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Pest categorisation of *Naupactus leucoloma*

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Abstract

The EFSA Panel on Plant Health performed a pest categorisation of *Naupactus leucoloma* Boheman (Coleoptera: Curculionidae) for the EU territory. *N. leucoloma* is a polyphagous pest reported to feed on 385 plant species; cultivated hosts include alfalfa, beans, brassicas, carrots, clover, onions, peas, potatoes and soft fruits. *N. leucoloma* is native to eastern South America. During the first half of the 20th century, it spreads to Australia, New Zealand, South Africa and the USA. In 2005, it was reported in the Azores where it occurs in the wild. In suitable conditions, *N. leucoloma* can develop from egg to adult in about 12 months with adults emerging during spring and summer. Outside of South America only females are known, they develop and lay eggs without fertilisation. Eggs are usually laid in the soil but can be laid on the stem or lower leaves of hosts. Larval root feeding causes damage to root surfaces leading to stunting and yield or quality losses. Larvae can tunnel inside potato tubers causing significant losses. Pupation takes place in the soil in spring and summer. Larvae and eggs that are laid late in the summer overwinter. Plants for planting and plant products, such as potatoes, provide potential pathways for entry into the EU. The suitable climate and the wide availability of host plants provide conditions to support the establishment of *N. leucoloma* in the EU. *N. leucoloma* is regulated in the EU by Commission Implementing Regulation 2019/2072 (Annex IIA). The import of soil or growing medium, from third countries other than Switzerland, is prohibited in the EU and therefore so far inhibited the entry of *N. leucoloma* larvae and pupae. All criteria assessed by EFSA for consideration either as a potential union quarantine pest or as a potential regulated non-quarantine pest are met.

Keywords: pest risk, plant health, plant pest, quarantine, white-fringed weevil

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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
Palm lethal yellowing mycoplasm
Satsuma dwarf virus
Citrus tristeza virus (non-EU isolates)
Leprosis
Little cherry pathogen (non- EU isolates)
Naturally spreading psorosis
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)
Mycosphaerella larici-leptolepis Ito et al.
Mycosphaerella populorum G. E. Thompson
Phoma andina Turkensteen
Phyllosticta solitaria Ell. and Ev.
Guignardia laricina (Saw.) Yamamoto and Ito
Gymnosporangium spp. (non-EU)
Inonotus weirii (Murril) Kotlaba and Pouzar
Melampsora farlowii (Arthur) Davis
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

Naupactus leucoloma Boheman 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 potential quarantine pest or those of a regulated non-quarantine pest for the area of the EU excluding Ceuta, Melilla and the outermost regions of Member States 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 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[5].

2. Data and methodologies

2.1. Data

2.1.1. Literature search

A literature search on *Naupactus leucoloma* was conducted at the beginning of the categorisation in the ISI Web of Science bibliographic database (31/1/2020), using the scientific name *Naupactus leucoloma* and the synonyms *Graphognathus leucoloma* and *Pantomorus leucoloma* 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.

[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.

2.1.2. Database search

Pest information, on host(s) and distribution, was retrieved from the European and Mediterranean Plant Protection Organization (EPPO) Global Database (EPPO GD, 2020) and relevant publications. The Global Biodiversity Information Facility (GBIF) database (https://www.gbif.org/; Robertson et al., 2014) was used to determine where in the Azores the organism had been recorded.

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 Member States (MS) and the phytosanitary measures taken to eradicate or avoid their spread.

2.2. Methodologies

The Panel performed the pest categorisation for *N. leucoloma*, 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 regulated non-quarantine pest (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 an 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?

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
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?
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. The identity of *Naupactus leucoloma* Boheman is established.

Figure 1: *Naupactus leucoloma* (Copyright: Pest and Diseases Image Library, Bugwood.org)

Naupatus leucoloma Boheman (Figure 1) is an insect in the weevil family (Coleoptera: Curculionidae). Junior synonyms include *Graphognathus leucoloma* Boheman and *Pantomorus leucoloma* Boheman (Lanteri and Marvaldi, 1995; CABI 2019; EPPO GD, 2020). The common name for the species is white-fringed weevil.

The EPPO code[6] (Griessinger and Roy, 2015; EPPO, 2019) for this species is GRAGLE (EPPO GD, 2020).

3.1.2. Biology of the pest

The biology and life history strategy of *N. leucoloma* has been described and summarised by several authors and in various pest fact sheets, e.g. Young et al. (1950), East (1977), Goodyer (1977), Matthiessen (1991), Metcalf and Metcalf (1993), EPPO (1999), Dixon (2008) and CABI (2019). The text below summarises what they report and is supplemented by additional references.

The life cycle of *N. leucoloma* is normally completed in around 12 months. However, where conditions are not so favourable, such as in areas of Western Australia, where there are dry summers and moist winters, development can take 2 years (Matthiessen, 1991). Typically, adult beetles emerge from the soil between late spring and late summer to feed on foliage (Senn and Brady, 1973). In the southern USA, peak emergence is usually in July. Males are known but they are very rare and are only reported from within the native range in South America. Females reproduce parthenogenetically, i.e. an individual develops from an unfertilised egg. Rodriguero et al. (2019) argue that parthenogenesis is a driver for *N. leucoloma* success as an invasive species compared to other *Naupactus* species that reproduce sexually. Oviposition begins 5–25 days after females emerge. Eggs are laid in the soil in groups of between 10 and 60 at depths of 2–5 mm below the surface and in ground litter beneath plants or on stems and the lower leaves of plants. Egg masses are covered with a sticky secretion

[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 harmonised system to facilitate the management of plant and pest names in computerised databases, as well as data exchange between IT systems (Griessinger and Roy, 2015; EPPO, 2019).

which allows them to stick to host roots and permits them to withstand drought. Egg laying may persist for 3 months.

