarded primarily as a pest of potted plants in greenhouses (see Section 3.5). In greenhouses, reproduction takes place throughout the year and populations can grow rapidly under favourable conditions (Mani and Shivaraju, 2016a). Development slows during the winter. All developmental stages can be found at the same time suggesting that there are multiple overlapping generations during the year (Jansen, 2001).

3.1.3. Intraspecific diversity

No intraspecific diversity has been reported for this species.

3.1.4. Detection and identification of the pest

Are detection and identification methods available for the pest?

Yes, *R. hibisci* can be detected during import inspections of contaminated hosts, often potted plants. As a soil-dwelling root feeder, it can be found when infested plants are removed from their containers. Morphological and molecular-based methods are available to identify specimens to the species level.

R. hibisci is primarily a subterranean species. As such it can be difficult to detect. Reduced plant growth, wilting leaves, pale leaves turning yellow or grey, or leaves that become soft and brown are symptoms of infestation (EPPO, 2005a,b).

Consignments of containerised host species from areas where *R. hibisci* occurs should be removed from pots and the roots inspected during import inspections. The creamy-white wax produced by adult females and deposited around the roots, on the soil, or on the inner surface of the plant container is often the first sign of infestation (Mani and Shivaraju, 2016a). Close inspection may reveal white adults and nymphs on the outer surface of infested root-balls,[7] adjacent to the inner surface of the container/pot; the white can stand out against dark soil/growing media. When there are heavy infestations, the roots and soil can appear to be completely white, at first glance this can look like a fungal disease (Jansen, 1995). When there is a heavy infestation, the crawler stage may be seen on the soil surface (EPPO, 2005b).

Kawai and Takagi (1971) provided a detailed description of adult females when they first described *R. hibisci* as a species new to science, placing it in the genus *Rhizoecus*. Tanaka (2016) provided a key to Japanese Rhizoecidae species. Another detailed description of adult females is provided by Williams (1996). Hodgson (2012) provided a detailed description of adult males and a key to adult male *Rhizoecinae*. A comprehensive key for Ripersiella species was developed by Kozár and Konczné Benedicty (2004).

A key to distinguish first, second and third instar nymphs of *Ripersiella* species found during import inspections and in greenhouses in the Netherlands is provided by Jansen and Westenberg (2015). The same authors also provided a key to adult female *Ripersiella* species found during import inspections and in greenhouses in the Netherlands.

Eggs are laid in white, loose, waxy, elongate ovisacs which are about 2 mm long. Ovisacs can contain approximately 80 eggs.

Nymphs are creamy-white and significantly smaller than adults.

Adults are snow white to a bluish-grey, 1.2–2.4 mm, with well-developed legs and no eyes. Adult females are elongate and covered in a powdery creamy-white wax (Mani and Shivaraju, 2016a). The adult males have wings (Hodgson, 2012).

EPPO provides a diagnostic protocol containing the information necessary for *R. hibisci* to be detected and positively identified by an expert using morphological characteristics of a specimen (EPPO, 2005a).

Molecular diagnostic methods, based on the cytochrome c oxidase I sequence, are available to identify *R. hibisci* with a number of accessions in Genbank (Jansen and Westenberg, 2015).

3.2. Pest distribution

3.2.1. Pest distribution outside the EU

R. hibisci was first described from Japan. In Asia, it is known to occur also in China and Taiwan (EPPO, online). Hara et al. (2001) suggest that *R. hibisci* may also occur elsewhere in south-east and east Asia. *R. hibisci* has been introduced into USA (Florida, Hawaii) and the US territory of Puerto Rico (Miller et al., 2002; Miller, 2005) (Figure 2; Table 2).

[7] In reference to potted plants, the root ball is the entire mass of roots as they are removed from the pot. The root ball is the part of the plants' root system which will be transplanted, e.g. into another pot.

