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Pest categorisation of *Arceuthobium* spp. (non-EU)

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Abstract

Following a request from the European Commission, the EFSA Panel on Plant Health performed a pest categorisation of *Arceuthobium* spp. (non-EU), a well-defined and distinguishable group of parasitic plant species of the family Viscaceae, also known as dwarf mistletoes. These are flowering plants parasitising a wide range of conifers of the families Pinaceae and Cupressaceae. *Arceuthobium* species (non-EU) are regulated in Council Directive 2000/29/EC (Annex IAI) as harmful organisms whose introduction into the EU is banned. Many *Arceuthobium* species are recognised, with most dwarf mistletoes native in the New World, and north-western Mexico and the western USA as the centre of diversity for the genus. Only two *Arceuthobium* species are native (and reported to be present) in the EU (*Arceuthobium azoricum* and *Arceuthobium oxycedrum*), which are thus not part of this pest categorisation. Hosts of non-EU dwarf mistletoes include species of the genera *Abies, Cupressus, Juniperus, Larix, Picea, Pinus, Pseudotsuga* and *Tsuga*. Most *Arceuthobium* spp. can parasitise more than one species of conifer host. Dwarf mistletoes could enter the EU via host plants for planting and cut branches, but these pathways are closed. They could establish in the EU, as hosts are widespread and climatic conditions are favourable. They would be able to spread following establishment by human movement of host plants for planting and cut branches, as well as natural spread. Should non-EU dwarf mistletoes be introduced in the EU, impacts can be expected on coniferous woodlands, plantations, ornamental trees and nurseries. The main uncertainties concern (i) the precise distribution and host range of the individual *Arceuthobium* spp. and (ii) the level of susceptibility of conifers native to Europe. For *Arceuthobium* spp. (non-EU) as a group of organisms, the criteria assessed by the Panel for consideration as a potential quarantine pest are met, while, for regulated non-quarantine pests, the criterion on the pest presence in the EU is not met.

Keywords: European Union, forest pathology, mistletoe, parasitism, plant pest, quarantine, tree health

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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 establishes the present European Union plant health regime. The Directive lays down the phytosanitary provisions and the control checks to be carried out at the place of origin on plants and plant products destined for the Union or to be moved within the Union. In the Directive's 2000/29/EC annexes, the list of harmful organisms (pests) whose introduction into or spread within the Union is prohibited, is detailed together with specific requirements for import or internal movement.

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

1.1.2. Terms of Reference

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

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

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

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

Arceuthobium spp. (non-EU), also known as dwarf mistletoes, are 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.

The term 'non-EU' is interpreted to refer to those *Arceuthobium* spp. native only outside of the EU and, if introduced in the EU, with restricted distribution and under official control. Therefore, *Arceuthobium oxycedri*, which is native both in the EU and outside of the EU, is not considered to be non-EU. *Arceuthobium azoricum*, which is native in the Azores (part of the risk assessment area), is also not considered to be non-EU and thus not considered in this pest categorisation.

2. Data and methodologies

2.1. Data

2.1.1. Literature search

A literature search on *Arceuthobium* spp. was conducted at the beginning of the categorisation in the ISI Web of Science bibliographic database, using the scientific name of the pest as search term. Relevant papers were reviewed 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, 2018) and relevant publications.

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

The Europhyt database was consulted for pest-specific notifications on interceptions and outbreaks. Europhyt is a web-based network run by the Directorate General for Health and Food Safety (DG SANTE) 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 *Arceuthobium* spp. (non-EU), following guiding principles and steps presented in the EFSA guidance on the harmonised framework for pest risk assessment (EFSA PLH Panel, 2010) and as defined in the International Standard for Phytosanitary Measures No 11 (FAO, 2013) and No 21 (FAO, 2004).

In accordance with the guidance on a harmonised framework for pest risk assessment in the EU (EFSA PLH Panel, 2010), this work was started 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, in agreement with the EFSA guidance on a harmonised framework for pest risk assessment (EFSA PLH Panel, 2010).