Ottens and Todd (1979) note how fecundity and life span vary with adult host food. For example, adults feeding on peanuts (*Arachis hypogaea*) laid an average of 1,031 eggs and lived for 167 days; adults feeding on soybean (*Glycine max*) laid an average of 716 eggs and lived for 157 days. Adults feeding on sorghum (*Sorghum bicolor*) produced no eggs and lived 58 days. East (1977) reported adults feeding on lucerne laid an average of 359 eggs per female with adults living an average of 61 days. At 24°C, egg development takes 17.1 days with a developmental threshold of 11.7°C and thermal constant of 208. 7 degree days (Masaki, 1998). In the USA, eggs laid during the summer and early autumn hatch after about 2–4 weeks, but eggs laid in the late autumn or early winter may overwinter and hatch in the spring. Eggs can remain dormant for up to 7 months in dry conditions. Moisture stimulates egg hatch. Once hatched larvae orient towards the roots of host plants in response to specific volatile compounds (Allen, 2015) and feed on roots, tubers and underground stems as well as dead plant material and complete their development in the soil. Larvae are most commonly found within 30 cm of the soil surface although they can be found at depths of up to 75 cm (de Jager et al., 1989). First instar larvae can survive 70 days or more without feeding (Gough and Brown, 1991). Given that larvae are legless and have limited dispersal ability, the ability to persist without feeding may be a survival strategy where first instar larvae remain quiescent until a root grows near. Authors report from 7 to 11 larval instars. Overwintering normally occurs in the larval stage although as noted above, eggs can also overwinter. Larvae form oval chambers in the soil in which they pupate during spring and summer. At 24°C, pupal development takes 15.7 days (Masaru et al., 2002).

In the southern USA, adults emerge from pupae after 2 or 3 weeks, but if the ground is hard and compacted, they can stay in the chambers until the soil is softened by rain. After emergence adults move to the soil surface where they feed on nearby plants. If favoured host plants are nearby, adults can remain close to where they emerge. Up to 200 adults per host plant have been recorded. The elytra of adults are fused and they cannot fly but adults can crawl/walk 0.4–1.2 km during their adult life (Metcalf and Metcalf, 1993). Between 26.5 and 27.6°C adults live for approximately 2–3 weeks; at temperatures between 11.9 and 19.7°C, adults live for approximately 3 months (de Jager et al., 1989).

3.1.3. Intraspecific diversity

N. leucoloma is a recognised species. Rodriguero et al. (2019) identified different parthenogenetic clones of this species in invaded areas outside of its putative area of origin (northern Buenos Aires).

3.1.4. Detection and identification of the pest

Are detection and identification methods available for the pest?

Yes. The adult pest can be detected in the field by visual inspection, often after damage symptoms are seen. Traditional ecological methods can then be used to collect *N. leucoloma*. Morphological keys and molecular methods are available to identify the species.

EPPO (2008) describes the inspection and sampling of *Fragaria* plants for planting with respect to *N. leucoloma*, the regime could also be applied to other host plants for planting.

Symptoms of infestation in fields include leaf damage. Adults feed on the outer margins of leaves and produce characteristic notched edges. Larvae feeding on roots cause surface furrows with rough ridges. Severe larval feeding can cause plants to turn yellow, wilt and die (Young et al., 1950). If larvae are suspected, roots of affected plants can be examined.

If *N. leucoloma* is suspected, conventional ecological sampling methods for soil-dwelling insects, such as taking soil samples, or using suction samplers to collect adults feeding on vegetation, can be used (Southwood, 1978; MacLeod et al., 1994). Where *N. leucoloma* is suspected in a field situation, soil sampling for larvae during late winter months when larvae are relatively large is an appropriate monitoring and sampling system with soil being sifted through soil sieves (Matthiessen and Learmonth, 1993; Dixon, 2008; Learmonth, 2005).

A key to *Naupactus* species from Argentina and neighbouring countries is provided by del Rio and Lanteri (2019). Molecular methods are available to identify *N. leucoloma* (e.g. Lin et al., 2008).

The description of life stages below is based on Young et al. (1950).

Eggs: Oval approximately 0.9 mm long and 0.6 mm wide, laid in clusters of approximately 10–60. Milky-white when first laid, changing to dull light-yellow.

Larvae: Legless, slightly curved, yellowish-white grub with a light brown head up to 13 mm long, 6 mm wide.

Pupa: Creamy white, 10–12 mm long occurring in chambers in soil. Two or three days before adult emergence, the pupa turns brown.

Adult: Approximately 10–13 mm long, 4 mm wide across the abdomen with a short snout, greyish, with a broad longitudinal white stripe along each side of the elytra. The body is densely covered with short pale hairs which are longer on the elytra.

Black and white photographs of life stages are provided in Young et al. (1950). Colour photographs of a larva and an adult are available in Dixon (2008) and the CABI datasheet (CABI, 2019).

3.2. Pest distribution

3.2.1. Pest distribution outside the EU

The genus *Naupactus* is South American and *N. leucoloma* is native to a region east of the Andes in Argentina, southern Brazil and Uruguay (Lanteri et al., 2013). Rodriguero et al. (2019) restrict this area to the north of Buenos Aires province in Argentina. *N. leucoloma* spread from its native area to Chile and Peru, west of the Andes (Guzman et al., 2012). It has also spread more widely from South America. *N. leucoloma* was first recorded in Australia, in New South Wales, in 1932 and has since spread more widely. It spread to Tasmania in the 1980s (McQuillan et al., 2007).

N. leucoloma was first reported in the USA in Florida and Alabama in 1936. It then spreads to Louisiana and Mississippi (Young et al., 1950). State quarantine measures and federal regulations were enacted but *N. leucoloma* continued to spread within the USA and it has spread north as far as Illinois (Voss and Poly, 2002). *N. leucoloma* was introduced to New Zealand in 1944 and it is now in parts of both the North and South Islands (Hardwick and Prestidge, 1994). It was introduced into South Africa in 1950 and has since spread within Cape Province (de Jager et al., 1989). Figure 2 shows the global distribution of *N. leucoloma*; for details of distribution outside the EU see Table 2.