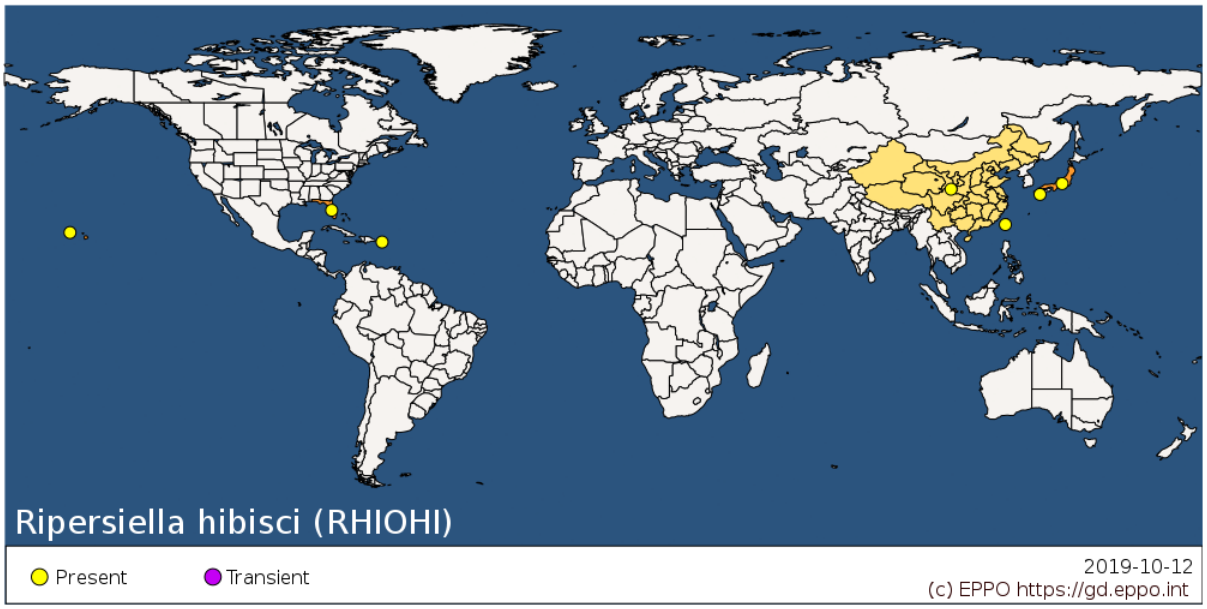


Figure 2: Global distribution of *Ripersiella hibisci* (extracted from the EPPO Global Database accessed 26/3/2020)

Table 2: Current distribution of *Ripersiella hibisci* worldwide (Source: EPPO Global Database, accessed 26/3/2020)

Continent	Country	Subnational, e.g. State	Status
America	Puerto Rico		Present, no details
	United States of America		Present, restricted distribution
		California	Absent, intercepted only
		Florida	Present, no details
		Hawaii	Present, no details
Asia	China		Present, no details
		Xianggang (Hong Kong)	Absent, unreliable record
	Japan		Present, no details
		Honshu	Present, no details
		Kyushu	Present, no details
	Taiwan		Present, no details

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. *R. hibisci* is not known to be present in the EU.

Literature reporting *R. hibisci* in Europe typically refers to interceptions on artificially dwarfed plants (i.e. bonsai/penjing) detected during import inspections or later in greenhouses associated with imported plants, rather than reports of established populations that have spread to other hosts. For example, Mazzeo et al. (2013, 2014) list *R. hibisci* among other mealybug species introduced into Italy since 1945 although the records for *R. hibisci* are interceptions. Similarly, Jansen (1995, 2001, 2003) reports *R. hibisci* as being occasionally detected in glasshouses in the Netherlands. However, under the supervision of the Dutch NPPO, action is taken to either destroy or treat infested plants to eradicate infestations (NPPO of the Netherlands, 2001). In the Netherlands, annual inspections are carried out at places of plant production and the NPPO of the Netherlands declares *R. hibisci* as 'absent: pest eradicated confirmed by survey' (April 2018) (EPPO, online).

EPPO (online) states that *R. hibisci* is not established in Europe.

3.3. Regulatory status

3.3.1. Commission Implementing Regulation 2019/2072

As noted in Section 1.2 (Interpretation of the Terms of Reference) *R. hibisci* is listed in Annex II of Commission Implementing Regulation (EU) 2019/2072, the implementing act of Regulation (EU) 2016/2031 under the synonym *Rhizoecus hibisci*. Details are presented in Table 3.

Table 3: *Ripersiella* (=*Rhizoecus*) *hibisci* in Commission Implementing Regulation 2019/2072

Annex II	List of Union quarantine pests and their respective codes
Part A	Pests not known to occur in the Union territory
	Quarantine Pests and their codes assigned by EPPO
C	Insects and mites
59.	*Rhizoecus hibisci* Kawai and Takagi [RHIOHI]

3.3.2. Legislation addressing the hosts of *Ripersiella hibisci*

R. hibisci is a polyphagous pest. No specific measures on plants or plant products are targeted exclusively against the pest in Commission Implementing Regulation 2019/2072. However, as an organism that spends much of its life in the soil, the general prohibition of soil from third countries is of particular relevance as a measure reducing the likelihood of its introduction (see Section 3.4.2 Entry).