Table 1: Pest categorisation criteria under evaluation, as defined in Regulation (EU) 2016/2031 on protective measures against pests of plants (the number of the relevant sections of the pest categorisation is shown in brackets in the first column)

Criterion of pest categorisation	Criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Criterion in Regulation (EU) 2016/2031 regarding protected zone quarantine pest (articles 32–35)	Criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest
Identity of the pest (Section 3.1)	Is the identity of the pest established, or has it been shown to produce consistent symptoms and to be transmissible?	Is the identity of the pest established, or has it been shown to produce consistent symptoms and to be transmissible?	Is the identity of the pest established, or has it been shown to produce consistent symptoms and to be transmissible?
Absence/ presence of the pest in the EU territory (Section 3.2)	Is the pest present in the EU territory? If present, is the pest widely distributed within the EU? Describe the pest distribution briefly!	Is the pest present in the EU territory? If not, it cannot be a protected zone quarantine organism	Is the pest present in the EU territory? If not, it cannot be a RNQP. (A RNQP must be present in the risk assessment area).

Criterion of pest categorisation	Criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Criterion in Regulation (EU) 2016/2031 regarding protected zone quarantine pest (articles 32–35)	Criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest
Regulatory status (Section 3.3)	If the pest is present in the EU but not widely distributed in the risk assessment area, it should be under official control or expected to be under official control in the near future	The protected zone system aligns with the pest free area system under the International Plant Protection Convention (IPPC). The pest satisfies the IPPC definition of a quarantine pest that is not present in the risk assessment area (i.e. protected zone)	Is the pest regulated as a quarantine pest? If currently regulated as a quarantine pest, are there grounds to consider its status could be revoked?
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Is the pest able to enter into, become established in, and spread within, the EU territory? If yes, briefly list the pathways!	Is the pest able to enter into, become established in, and spread within, the protected zone areas? Is entry by natural spread from EU areas where the pest is present possible?	Is spread mainly via specific plants for planting, rather than via natural spread or via movement of plant products or other objects? Clearly state if plants for planting is the main pathway!
Potential for consequences in the EU territory (Section 3.5)	Would the pests' introduction have an economic or environmental impact on the EU territory?	Would the pests' introduction have an economic or environmental impact on the protected zone areas?	Does the presence of the pest on plants for planting have an economic impact, as regards the intended use of those plants for planting?
Available measures (Section 3.6)	Are there measures available to prevent the entry into, establishment within or spread of the pest within the EU such that the risk becomes mitigated?	Are there measures available to prevent the entry into, establishment within or spread of the pest within the protected zone areas such that the risk becomes mitigated? Is it possible to eradicate the pest in a restricted area within 24 months (or a period longer than 24 months where the biology of the organism so justifies) after the presence of the pest was confirmed in the protected zone?	Are there measures available to prevent pest presence on plants for planting such that the risk becomes mitigated?
Conclusion of pest categorisation (Section 4)	A statement as to whether (1) all criteria assessed by EFSA above for consideration as a potential quarantine pest were met and (2) if not, which one (s) were not met	A statement as to whether (1) all criteria assessed by EFSA above for consideration as potential protected zone quarantine pest were met, and (2) if not, which one(s) were not met	A statement as to whether (1) all criteria assessed by EFSA above for consideration as a potential 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

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 non-EU *Arceuthobium* spp. as a group of species is clear.

Arceuthobium spp. are parasitic plants of the family Viscaceae. They are also known as dwarf mistletoes.

A detailed discussion of the taxonomy of the genus *Arceuthobium* is provided by Hawksworth and Wiens (1996). There is a phylogeny of the known species of *Arceuthobium* differentiating them based on molecular data (Nickrent et al., 2004).

3.1.2. Biology of dwarf mistletoes

The genus *Arceuthobium* is a clearly defined group of small (generally less than 20 cm high), variously coloured (yellow to brown, black or red) flowering plants that are aerial parasites on conifers of the families Pinaceae and Cupressaceae (Nickrent et al., 1994; Hawksworth and Wiens, 1996). *Arceuthobium* spp. are obligate parasites with an endophytic root system ramifying within host branches (Anon, 2017). Dwarf mistletoes rely on their host for support, water and nutrients, including a portion of their required carbon compounds (Shamoun et al., 2003).