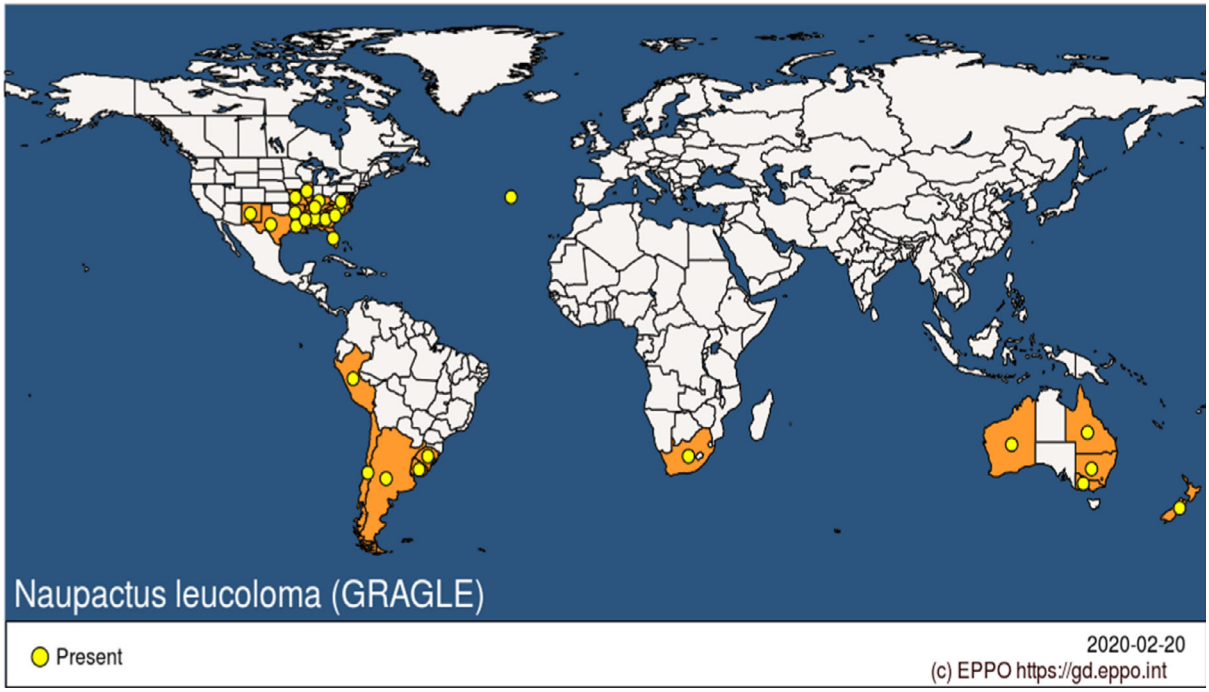


Figure 2: Global distribution map for *Naupactus leucoloma* (extracted from the EPPO Global Database accessed on 20 February 2020)

Table 2: Distribution of *Naupactus leucoloma* outside the EU (Source: EPPO Global database, 2020)

Continent	Country	Subnational area e.g. State	Status
North America	USA		Present, restricted distribution
		Alabama, Georgia, Mississippi	Present, widespread
		Arkansas, Florida, Kentucky, Louisiana, North Carolina, South Carolina, Tennessee, Virginia	Present, restricted distribution
		New Mexico, Texas, Illinois, Missouri	Present, no details
South America	Argentina		Present, widespread
	Brazil	Rio Grande do Sul	Present, no details
	Chile		Present, no details
	Peru		Present, no details
	Uruguay		Present, no details
Africa	South Africa		Present, restricted distribution
Oceania	Australia		Present
		New South Wales, Victoria	Present, widespread
		Queensland, Western Australia	Present, no details
	New Zealand		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?

Yes, *N. leucoloma* is present in the EU. It is not widely distributed. It is known to occur in the Azores (Portugal).

N. leucoloma is present on the islands of Flores and Terceira in the Azores (Portugal) (Borges et al., 2010; EPPO GD, 2020). Indeed, records from GBIF (Robertson et al., 2014) indicate *N. leucoloma* findings in the east of Ilha Terceira around the port of Praia da Vitória in the Azores (accessed 14/3/2020).

3.3. Regulatory status

3.3.1. Commission Implementing Regulation 2019/2072

Naupactus leucoloma is listed in Commission Implementing Regulation 2019/2072. Details are presented in Table 3.

Table 3: ***Naupactus leucoloma* 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.
C.	Insects and mites
42.	*Naupactus leucoloma* Boheman [GRAGLE]

Due to *N. leucoloma* occurring in the Azores (PT), *N. leucoloma* could be transferred from Annex II A (pests not known to occur in the Union territory) to Annex II B (pests known to occur in the Union territory), to indicate that the organism is now recognised as being present in the EU territory.

3.3.2. Legislation addressing the hosts of *Naupactus leucoloma*

No specific measures on plants or plant products are targeted exclusively against the highly polyphagous *N. leucoloma* 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).

3.4. Entry, establishment and spread in the EU

3.4.1. Host range

Naupactus leucoloma is highly polyphagous and much of the literature cites a USDA circular by Young et al. (1950) stating that 'larvae and adults have been observed to feed on 385 species of plants'. However, Young et al. (1950) do not provide a comprehensive list of the 385 plants, but write that in the field 'adults have been found to feed on more than 170 species of plants, including field, garden, and truck crops, weeds, ornamental shrubs and flowers, wild bushes, vines, and trees'. Young et al. (1950) further state that 'in the laboratory adults have fed on 215 species of plants and have deposited fertile eggs when confined on any one of 184 species', again without listing all plants. Young et al. (1950) report that in the field larvae have been observed feeding on 240 species of plants. Appendix A lists the hosts named in the EPPO global database (EPPO GD, 2020) and in the CABI datasheet (CABI, 2019) together with hosts identified in the literature used in preparing this categorisation. Alfalfa, beans, brassicas, carrots, onions, soft fruits, strawberries, peas, potatoes and *Trifolium* spp. are hosts of particular note in Europe. Several of these crops are the main hosts of *N. leucoloma* in its native Argentina. Judging by fecundity and duration of adult survival, *N. leucoloma* shows a preference for legumes over brassicas, grasses and cereals (East, 1977; Ottens and Todd, 1979; Ketchersid and Klingeman, 2007).

3.4.2. Entry

Is the pest able to enter into the EU territory?

Yes, eggs could be carried on roots, stems and lower leaves of hosts; eggs, larvae and pupae could be transported in soil and growing media accompanying plants for planting; soil contaminating root crops could be infested by larvae and the commodity itself could be infested if larvae burrow into roots or tubers. Adults could be carried with cut flowers, foliage and forage.

Naupactus leucoloma is a polyphagous species; eggs are laid in soil by host roots and occasionally on stems and lower leaves. Eggs can remain viable for more than 7 months enabling them to be transported in trade (Chadwick, 1978). Eggs, larvae and pupae occur in the soil, adults feed on foliage. *N. leucoloma* is assumed to have been carried into South Africa with imported fodder (de Jager et al., 1989). Table 4 identifies potential pathways and life stages associated with each pathway.