3.3.3. Legislation addressing the organisms vectored by *Ripersiella hibisci* (Commission Implementing Regulation 2019/2072)

R. hibisci is not known to vector any plant pathogenic organisms.

3.3.4. Legislation addressing the organisms that vector *Ripersiella hibisci* (Commission Implementing Regulation 2019/2072)

R. hibisci is a free-living organism that does not require a vector.

3.4. Entry, establishment and spread in the EU

3.4.1. Host range

R. hibisci is a polyphagous species recorded feeding on cultivated monocotyledonous and dicotyledonous plants. The wild native hosts are not reported in literature (CABI, 2019). Kawai and Takagi (1971) first described *R. hibisci* from the roots of cultivated potted plants in greenhouses in the western outskirts of *Tokyo*. The literature mainly refers to potted plants as hosts, especially artificially dwarfed plants such as *Serissa foetida*. Other hosts reported as main or major hosts by CABI (2019) or EPPO online are the following genera: *Dieffenbachia* (Araceae), *Phoenix* (Palmae), *Nerium* (Apocynaceae), *Rhododendron* (Ericaceae), *Pelargonium* (Geraniaceae), *Cuphea* (Lythraceae), *Hibiscus* (Malvaceae), *Ficus* (Moraceae), *Ligustrum* (Oleaceae), *Punica* (Punicaceae), *Calathea* (Ranunculaceae), *Camellia* (Theaceae), *Ulmus* and *Zelkova* (Ulmaceae). Plants grown in pots, which may result in them being stressed, may be more vulnerable to *R. hibisci* (Mazzeo et al., 2013). Appendix A provides a more comprehensive list of reported hosts.

3.4.2. Entry

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

Yes, *R. hibisci* has been intercepted in the EU on several occasions. Plants for planting provide a pathway.

As a soil-dwelling organism feeding on a range of species, the international trade of potted plants has transported *R. hibisci* from its native countries in Asia. It was first found outside of its native range at a plant nursery in Florida in 1978 on ornamental *Cryptanthus* (Bromeliaceae) from Japan, perhaps entering the USA via Puerto Rico (Anon, 1979; Frank and McCoy, 1992). Table 4 identifies the main pathway and life stages associated with the pathway.

Table 4: Potential pathways for *Ripersiella hibisci* and existing mitigations

Pathways	Life stage	Relevant mitigations [e.g. prohibitions (Annex VI) or special requirements (Annex VII) within Implementing Regulation 2019/2072]
Plants for planting with growing media	Eggs, nymphs, adults (on roots, and in growing media)	The growing medium attached to or associated with plants, intended to sustain the vitality of the plants, are regulated in Article VII of Regulation 2019/2072 (point 1.)

R. hibisci was included as a pest of concern to USDA within qualitative commodity risk assessments for the import of artificially dwarfed *Ehretia microphylla* (Boraginaceae) and *Buxus sinica* (Buxaceae) (Cave and Redlin, 1996a,b). *R. hibisci* has been intercepted in California on potted plants from Florida where it is established (Miller et al., 2002; Leathers, 2016).

Further evidence that *R. hibisci* is moving with plants internationally comes from an EPPO survey on the use of diagnostic protocols (Petter and Suffert, 2010). Diagnostic laboratories in the EPPO region were asked to indicate the number of samples that they tested during 2007 and which test they used. Forty-four laboratories from 20 EPPO countries responded. A diagnostic test for *R. hibisci* was used up to 100 times during 2007 (cf. > 5,000 times for *Thrips palmi*).

There have been interceptions of *R. hibisci* in Europe as reported in the literature, e.g. in Italy by Pellizzari and Dalla Montà (1997), in the Netherlands by Jansen (2001), and in the UK by Malumphy and Robinson (2004). A search of Europhyt interceptions up to 30 March 2020 indicate 49 reports of *R. hibisci* (Figure 3). All interceptions were on plants for planting from China. Of the interceptions of *R. hibisci* in the Europhyt database 39 were notifications from the NL and 10 were from the UK. One interception notified by the UK was on plants from the NL; we assume that the infested plants had originated in China and had passed through EU border inspections undetected before being intercepted in the UK.