A generalised life cycle of *Arceuthobium* spp. starts with explosive seed ejection (up to 14–16 m distance; animals may be involved in long-distance dispersal) from mature dwarf mistletoe fruits (Robinson and Geils, 2006; Hill et al., 2017). Dwarf mistletoes reproduce only from seeds (Hawksworth and Wiens, 1996). After rainfall, the seed coat stickiness makes dwarf mistletoe seeds adhere to host needles, which makes it more likely for germination on host twigs to occur. Once infection is established (twig penetration), the mistletoe develops a system of haustoria. After a period of 2–5 years from infection, initial shoots develop (Hawksworth and Wiens, 1996). Flowering occurs 1–2 years after shoot development (EPPO, 1997).

Most *Arceuthobium* spp. are dioecious and both female and male plants can be produced on the same host tree (Linhart et al., 2003; Hoffman, 2010). Pollination is mediated by insects, but (early in the spring when few insect pollinators are active) dwarf mistletoes can also be wind pollinated (Hill et al., 2017). The time required from pollination to fruit maturity varies considerably (4–19 months) depending on the species (Hawksworth and Wiens, 1996). On the whole, the minimum time from infection to initial seed production averages 6–8 years depending on the *Arceuthobium* species (Hawksworth and Wiens, 1996).

Many different *Arceuthobium* species are recognised (Table 2). The Plantlist (an online working list of all plant species, accessed April 2018) lists 39 accepted species names for the genus *Arceuthobium* (http://www.theplantlist.org/browse/A/Santalaceae/Arceuthobium/), one of which (*Arceuthobium chinensis*) is likely to be a misspelling. Most dwarf mistletoes are native in the New World, with north-western Mexico and the western USA as the centre of diversity for the genus (Shamoun et al., 2003). *Arceuthobium* is the most widespread and species-rich mistletoe in North America (Dwarka et al., 2011). Only two *Arceuthobium* species are native in the EU (*Arceuthobium azoricum* and *Arceuthobium oxycedrum*) (Hawksworth and Wiens, 1976) (Table 2), which are thus not part of this pest categorisation (see Section 1.2).

Table 2: List of currently recognised *Arceuthobium* species (compiled from EPPO (2018), the PlantList (http://www.theplantlist.org/) and the Plants of the World online database, http://powo.science.kew.org/). 'X' in 'EPPO Global Database' column implies presence in that database. '-' in 'Presence in the EU' column implies not known to occur in the EU. '-' in the 'Distribution according to EPPO' column implies no information available.