Table 4: Potential pathways for *Naupactus leucoloma* 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 foliage and with growing media	Eggs, larvae, pupae (on roots, stems and lower leaves and in growing media) Adults (on foliage)	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.) Many hosts are covered by the CN codes listed in Annex VII of Regulation 2019/2072 and require a general freedom from symptoms of quarantine pests
Cut flowers and foliage	Adults (on foliage)	
Plants for planting (excluding seeds) without foliage/dormant, and with growing media	Eggs, larvae, pupae (on roots, stems 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.)
Ware potatoes (*Solanum tuberosum*)	Eggs, larvae (in soil), Larvae (in tubers)	Annex VII (14.) Official statement that the consignment or lot does not contain more than 1% by net weight of soil and growing medium
Animal fodder	Adults	–
Soil & growing media	Eggs, larvae, pupae	Annex VI (19. and 20.) of Regulation 2019/2072 bans the introduction of soil and growing media as such into the Union from third countries other than Switzerland
Soil on machinery	Eggs, larvae, pupae	Annex VII (2.) Official statement that machinery or vehicles are cleaned and free from soil and plant debris

The soil/growing media pathway can be considered as closed because soil can only enter the EU from Switzerland (Annex VI). *N. leucoloma* is not known to occur in Switzerland.

Larvae can burrow into potato tubers (Young et al., 1950) and could therefore be carried with ware potatoes from infested sites. Table 5 shows EU imports of potatoes from countries where *N. leucoloma* is present.

Table 5: EU imports of potatoes from countries where *Naupactus leucoloma* occurs, 2013–2018 (Tonnes)

Source	2013	2014	2015	2016	2017	2018
South Africa	520	–	–	2	–	–
USA	156	–	–	2	78	11
Australia	160	–	–	–	–	–
Peru	25	34	–	10	35	19
New Zealand	45	–	–	–	2	–

Source: Eurostat (EASY COMEXT) trade data, accessed 31/1/2020.

There are no records of interceptions of *N. leucoloma* in the Europhyt database (accessed 31/1/2019). *N. leucoloma* has been intercepted by quarantine officials in Japan (Masaru et al., 2002).

3.4.3. Establishment

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

Yes, *N. leucoloma* is already established in the Azorean islands of Flores and Terceira and could further establish in the EU, hosts are widely available, environmental conditions are suitable. Moreover, parthenogenesis in this species is considered a driver for colonisation of marginal areas (Rodriguero et al., 2019)

3.4.3.1. EU distribution of main host plants

As noted above, *N. leucoloma* is polyphagous and cultivated hosts such as alfalfa, beans, brassicas, carrots, onions, soft fruits, strawberries, peas and potatoes are grown widely over the EU, grown as commercial crops and many in home-gardens (de Rougemont, 1989). Table 6 shows the area of key hosts cultivated in the EU in recent years.

Table 6: Harvested area of some *Naupactus leucoloma* hosts in EU Member States 2015–2019 (thousand ha). Source EUROSTAT (accessed 21/2/2020)

Crop	Code	2015	2016	2017	2018	2019
Potatoes (including seed potatoes)	R1000	1,656.13	1,689.38	1,746.18	1,702.53	1,746.82
Soya	I1130	892.89	832.15	962.39	955.40	:
Field peas	P1100	744.36	913.39	1,025.79	867.24	:
Broad and field beans	P1200	624.30	655.05	688.80	624.02	:
Brassicas	V1000	273.77	273.01	279.90	278.53	:
Onions	V4210	172.94	179.93	180.98	182.21	:
Fresh peas	V5100	165.54	177.53	176.53	180.28	:
Carrots	V4100	112.62	117.43	118.55	119.01	:
Berries (excluding strawberries)	F3000	:	144.83	151.61	155.78	:
Strawberries	S0000	107.57	108.78	108.46	111.74	:
Fresh beans	V5200	93.41	99.17	102.66	98.04	:
Lettuces	V2300	93.95	91.19	91.00	88.33	:
Lucerne/alfalfa	G2100	:	:	:	:	:
Clover and mixtures	G2910	:	:	:	:	:

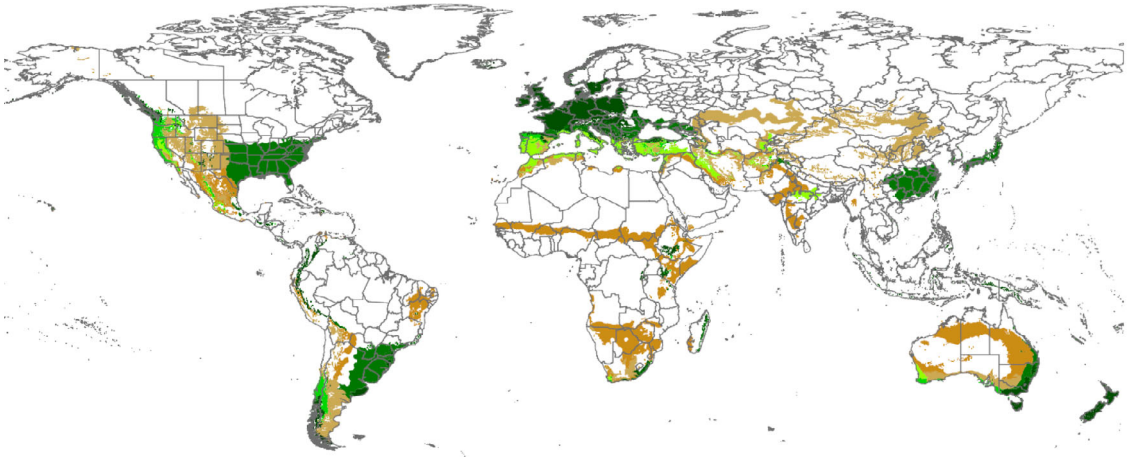
':' data not available.

3.4.3.2. Climatic conditions affecting establishment

Climatic zones in parts of South America, South Africa, Australia, New Zealand and USA where *N. leucoloma* is found are comparable to climatic zones within the EU (Figure 3). 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). *N. leucoloma* occurs in a number of zones such as Cfa, Cfb and Cfc. These climate zones also occur in the EU where many hosts are grown.

Guzman et al. (2012) and Lanteri et al. (2013) included *N. leucoloma* in niche modelling research using MaxEnt which showed that parts of Europe had similar environmental conditions to those in locations where *N. leucoloma* already occurs suggesting Europe could be suitable for establishment. Guzman et al. (2012) reported that annual mean temperature, isothermality and temperature annual range were the most important factors influencing distribution in their model.