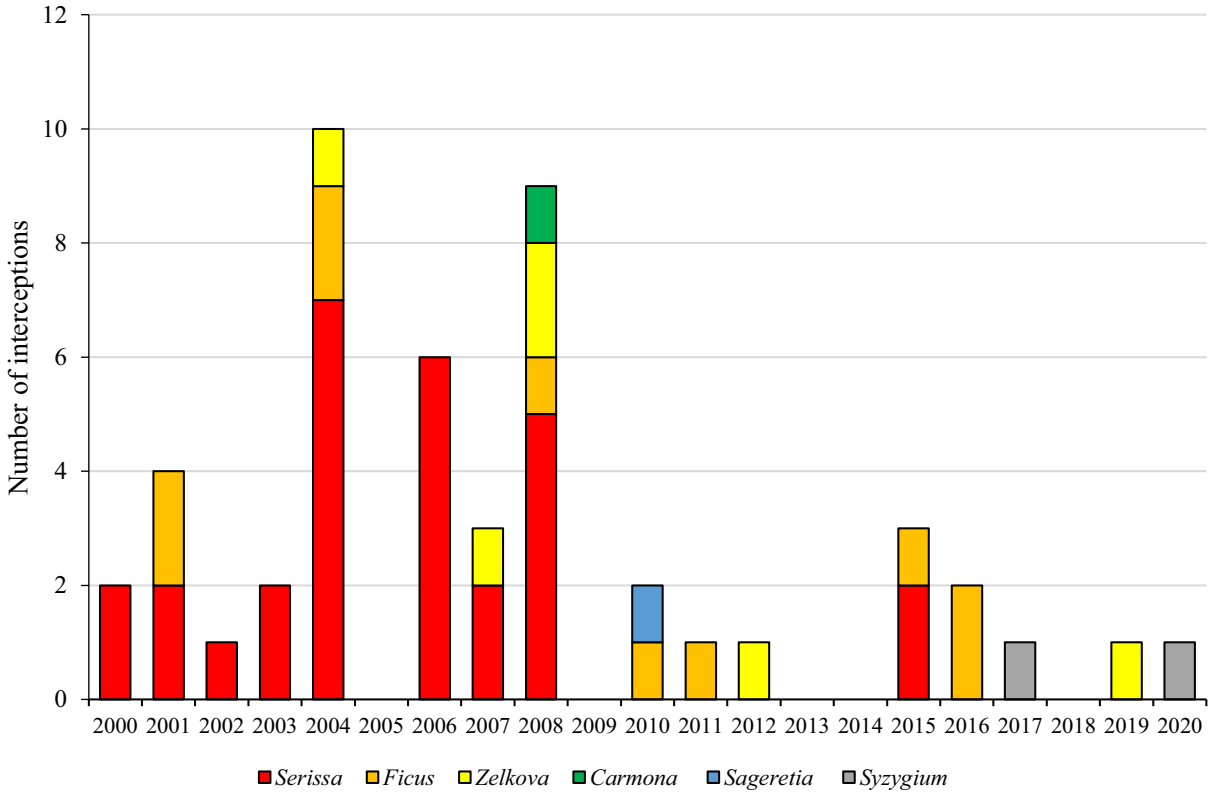


Figure 3: Number of interceptions of *Ripersiella hibisci* per year by host genus (Source: Europhyt, searched on 30 March 2020)

Figure 3 indicates that the majority of interceptions occurred over 10 years ago. However, there are limits as to the interpretation of such data. This is because the number of consignments imported into the EU potentially carrying *R. hibisci* and the total number of consignments examined is not centrally

compiled or linked with interception data, preventing a more meaningful analysis that could explain the reduction in interceptions in recent years. Reports of interception should therefore be interpreted with caution (MacLeod, 2015). Recording inspection and sampling efforts with the number of consignments entering the EU could provide information that would significantly help the interpretation of interception data. Moreover, it would better inform risk reduction decision-making and would allow the efficacy of the risk reduction options affecting entry to be measured (MacLeod et al., 2005; MacLeod, 2015).

3.4.3. Establishment

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

Yes, *R. hibisci* has been reported from greenhouses in the EU in the past. Hosts are widely available and environmental conditions are suitable for its establishment. Reproduction by parthenogenesis facilitates the introduction of the pest even with low numbers of females.

3.4.3.1. EU distribution of main host plants

No data showing the area of EU greenhouse ornamental potted plant production could be found. The most recent data for the area of EU flower and ornamental plant production under greenhouse is from 2013, such data was not reported annually (Table 5). More recent data on the area of EU flowers and ornamental plant production to 2018 is available in Eurostat (Crop production in EU standard humidity, crop code N0000: Flowers and ornamental plants (excluding nurseries)). For the years 2005–2013, it appears approximately one-third of EU flower and ornamental plant production was under glass (Table 5). Assuming the same proportion of ornamental production continues to be produced under greenhouse, we estimate that approximately 25,000 ha of flowers and ornamental plants were produced in 2018 (Table 5). Figures appearing in Table 5 within brackets are estimates.

Table 5: EU 28 area of flowers and ornamental plant production (ha). Production under greenhouse 2015–2018 has been estimated

Year	2005	2007	2010	2013	2015	2016	2017	2018
Flowers and ornamental plants under greenhouse(1)	23,080	22,610	22,490	21,810	(26,140)	(27,800)	(25,840)	(25,900)
Flowers and ornamental plants(2)	65,900	72,540	73,200	72,070	82,210	87,430	81,250	81,460
% greenhouse production	35.0	31.2	30.7	30.3	(32)	(32)	(32)	(32)

Sources: (1): Eurostat [ef_alflower] Eurofarm indicator code B_1_8_2HA.
(2): Eurostat [apro_cpsh1] Crop production in EU standard humidity, Crop code N0000.

The data shown in Table 5 includes cut flower production as well as potted plant production in greenhouses. As such the data are an overestimate of the ornamental greenhouse area containing potted plants where *R. hibisci* could establish in the EU. The Netherlands has the largest area of such production of any single EU MS (approximately 22% of EU total in 2013). Appendix B provides the area of flower and ornamental plant production under greenhouse for individual EU MS up to 2013.