Accepted species name in the Plantlist	EPPO GD	Presence in the EU	Distribution according to EPPO	Distribution according to Plants of the World Online (Kew)
Arceuthobium abietinum (Engelm.) Abrams	X	-	Mexico, USA	Mexico, USA
Arceuthobium abietis-religiosae Heil	-	-	-	Mexico
Arceuthobium americanum Nutt. ex A.Gray	X	-	Canada, USA	Canada, USA
Arceuthobium apachecum Hawksw. & Wiens	X	-	-	Mexico, USA
Arceuthobium azoricum Wiens & Hawksw.	X	Yes	-	Azores
Arceuthobium bicarinatum Urb.	-	-	-	Dominican Republic, Haiti
Arceuthobium blumeri A.Nelson	X	-	-	Mexico
Arceuthobium californicum Hawksw. & Wiens	X	-	-	USA
Arceuthobium campylopodum Engelm.	X	-	Canada, USA, Mexico	Mexico, USA
Arceuthobium chinense Lecomte	-	-	-	China
Arceuthobium cubense Leiva & Bisse (synonym of *Dendrophthora cupressoides* (Griseb.) Eichler)	-	-	-	Cuba, Haiti
Arceuthobium cyanocarpum (A.Nelson) Abrams	X		-	Mexico, USA
Arceuthobium dacrydii Ridl. (synonym of *Korthalsella dacrydii* (Ridl.) Danser)	-	-	-	Indonesia
Arceuthobium divaricatum Engelm.	X	-	-	Mexico, USA
Arceuthobium douglasii Engelm.	X	-	Canada, USA, Mexico	Mexico, USA
Arceuthobium gillii Hawksw. & Wiens	X	-	-	Mexico, USA
Arceuthobium globosum Hawksw. & Wiens	-	-	-	Mexico
Arceuthobium guatemalense Hawksw. & Wiens	-	-	-	Guatemala, Mexico
Arceuthobium hondurense Hawksw. & Wiens	-	-	-	Honduras
Arceuthobium juniperi-procerae Chiov.	X	-	-	Eritrea, Ethiopia, Kenya
Arceuthobium laricis (Piper) H.St.John (synonym of *Arceuthobium campylopodum* subsp. *laricis* (M.E.Jones) Nickrent)	X	-	Canada, USA	USA
Arceuthobium littorum Hawksw., Wiens & Nickrent	-	-	-	USA
Arceuthobium minutissimum Hook.f.	X	-	Bhutan, India, Pakistan, Nepal	West Himalaya
Arceuthobium monticola Hawksw., Wiens & Nickrent	-	-	-	USA

Accepted species name in the Plantlist	EPPO GD	Presence in the EU	Distribution according to EPPO	Distribution according to Plants of the World Online (Kew)
Arceuthobium occidentale Engelm. ex S.Watson	X	-	USA	California
Arceuthobium oxycedri (DC.) M.Bieb.	X	Yes	Western Mediterranean, Balkans, Black Sea, Caucasus, Central Asia	Europe, Asia-Tropical, Africa and Asia-Temperate
Arceuthobium pendens Hawksw. & Wiens	-	-	-	Mexico
Arceuthobium pini Hawksw. & Wiens	X	-	-	China, Tibet
Arceuthobium pusillum M.Peck	X	-	Canada, USA	USA
Arceuthobium rubrum Hawksw. & Wiens	-	-	-	Mexico
Arceuthobium sichuanense (H.S.Kiu) Hawksw. & Wiens	X	-	-	East Himalaya, Tibet, China South-Central and Qinghai
Arceuthobium siskiyouense Hawksw., Wiens & Nickrent	-	-	-	USA
Arceuthobium strictum Hawksw. & Wiens	-	-	-	Mexico
Arceuthobium tibetense H.X.Kiu & W.Ren	-	-	-	Tibet
Arceuthobium tsugense (Rosend.) G.N.Jones	X	-	Canada, USA	Canada, USA
Arceuthobium vaginatum (Humb. & Bonpl. ex Willd.) J.Presl	X	-	Mexico, USA	Mexico, Honduras
Arceuthobium verticilliflora Engelm.	-	-	-	Mexico
Arceuthobium yecorense Hawksw. & Wiens	-	-	-	Mexico

3.1.3. Intraspecific diversity

A study of the isozymes of 19 North American taxa of *Arceuthobium* showed that the genus has remarkably high levels of genetic diversity, despite the relative morphological homogeneity of dwarf mistletoes (Nickrent, 1986). Subsequent studies have documented the intraspecific genetic diversity (and distinguished races, formae speciales and subspecies) within some individual *Arceuthobium* species, often in association with their different hosts (Jerome and Ford, 2002; Linhart et al., 2003; Nickrent, 2012; Reif et al., 2015; Mathiasen and Kenaley, 2017). An overview of the accepted infraspecific nomenclature of *Arceuthobium* species is available on the Plants of the World online database of the Kew Gardens (http://powo.science.kew.org/).

3.1.4. Detection and identification

Are detection and identification methods available for the pest?