N. leucoloma is already present in the Azores (Portugal) (Borges et al., 2010; EPPO GD, 2020). We assume that climatic conditions will not limit the ability of *N. leucoloma* to establish in continental EU.



Key	Climate category	Descriptions
	BSh	Dry, Hot semi-arid steppe, sub-tropical steppe, low-altitude dry
	BSk	Dry, Cold semi-arid steppe, Mid-altitude steppe, dry
	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
	Cfc	Temperate, uniform precipitation through year, Sub-polar oceanic; Mild, no dry season, cool summer
	Csa	Temperate, Dry hot summer; Mediterranean; Mild with dry, hot summer
	Csb	Temperate, Dry, warm summer; Mediterranean; Mild with dry, warm summer

Figure 3: World distribution of Köppen–Geiger climate zones in countries where *Naupactus leucoloma* occurs and which also occur in the EU (Map from MacLeod and Korycinska, 2019)

3.4.4. Spread

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

Yes, as a free-living organism *N. leucoloma* has the capacity for natural dispersal, i.e., it can disperse unaided by human activity. However, natural spread will be slow because adults walk and cannot fly (the elytra are fused). Long distance spread within the EU will be facilitated by the human movement of contaminated commodities.

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

Not for definite. As a highly polyphagous pest, international spread has not so far been attributed to specific plants for planting. However, a wide range of plants for planting could facilitate spread. Long distance spread could also be due to movement of plant products.

The elytra (wing cases) of adults are fused; adults cannot fly and so do not naturally spread rapidly. Nevertheless, they can walk between fields of different crops and their polyphagous nature supports their

dispersal through survival on a range of crops. Eggs on roots and eggs, larvae and pupae in soil together with adults on plant foliage could provide means of spread within the EU. Long distance and international spread to new areas are believed to be usually as larvae in the soil of potted plants, in tubers or as transported adults. Plants for planting could therefore be one of the main means of spread.

3.5. Impacts

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

Yes, the introduction of *N. leucoloma* is likely to have an economic impact in the EU through qualitative and quantitative effects on agricultural production.

RNQPs: Does the presence of the pest on plants for planting have an economic impact, as regards the intended use of those plants for planting?[7]

Yes, should *N. leucoloma* be present in plants for planting, an economic impact on their intended use would be expected.

Although adults feed on leaves the damage they cause is not economically important unless they occur in large numbers (Ottens and Todd, 1980). The soil-dwelling larva is the most damaging stage. Larvae can be present in the soil for 9 months of the year feeding on spring and autumn sown crops (Gross et al., 1972). Larval root feeding causes damage to root surfaces leading to stunting and yield or quality losses of a wide variety of crops and ornamental plants. Larvae can tunnel inside potato tubers causing significant losses.

In Argentina, the main hosts on which damage is reported being alfalfa/lucerne, soybean, strawberry, sweet cherry, onions, potatoes and pepper (Lanteri et al., 2013). Very low population densities of *N. leucoloma* can cause economic damage. A density of only one larva m^{-1} row of potatoes (equivalent to approximately 1 larva 1.5 m^{-2}) resulted in a loss of 9% of average gross return (Learmouth, 1993). In Australia, *N. leucoloma* can be a major pest of potatoes with larvae causing 'devastating damage' to the roots and tubers of crops, unless managed using pre-planting insecticide sprays (Allen, 2015). *N. leucoloma* has had a major impact on potato production since its introduction into northern Tasmania (Allen, 2015).

Populations of white-fringed weevil caused reductions of 25%–45% in dry matter during trials assessing pasture yields in New Zealand, losses were largely due to the damage to white clover (King et al., 1982). Hardwick and Prestidge (1994) showed the nitrogen fixation rate of *Trifolium repens* was reduced by 92% by *N. leucoloma* larval feeding. Larvae hatching from eggs in early or late summer reach sufficient size to damage sweet potato roots before the autumn harvest (Zehnder, 1997).

In South Africa, de Jager et al. (1989) reported larvae feeding on the taproot of lucerne and although they rarely severed roots completely, young plants were often killed whilst older, well-established plants normally survived, but with a significant loss in yield. Ornamental shrubs and trees including young fruit trees and nursery plants can also be seriously damaged by *N. leucoloma*.

In the Azores, *N. leucoloma* occurs in the wild and so far has not been posing problems to agriculture (P.A.V. Borges, Universidade dos Açores, pers comm, 13/2/2020).

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. Although not specifically targeted against *N. leucoloma,* existing phytosanitary measures mitigate the likelihood of its entry within the EU (see also Section 3.6.1).

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

Yes, sourcing plants for planting from pest free areas or pest free places of production would mitigate the risk

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

3.6.1. Identification of additional measures

Phytosanitary measures are currently applied to many *N. leucoloma* hosts although measures in Annex VII of Commission Implementing Regulation 2019/2072 do not specifically refer to *N. leucoloma.* The general prohibition of soil from third countries is of particular relevance as a measure reducing the likelihood of the pests' introduction (see Section 3.4.2 Entry).

3.6.1.1. Additional control measures

Potential additional control measures are listed in Table 7.

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 unregulated hosts and pathways. 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	Host plants could be grown under physical protection in greenhouses or polytunnels	Entry (from third countries), Spread (e.g. from Azores)
Soil treatment	Soil fumigation as described by Matthiessen and Shackleton (2000)	Entry (from third countries), Spread (e.g. from Azores)
Roguing and pruning	Individually infested plants could be rogued but this would be labour intensive and likely not practical	Entry (from third countries), Spread (e.g. from Azores)
Crop rotation, associations and density, weed/volunteer control	Long crop rotations (Metcalf and Metcalf, 1993; Allen, 2015) can lower field populations	Entry (from third countries), Spread (e.g. from Azores)
Chemical treatments on consignments or during processing	Use of chemical fumigants applied to plants or to plant products after harvest, during processing or packaging operations and storage may be effective	Entry
Chemical treatments on crops including reproductive material	Pre-planting soil insecticides are used to manage larvae (Allen, 2015)	Impact
Biological control and behavioural manipulation	Entomopathogenic nematodes marketed to target turf and pasture pests may likely reduce larval populations of *N. leucoloma* (Allen, 2015). The fungi *Metarhizium* and *Beauveria* infect *Naupactus* spp. larvae and can be considered as potential microbial control agents for *Naupactus* spp., but further studies are lacking (Allen, 2015) and non-target effects can be expected since entomopathogenic fungi in the soil are often not very specific	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 tra pping	Visual examination of plants and plant products to determine if pests are present is a basic measure. *N. leucoloma* has been detected during import inspections in Japan (Masaru et al., 2002)	Entry (from third countries), Spread (e.g. from Azores)
Phytosanitary certificate and plant passport	A phytosanitary certificate from third countries where the pest occurs, or a plant passport for host material from the Azores, stating that the plants (inc. plant products) are free from *N. leucoloma* would provide reassurance	Entry (from third countries) Spread (e.g. from Azores)
Surveillance	Conducting specific surveillance to detect incursions early is used to improve likelihood of subsequent eradication efforts	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