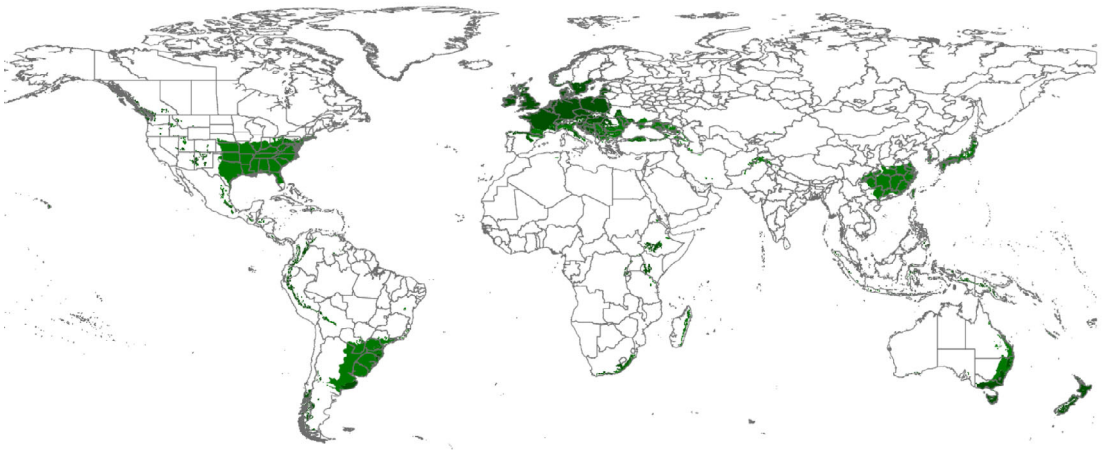
3.4.3.2. Climatic conditions affecting establishment

We assume that environmental conditions in greenhouse potted plant production sites where *R. hibisci* occurs are similar to greenhouse potted plant production systems in the EU. Findings of *R. hibisci* in Dutch glasshouses support such an assumption.[8]

Although regarded as a pest under greenhouse conditions, *R. hibisci* must survive outdoors in its native area. We therefore considered environmental conditions (climate types) in countries where *R. hibisci* occurs.

The global Köppen–Geiger climate zones (Kottek et al., 2006) describe terrestrial climate in terms of average minimum winter temperatures and summer maxima, amount of precipitation and seasonality (rainfall pattern). Climatic zones Cfa and Cfb occupy large areas in Japan and China, countries where *R. hibisci* occurs. Such climate types also occur in the EU (Figure 4).

[8] *R. hibisci* was eradicated from Dutch glasshouses (see Section 3.2.2).



Key	Climate category	Descriptions
	Cfa	Temperate, uniform precipitation through year; Humid sub-tropical, Mild, no dry season, hot summer
	Cfb	Temperate, uniform precipitation through year, Temperate oceanic; Mild, no dry season, warm summer

Figure 4: World distribution of Köppen–Geiger climate zones in countries where *Ripersiella hibisci* occurs and which also occur in the EU (Map from MacLeod and Korycinska, 2019)

In China, artificially dwarfed plants (penjing) are produced in nurseries in the vicinity of the cities Guangzhou, Hangzhou, Nanking and Shanghai. The majority (> 80%) of production is based in Guangzhou (Bartlett, 1995). The provinces in which production of penjing occurs predominantly have a Köppen–Geiger climate classification of Cfa (Table 6), which is also found in Europe Figure 4) (MacLeod and Korycinska, 2019).

Table 6: Köppen–Geiger climate classifications in penjing producing provinces in china

City	Province	Approximate % area of Köppen–Geiger climate type in province
Guangzhou	Guangdong	55% Cfa, 45% Cwa
Hangzhou	Zhejiang	100% Cfa
Nanking	Jiangsu	100% Cfa
Shanghai	Shanghai	100% Cfa

3.4.4. Spread

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

Yes. R. *hibisci* is a free-living organism with the capacity for natural spread, but only slowly and to a limited extent. Only crawlers (first instar nymphs) and adult males are mobile. Long-distance spread within the EU would need to be facilitated by the human movement of infested hosts.

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

Yes. Long-distance and international spread are attributed to the trade in plants for planting, specifically ornamental potted plants and artificially dwarfed plants in particular.

Under moist conditions, first instar nymphs are active. They can crawl short distances to adjacent plants and may spread from pot to pot exiting via drainage holes, crawling over the substrate and into an adjacent pot entering it via drainage holes. They can also spread by being carried in irrigation water (Hara et al., 2001). Re-use of infested pots that have not been cleaned thoroughly and re-use of contaminated growing media can also facilitate spread. Root mealybug nymphs can also move into greenhouses from host plants outside near a greenhouse (Hara et al., 2001; Matthew and Mani, 2016). Slow-growing potted plants are susceptible to infestation by root mealybugs such as *R. hibisci*

because they are kept in nurseries for long periods while they grow to a marketable size. Hence they have a greater exposure time in infested areas (Matthew and Mani, 2016).