- Parthenogenic reproduction (a single female can instigate a new population)
- Eggs can be attached to roots; eggs, larvae and pupae in soil make detection difficult
- Eggs can delay hatching for months
- First instar larvae can survive over 2 months without feeding
- Adults can cling to plants and plant products (Metcalf and Metcalf, 1993).

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

Factors listed in Section 3.6.1.3 are also relevant here.

3.7. Uncertainty

A comprehensive list of host plants was not found in the available literature, so there remains some uncertainties regarding the range of plants that could be impacted were *N. leucoloma* to establish more widely in the EU. This does not, however, affect the conclusions of this pest categorisation.

4. Conclusions

N. leucoloma is a pest of many agricultural and horticultural crops, it survives in conditions which can also be found in the EU. It has a history of national and international spread despite quarantine measures being used against it. *N. leucoloma* satisfies all the criteria that are within the remit of EFSA to assess for it to be regarded as a Union quarantine pest. Given that the organism does occur in the EU and the pathway 'plants for planting' could be a main means of spread, *N. leucoloma* also satisfies the criteria for it to be regarded as a potential regulated non-quarantine pest (Table 9).

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)	The identity of *Naupactus leucoloma* is well established and there are taxonomic keys and molecular methods available for its identification to species level	The identity of *Naupactus leucoloma* is well established and there are taxonomic keys and molecular methods available for its identification to species level	None
Absence/ presence of the pest in the EU territory (Section 3.2)	*N. leucoloma* is present in the EU. It is not widely distributed. It is known to occur in the Azores (PT)	*N. leucoloma* is present in the EU. It is not widely distributed. It is known to occur in the Azores (PT)	None
Regulatory status (Section 3.3)	*Naupactus leucoloma* is listed as a quarantine pest in Annex II A of Commission Implementing Regulation 2019/2072 There is no reason to think that its regulatory status should be revoked in the near future (although it could be moved from Annex II A to Annex II B, to indicate that it is recognised as being present in the EU)	*Naupactus leucoloma* is listed as a quarantine pest in Annex II A of Commission Implementing Regulation 2019/2072 There are no grounds to consider its status as a quarantine pest should be revoked in the near future (although it could be moved from Annex II A to Annex II B, to indicate that it is recognised as being present in the EU)	None
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	*N. leucoloma* could enter into, become established in, and spread within, the EU territory The pathways are: • Plants for planting (excluding seeds) • Plant products (e.g. vegetables and ornamentals)	Spread is not known to be mainly only via specific plants for planting; spread can also occur via movement of plant products Adults cannot fly but walk. Natural spread is therefore not considered a main mechanism for long distance dispersal. Instead human assisted transport via plants for planting and plant products (e.g. root vegetables) are likely the main means of spread	Whether plants for planting is the dominant, hence major, pathway for spread is unknown
Potential for consequences in the EU territory (Section 3.5)	The pests' introduction would most probably have an economic impact in the EU	Should *N. leucoloma* be present on plants for planting, an economic impact on their intended use would be expected	There is no evidence of impacts in the Azores
Available measures (Section 3.6)	There are measures available to prevent the entry into and spread within the EU, e.g. sourcing plants and plant products from pest-free areas (PFA)	There are measures available to prevent pest presence on plants for planting, e.g. sourcing plants from PFA, or pest-free place of production (PFPP)	
Conclusion on pest categorisation (Section 4)	*N. leucoloma* satisfies all the criteria assessed by EFSA PLHP for it to be considered as a potential EU quarantine pest	*N. leucoloma* satisfies all criteria assessed by EFSA PLHP for it to be considered as a potential regulated non-quarantine pest (present in EU, plants for planting may be the main means of spread)	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	Impacts in Azores and the potential for spread from Azores to continental EU could be assessed in future		

References

Allen G, 2015. Improving management of white-fringed weevils in potatoes. Final Report. Tasmanian Institute of Agriculture, Project PT09027. Horticulture Innovation Australia Limited. 62 pp. Available online: https://www.horticulture.com.au/globalassets/laserfiche/assets/project-reports/pt09027/pt09027-final-report-7623.pdf

Borges PAV, Costa A, Cunha R, Gabriel R, Gonçalves V, Frias Martins A, Melo I, Parente M, Raposeiro P, Rodrigues P, Serrão Santos R, Silva L, Vieira P and Vieira V, 2010. Listagem dos organismos terrestres e marinhos dos Açores (A list of the terrestrial and marine biota from the Azores). Available online: http://www.azoresbioportal.angra.uac.pt/files/publicacoes_Listagem_ml.pdf

CABI, 2019. Datasheet report for *Naupactus leucoloma* (whitefringed weevil). CABI Crop Protection Compendium. Last modified 20th November 2019. Available online: https://www.cabi.org/cpc/datasheet/25829 (Accessed: 15 February 2020)

Chadwick CE, 1978. Distribution and food plants of certain Curculionoidea (Coleoptera) with special reference to New South Wales. General and Applied Entomology, 10, 3–38.

Dixon, 2008. *Naupactus leucoloma* factsheet. Featured Creatures. UF/IFAS. Available online: http://entnemdept.ufl.edu/creatures/field/beetles/whitefringed_beetles.htm

East R, 1977. Effects of pasture and forage crop species on longevity, fecundity, and oviposition rate of adult white-fringed weevils *Graphognathus leucoloma* (Boheman). New Zealand Journal of Experimental Agriculture, 5, 177–181.