R. hibisci was discovered in Hawaii in the early 1990s (Beardsley, 1995; Hara et al., 2001; Kumashiro et al., 2001) and spread within Hawaii to the state's major potted plant production areas.

3.5. Impacts

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

Yes. The introduction of *R. hibisci* into EU greenhouse ornamental potted plant production could reduce the quality and quantity of plants produced resulting in economic impact.

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?[9]

Yes. If *R. hibisci* were present in plants for planting, an economic impact on their intended use would be expected.

R. hibisci feeds on the roots of hosts reducing nutrient and water uptake. Damage to the roots retards plant growth and may cause leaves to wilt or discolour, flowers might not be produced and heavily infested plants can die (Jansen, 1995; Hara et al., 2001; EPPO, 2005b; Matthew and Mani, 2016). When Kawai and Takagi (1971) first described *R. hibisci*, they noted that it was a greenhouse-pest and reported it as occasionally causing serious damage to potted ornamental *Cuphea, Hibiscus, Pelargonium* and *Phoenix.* Since being first described the range in host plants has increased (see Appendix A) although literature still focusses on damage caused to potted ornamental plants growing in greenhouses, e.g. Jansen (1995) reports *R. hibisi* caused serious damage to *Serissa* in a greenhouse in the Netherlands in 1992. Given the lack of reported impacts to plants grown outdoors, there is uncertainty as to whether impacts would occur outdoors in the EU.

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, for example, plants could be sourced from pest free areas (see Section 3.6.1)

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

Yes, hot water treatments and soil insecticides could prevent pest presence on plants for planting.

3.6.1. Identification of additional measures

3.6.1.1. Additional control measures

Although currently regulated and listed in Commission Implementing Regulation 2019/2072 there are no measures exclusively targeting the pest (Section 3.3.2). As a root-feeding pest with limited dispersal ability, additional control measures that would enable its host plants for planting to be sourced from pest free production sites could be considered. Potential additional control measures are listed in Table 7.

[9] See Section 2.1 on what falls outside EFSA's remit.

Table 7: Selected control measures (a full list is available in EFSA PLH Panel, 2018) for pest entry/establishment/spread/impact in relation to currently regulated hosts and pathways on which interceptions occur. Control measures are measures that have a direct effect on pest abundance

Information sheet title (with hyperlink to information sheet if available)	Control measure summary	Risk component (entry/establishment/spread/impact)
Growing plants in isolation	Plants grown in isolation within dedicated pest free greenhouses with good biosecurity to maintain isolation from *R. hibisci* populations outside	Entry/spread
Cleaning and disinfection of facilities, tools and machinery	Pots/containers should be thoroughly cleaned before re-use	Entry/spread
Physical treatments on consignments or during processing	Mechanical cleaning (brushing, washing) to remove soil from roots could be used to reduce the likelihood that eggs, nymphs or adults are transported	Entry
Roguing and pruning	Roguing (removing) and destroying infested plants will prevent spread at a site of production	Entry/Spread
Heat and cold treatments	Hu et al. (1996) report that hot water treatment (dipping roots into water) at 47°C for 23 min ensures 100% mortality of adults, nymphs and eggs. The same degree of mortality is provided in 15 min at 50°C (Hara, 2013)	Entry
Chemical treatments on crops including reproductive material	During efficacy trials of insecticide granules, Hata et al. (1996) reported that imidacloprid significantly reduced the mean number of *R. hibisci* in pots used to grow *Rhapis* palms The keto-enol insecticide spirotetramat, applied as a soil drench, significantly reduced numbers of *R. hibisci* infesting roots of *Pisonia brunoniana* (Nyctaginaceae) during trials in Hawaii (Cabral and Hara, 2015)	Entry/impact

3.6.1.2. Additional supporting measures

Potential additional supporting measures are listed in Table 8.

Table 8: Selected supporting measures (a full list is available in EFSA PLH Panel, 2018) in relation to currently unregulated hosts and pathways. Supporting measures are organisational measures or procedures supporting the choice of appropriate risk reduction options that do not directly affect pest abundance

Information sheet title (with hyperlink to information sheet if available)	Supporting measure summary	Risk component (entry/establishment/spread/impact)
Inspection and trapping	Regular inspections at sites of production prior to export with control measures (see Section 3.6.1.1) applied when *R. hibisci* is found could lead to a production site achieving a pest free status	Entry/spread

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

- As a soil-dwelling organism causing unspecific symptoms on hosts *R. hibisci* is difficult to detect (Hara et al., 2001) unless specifically examining the roots of potted plants.
- Females can reproduce parthenogenetically (Malumphy and Robinson, 2004).

- Populations can grow rapidly under favourable conditions (Mani and Shivaraju, 2016a) However, Mani and Shivaraju (2016a) do not report what is required for favourable conditions, i.e. the host, humidity or temperature regime).