EFSA PLH Panel (EFSA Panel on Plant Health), Jeger M, Bragard C, Caffier D, Candresse T, Chatzivassiliou E, Dehnen-Schmutz K, Gregoire J-C, Jaques Miret JA, MacLeod A, Navajas Navarro M, Niere B, Parnell S, Potting R, Rafoss T, Rossi V, Urek G, Van Bruggen A, Van Der Werf W, West J, Winter S, Hart A, Schans J, Schrader G, Suffert M, Kertesz V, Kozelska S, Mannino MR, Mosbach-Schulz O, Pautasso M, Stancanelli G, Tramontini S, Vos S and Gilioli G, 2018. Guidance on quantitative pest risk assessment. EFSA Journal 2018;16(8):5350, 86 pp. https://doi.org/10.2903/j.efsa.2018.5350

EPPO, 1999. EPPO data sheets on quarantine pests: *Naupactus leucoloma*. Bulletin OEPP, 29, 483–487. https://doi.org/10.1111/j.1365-2338.1999.tb01423.x

EPPO, 2008. Draft commodity-specific phytosanitary procedure. Consignment inspection of *Fragaria* plants for planting. Bulletin OEPP, 38, 396–406.

EPPO, 2020. EPPO Global Database (GD). Available online: https://gd.eppo.int [Accessed: 9 January 2020]

FAO (Food and Agriculture Organization of the United Nations), 1995. ISPM (International standards for phytosanitary measures) No 4. Requirements for the establishment of pest free areas. Available online: https://www.ippc.int/en/publications/614/

FAO (Food and Agriculture Organization of the United Nations), 2004. ISPM (International Standards for Phytosanitary Measures) 21—Pest risk analysis of regulated non-quarantine pests. FAO, Rome, 30 pp.

FAO (Food and Agriculture Organization of the United Nations), 2013. ISPM (International Standards for Phytosanitary Measures) 11—Pest risk analysis for quarantine pests. FAO, Rome, 36 pp.

FAO (Food and Agriculture Organization of the United Nations), 2017. ISPM (International standards for phytosanitary measures) No 5. Glossary of phytosanitary terms.

Goodyer GJ, 1977. White fringed beetle. Entomology Branch Insect Pest Bulletin, New South Wales. 130 pp.

Gough N and Brown JD, 1991. Development of larvae of the white-fringed weevil, *Graphognathus-leucoloma* (Coleoptera, Curculionidae), in Northern Queensland. Bulletin of Entomological Research, 81, 385–393. https://doi.org/10.1017/s0007485300031941

Griessinger D and Roy AS, 2015. EPPO codes: a brief description. Available online: https://www.eppo.int/media/uploaded_images/RESOURCES/eppo_databases/A4_EPPO_Codes_2018.pdf

Gross HR, Shaw ZA, Mitchell JA and Padgett GR, 1972. Crop damage by larvae of white fringed beetle as related to time of larval introduction into soil. Journal of Economic Entomology, 65, 713–716.

Guzman NV, Lanteri AA and Confalonieri VA, 2012. Colonization ability of two invasive weevils with different reproductive modes. Evolutionary Ecology, 26, 1371–1390.

Hardwick S and Prestidge RA, 1994. Phenology of white-fringed weevil (*Graphognathus-leucoloma*) in pasture in Northern New-Zealand. . In: Popay AJ (ed.). Proceedings of the Forty Seventh New Zealand Plant Protection Conference. pp. 257–260.

de Jager J, Lategan K and van der Westhuizen MC, 1989. Some aspects of the biology of the white-fringed beetle, *Graphognathus leucoloma* (Coleoptera: Curculionidae), in the lower Orange River irrigation area of South Africa. Phytophylactica, 21, 259–263.

Ketchersid DR and Klingeman WE, 2007. Ornamental host plant foliage influences longevity and fecundity of adult white-fringed beetles (Coleoptera: Curculionidae). Journal of Entomological Science, 42, 404–408.

King PD, Meekings JS and Mercer CF, 1982. Effects of whitefringed weevil (*Graphognathus leucoloma*) and black beetle (Heteronychus arator) populations on pasture species. New Zealand Journal of Agricultural Research, 25, 405–414.

Kottek M, Grieser J, Beck C, Rudolf B and Rubel F, 2006. World map of the Koppen-Geiger climate classification updated. Meteorologische Zeitschrift, 15, 259–263.

Lanteri AA and Marvaldi AE, 1995. *Graphognathus* Buchanan a new synonym of *Naupactus* Dejean and systematics of the *N. leucoloma* species group (Coleoptera: Curculionidae). Coleopterists Bulletin, 49, 206–228.

Lanteri AA, Guzman NV, Del Rio MG and Confalonieri VA, 2013. Potential geographic distributions and successful invasions of parthenogenetic broad-nosed weevils (Coleoptera: Curculionidae) Native to South America. Environmental Entomology, 42, 677–687.

Learmouth SE, 1993. Control of white-fringed weevil in potatoes. In Proceedings of the 7th National Potato Research Workshop (ed Fennell J et al.) Devonport (AU).

Learmonth S, 2005. Monitoring and developing management strategies for soil insect pests of potatoes. HAL Project Number PT01008 Final Report, 16 May 2005. Horticulture Australia Ltd, Sydney, 73 pp.

Lin G, Lu S, Huang T, Shih C, Wu W and Chang C, 2008. Molecular identification of weevils significant for customs inspection and quarantine importance. Formosan Entomologist, 28, 43–55.

MacLeod A and Korycinska A, 2019. Detailing Köppen-Geiger climate zones at a country and regional level: a resource for pest risk analysis. EPPO Bulletin, 49, 73–82.

MacLeod A, Wratten SD and Harwood RW, 1994. The efficiency of a new lightweight suction sampler for sampling aphids and their predators in arable land. Annals of Applied Biology, 124, 11–17.

Masaki M, 1998. Notes on the development of eggs of some otiorhynchid weevils. Research Bulletin of the Plant Protection Service, Japan, 34, 47–49 [In Japanese with English abstract].

Masaru S, Masashi K and Tamio S, 2002. Development and reproductive ability of white fringed weevil, *Naupactus leucoloma* (Boheman) (Coleoptera: Curculionidae). Research Bulletin of the Plant Protection Service, Japan, 38, 67–71 [In Japanese with English abstract].

Matthiessen JN, 1991. Population phenology of whitefringed weevil, *Graphognathus leucoloma* (Coleoptera: Curculionidae), in pasture in a Mediterranean-climate region of Australia. Bulletin of Entomological Research, 81, 283–289.