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

R. hibisci does not occur in the EU so does not meet an essential criterion required for RNQP status. Nevertheless, should *R. hibisci* become established in the EU, the bullet points shown in Section 3.6.1.3, which limit the effectiveness of measures to prevent the entry, establishment and spread of the pest, are also relevant for limiting the ability to prevent the presence of the pest on plants for planting.

3.7. Uncertainty

Literature focusses on the damage caused to potted ornamental plants growing in greenhouses. There is uncertainty as to whether impacts would occur in the EU on hosts grown outdoors. However, such uncertainty does not change the conclusion of this pest categorisation.

4. Conclusions

R. hibisci meets the criteria assessed by EFSA for consideration as a potential Union quarantine pest (it is absent from the EU, pathways exist, and its establishment is likely to have an economic impact). The criterion of the pest being present in the EU, which is a prerequisite for RNQP status, is not met. Table 9 provides a summary of the conclusions of each part of this pest categorisation.

Table 9: 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 pests (Section 3.1)	*R. hibisci* (Kawai and Takagi, 1971) is an established and recognised species	*R. hibisci* (Kawai and Takagi, 1971) is an established and recognised species	
Absence/presence of the pest in the EU territory (Section 3.2)	*R. hibisci* is not known to be present in the EU	*R. hibisci* is not known to be present in the EU	
Regulatory status (Section 3.3)	*R. hibisci* is listed in Annex II of Commission Implementing Regulation (EU) 2019/2072, the implementing act of Regulation (EU) 2016/2031 under the synonym *Rhizoecus hibisci*	*R. hibisci* is listed in Annex II of Commission Implementing Regulation (EU) 2019/2072, the implementing act of Regulation (EU) 2016/2031 under the synonym *Rhizoecus hibisci*. There are no grounds to consider its status could be revoked	
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	*R. hibisci* has spread internationally and has been intercepted in the EU on several occasions. It has been reported (then eradicated) from greenhouses in the EU in the past. Hosts are widely available and environmental conditions are suitable for its establishment	*R. hibisci* has been intercepted in the EU on several occasions; always on plants for planting and most frequently of ornamental artificially dwarfed plants (bonsai/penjing)	

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
Potential for consequences in the EU territory (Section 3.5)	The introduction of *R. hibisci* into EU greenhouse ornamental potted plant production could reduce the quality and quantity of plants produced resulting in economic impact	The presence of *R. hibisci* on plants for planting could have an economic impact due to the damage caused by the root-feeding pest	
Available measures (Section 3.6)	Measures are available to prevent entry e.g. plants could be sourced from pest free places of production/pest free areas	Measures are available to prevent the presence of the pest on plants for planting e.g. hot water treatment of roots; plants could be sourced from pest free production sites	
Conclusion on pest categorisation (Section 4)	*R. hibisci* meets the criteria assessed by EFSA for it to be considered as a potential Union quarantine pest	*R. hibisci* does not meet all the criteria assessed by EFSA for it to be considered a potential Union regulated non-quarantine pest. The criterion of the pest being present in the EU, a prerequisite for RNQP status, is not met	
Aspects of assessment to focus on/ scenarios to address in future if appropriate			

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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)
Greenhouse	A walk-in, static, closed place of crop production with a usually translucent outer shell, which allows controlled exchange of material and energy with the surroundings and prevents release of plant protection products (PPPs) into the environment
Impact (of a pest)	The impact of the pest on the crop output and quality and on the environment in the occupied spatial units
Introduction (of a pest)	The entry of a pest resulting in its establishment (FAO, 2017)

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

Abbreviations

DG SANTÉ	Directorate General for Health and Food Safety
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
PLH	EFSA Panel on Plant Health
PZ	Protected Zone
TFEU	Treaty on the Functioning of the European Union
ToR	Terms of Reference

Appendix A – Host plants

Host plants of *Ripersiella hibisci* and their status as recognized in the EPPO global database (EPPO, online) and the CABI Crop Protection Compendium (CABI, 2019; accessed 26/3/2020)

Class/Family	Plant name	EPPO status	CABI status
Monocotolydonae			
Araceae	*Dieffenbachia*	Minor	Main
	Dieffenbachia maculata	Minor	
Bromeliaceae	*Cryptanthus*	Minor	
Commelinaceae	*Dichorisandra thyrsiflora*	Minor	
Cyperaceae	*Carex*	Minor	
Gramineae/Poaceae	*Cynodon dactylon*	Wild/Weed	
	Hakonechloa macra	Minor	
Palmae	*Areca*	Minor	
	Caryota mitis	Minor	
	Gronophyllum		
	Howea forsteriana	Minor	
	Hydriastele	Minor	
	Phoenix canariensis	Major	
	Phoenix	Minor	
	Phoenix roebelenii	Minor	
	Rhapis	Minor	
	Rhapis excelsa	Minor	
	Ravenea rivularis	Minor	
	Sabal	Minor	
Liliaceae	*Crinum asiaticum*	Minor	
Dicotolydonae			
Apocynaceae	*Nerium oleander*	Minor	Main
Boraganaceae	*Carmona*	–	–
Celtidaceae	*Celtis*	Minor	
Crassulaceae	*Crassula*	Minor	
Ericaceae	*Rhododendron*	Minor	Main
Geraniaceae	*Pelargonium x hortorum*	Major	Main
	Pelargonium	Minor	Main
Lythraceae	*Cuphea hyssopifolia*	Major	
Malvaceae	*Hibiscus rosa-sinensis*	Major	Main
Moraceae	*Ficus*	Minor	Main
Myrtaceae	*Syzygium*	–	–
Nyctaginaceae	*Pisonia brunoniana*	–	–
Oleaceae	*Ligustrum ovalifolium*	Minor	Main
Punicaceae	*Punica granatum*	Minor	Main
Ranunculaceae	*Calathea*	Minor	Main
Rhamnaceae	*Sageretia thea*	Minor	
Rubiaceae	*Serissa foetida*	Major	Main
	Serissa	Minor	
Theaceae	*Camellia sinensis*	Minor	Main
Ulmaceae	*Ulmus*	Minor	
	Ulmus parvifolia	Minor	Main
	Zelkova	Minor	
	Zelkova serrata	Minor	Main

Appendix B – Area of EU Member State production of flowers and ornamental plants under greenhouse

Area of flowers and ornamental plants under greenhouse (ha)
Source: Eurostat [ef_alflower] https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do Eurofarm indicator code B_1_8_2HA Accessed 9th May 2020

EU MS \ Year:	2005	2007	2010	2013
Netherlands	5,620	5,330	4,770	4,400
Italy	4,890	4,110	5,440	5,300
Spain	2,390	2,570	2,620	3,180
France	2,410	2,320	2,330	1,830
Germany	2,400	2,500	2,060	1,830
Poland	1,310	1,430	1,580	1,330
Portugal	660	710	610	1,010
Belgium	680	640	600	410
Denmark	330	330	320	270
Greece	250	490	270	220
Hungary	350	230	280	220
Romania	140	290	190	350
Austria	110	200	240	210
Finland	170	160	150	130
Sweden	130	50	100	150
Czechia	110	100	0	:
Cyprus	90	90	60	40
Croatia	:	30	60	60
Bulgaria	50	60	40	30
Ireland	0	0	30	140
Lithuania	60	50	10	40
Slovakia	60	40	40	20
Slovenia	20	40	50	30
Estonia	10	10	10	10
Latvia	20	10	10	0
Malta	10	0	10	10
Luxembourg	0	10	0	0
EU 27 Sum	22,270	21,800	21,880	21,220
United Kingdom	810	810	610	590
EU 28 Sum	23,080	22,610	22,490	21,810

: data not available.
An unknown proportion of the area will be ornamental potted plant production, likely to contain hosts and with suitable environmental conditions for *R. hibisci* establishment.

Appendix C – Area of EU Member State production of flowers and ornamental plants (excluding nurseries)

Crop production in EU standard humidity, crop code N0000: Flowers and ornamental plants. Eurostat [apro_cpsh1] Accessed 9th May 2020

EU MS\Year:	2009	2013	2015	2016	2017	2018
Netherlands	27,400	26,200	27,640	32,630	33,380	34,430
France	8,800	9,010	8,830	8,880	8,970	8,840
Italy	:	:	8,850	8,780	:	:
Germany	6,200	7,700	7,500	7,300	6,900	6,900
Spain	4,200	6,980	6,300	6,440	6,230	6,220
Belgium	900	5,240	5,350	5,280	5,390	5,380
Poland	2,600	3,400	3,500	4,900	5,450	5,700
Portugal	2,400	3,860	3,590	3,450	3,450	3,450
Hungary	900	540	580	540	530	680
Denmark	1,800	270	270	300	400	300
Greece	420	410	420	420	430	440
Czechia	1,110	340	320	280	210	240
Romania	220	450	420	520	310	310
Austria	200	410	350	350	350	350
Croatia	300	300	300	300	320	300
Sweden	500	150	180	180	180	180
Slovakia	200	180	180	140	140	140
Ireland	60	150	170	180	200	200
Cyprus	180	150	160	130	90	90
Lithuania	100	100	120	150	150	150
Slovenia	200	100	50	90	:	:
Latvia	0	100	100	100	100	100
Malta	30	30	30	40	40	40
Estonia	0	:	0	40	20	10
Luxembourg	0	0	0	10	10	10
Bulgaria	:	0	:	:	:	0
Finland	:	:	0	0	0	0
United Kingdom	5,000	6,000	7,000	6,000	8,000	7,000

: data not available.
An unknown proportion of the area will be ornamental potted plant production, likely to contain hosts and with suitable environmental conditions for *R. hibisci* establishment.