Matthiessen JN and Learmonth SE, 1993. Spatial sampling of insects, plant-parts and insect attacks in the soil of potato crops. Bulletin of Entomological Research, 83, 607–612. https://doi.org/10.1017/s0007485300040037

Matthiessen JN and Shackleton MA, 2000. Advantageous attributes of larval white-fringed weevil, *Naupactus leucoloma* (Coleoptera: Curculionidae) for bioassaying soil fumigants, and responses to pure and plant-derived isothiocyanates. Bulletin of Entomological Research, 90, 349–355.

McQuillan P, Ireson J, Hill L and Young C, 2007. Tasmanian pasture and forage pests. Identification, biology and control. Department of Primary Industries and Water, Tasmania, ISBN: 0–7246–6761 X

Metcalf RL and Metcalf RA, 1993. Destructive and Useful Insects, 5th Edition. McGraw-Hill, London.

Ottens RJ and Todd JW, 1979. Effects of host plant on fecundity, longevity, and oviposition rate of a white-fringed beetle. Annals of the Entomological Society of America, 72, 837–839.

Ottens RJ and Todd JW, 1980. Leaf-area consumption of cotton, peanuts, and soybeans by adult *Graphognathus peregrinus* and *Graphognathus leucoloma* Coleoptera, Curculionidae. Journal of Economic Entomology, 73, 55–57.

del Rio MG and Lanteri AA, 2019. Recognition of species groups of *Naupactus* Dejean (Coleoptera: Curculionidae) from Argentina and neighbouring countries. Peerj, 6, https://doi.org/10.7717/peerj.6196

Robertson T, Döring M, Guralnick R, Bloom D, Wieczorek J, Braak K, Otegui J, Russell L and Desmet P, 2014. The GBIF integrated publishing toolkit: facilitating the efficient publishing of biodiversity data on the internet. PLoS ONE, 9, e102623.

Rodriguero MS, Guzman NV, Lanteri AA and Confalonieri VA, 2019. The effect of reproductive system on invasiveness: lessons from South American weevils. Florida Entomologist, 102, 495–500.

de Rougemont GM, 1989. A Field Guide to the Crops of Britain and Europe. Collins Sons and Co., Ltd., London.

Senn LH Jr and Brady UE, 1973. Circadian rhythm of feeding by adult white-fringed beetles, *Graphognathus* spp. (Coleoptera: Curculionidae). Annals of the Entomological Society of America, 66, 719–722.

Southwood TRE, 1978. Ecological Methods with Particular Reference to the Study of Insect Populations, 2nd Edition. Chapman & Hall, London. 524 pp.

Voss SC and Poly WJ, 2002. First record of whitefringed beetle, *Naupactus leucoloma* Boheman, 1840 (Coleoptera, Cucrulionidae), in Illinois. Transactions of the Illinois State Academy of Science, 95, 141–142.

Young HC, App BA, Gill JB and Hollingsworth HS, 1950. White-fringed beetles and how to combat them. USDA Circular, 850, 1–15.
Zehnder GW, 1997. Population dynamics of white-fringed beetle (Coleoptera: Curculionidae) on sweet potato in Alabama. Environmental Entomology, 26, 727–735.

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
PLH	EFSA Panel on Plant Health
PZ	Protected Zone
RNQP	regulated non-quarantine pest
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)
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 to support 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 plants for *Naupactus leucoloma*

Young et al. (1950) report that *N. leucoloma* feeds on 385 species of plants but does not provide a list. The table below was compiled from hosts named in the EPPO global database (EPPO GD, 2020), the CABI datasheet (CABI, 2019) and from key hosts identified in the literature. The list is not comprehensive.

Family	Host	Common name	Reference
Amaryllidaceae	*Allium cepa*	Onion	Lanteri et al. (2013)
Apiaceae	*Daucus carota*	Carrot	EPPO GD (2020)
Asteraceae	*Chrysanthemum*	Chrysanthemum	Young et al. (1950)
Asteraceae	*Dahlia pinnata*	Dahlia	Young et al. (1950)
Asteraceae	*Lactuca* spp	Lettuce	Lanteri and Marvaldi (1995)
Brassicaceae	*Brassica* spp	Various e.g. broccoli, cabbage	EPPO GD (2020)
Convolvulaceae	*Ipomoea batatas*	Sweet potato	CABI (2019)
Fabaceae	*Arachis hypogaea*	Peanut/groundnut	CABI (2019)
Fabaceae	*Glycine max*	Soybean	CABI (2019)
Fabaceae	*Medicago sativa*	Lucerne/alfalfa	CABI (2019)
Fabaceae	*Mucuna pruriens*	Velvet beans	Dixon (2008)
Fabaceae	*Onobrychis viciifolia*	Sainfoin	East (1977)
Fabaceae	*Phaseolus lunata*	Lima bean	Young et al. (1950)
Fabaceae	*Pisum sativum*	Peas	EPPO GD (2020)
Fabaceae	*Trifolium spp*	Clovers	EPPO GD (2020)
Fabaceae	*Vigna unguiculata*	Cowpea	EPPO GD (2020)
Juglandaceae	*Carya illinoinensis*	Pecan	Dixon (2008)
Liliaceae	*Allium cepa*	Onion	CABI (2019)
Malvaceae	*Abelmoschus esculentus*	Okra	Dixon (2008)
Malvaceae	*Gossypium*	Cotton	Dixon (2008)
Pinaceae	*Pinus spp*	Pines	Dixon (2008)
Poaceae	*Avena sativa*	Oats	East (1977)
Poaceae	*Dactylis glomerata*	Cocksfoot	East (1977)
Poaceae	*Lolium perenne*	Rye grass	East (1977)
Poaceae	*Zea mays*	Maize	EPPO GD (2020)
Rosaceae	*Fragaria x ananassa*	Strawberry	EPPO GD (2020)
Rosaceae	*Prunus avium*	Sweet cherry	Lanteri et al. (2013)
Rosaceae	*Prunus persica*	Peach	Dixon (2008)
Rosaceae	*Rubus* spp	Various e.g. raspberries, blackberries	EPPO GD (2020)
Salicaceae	*Salix* spp	Willow	Dixon (2008)
Solanaceae	*Capsicum annum*	Sweet pepper	Lanteri et al. (2013)
Solanaceae	*Nicotiana tabacum*	Tobacco	Young et al. (1950)
Solanaceae	*Solanum tuberosum*	Potato	EPPO GD (2020)
–	–	Ornamental shrubs	Young et al. (1950)
–	–	Ornamental flowers	Young et al. (1950)