Yes

Early detection of *Arceuthobium* spp. is limited by the difficulty to detect infection during the 2- to 5-year endophyte phase of the parasite. The endophytic root system within the host branch may or may not (depending upon the species) induce host deformations called witches' brooms, which have diagnostic value (Nickrent and García, 2009). However, polymerase chain reaction (PCR) techniques for detecting some *Arceuthobium* spp. in tissues of their hosts have been developed (Marler et al., 1999).

Identification keys to distinguish the different *Arceuthobium* species are available (e.g. Hawksworth and Wiens, 1972, 1996), thus making it possible to separate *Arceuthobium* species native to the EU

(*Arceuthobium azoricum* and *Arceuthobium oxycedri*) from those native only outside of the EU (Hawksworth and Wiens, 1976).

3.2. Distribution of dwarf mistletoes

3.2.1. Distribution of dwarf mistletoes outside the EU

Arceuthobium spp. (non-EU) are present in North and Central America, Africa and Asia (Figure 1; Table 2; EPPO, 2018).

According to the Plants of the World online database, 17 *Arceuthobium* spp. (non-EU) are native in Mexico and 16 spp. in the USA (two of which also in Canada), with 7 of these species reported as native from both countries. Six further *Arceuthobium* spp. (non-EU) are reported as native in Asia, three from Central America and one from Eastern Africa (Table 2). On the whole, 36 *Arceuthobium* spp. (non-EU) are thus currently recognised according to this database (accessed April 2018).

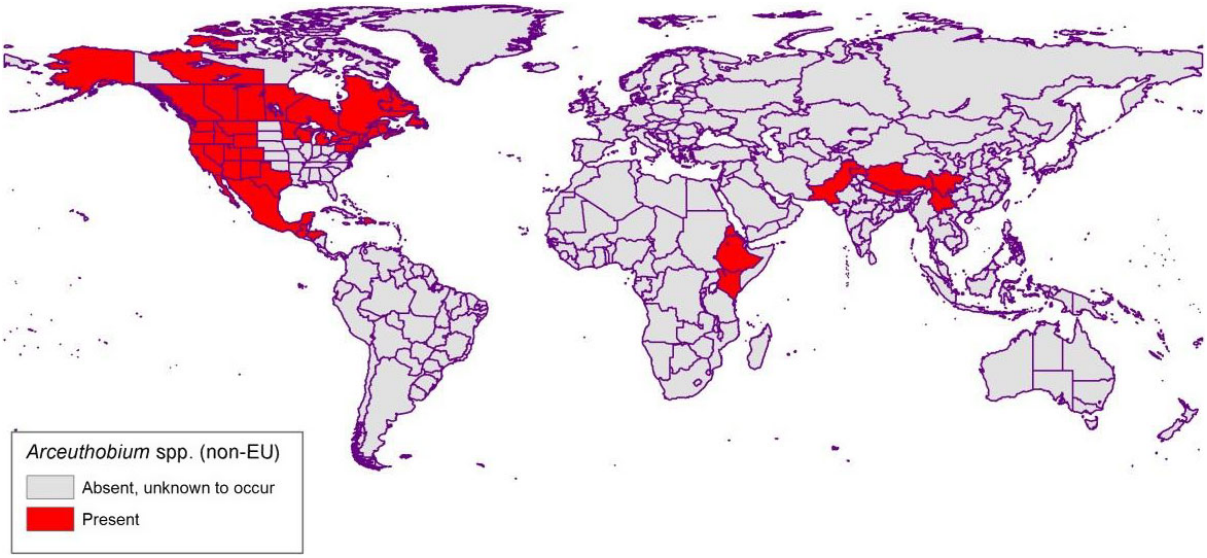

Figure 1: Global distribution map for *Arceuthobium* spp. (non-EU) (based on Table 2)

3.2.2. Distribution of dwarf mistletoes in the EU

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

No, *Arceuthobium* spp. (non-EU) are not reported to be present in the EU.

3.3. Regulatory status

3.3.1. Council Directive 2000/29/EC

Arceuthobium is listed in Council Directive 2000/29/EC. Details are presented in Tables 3 and 4.

Table 3: *Arceuthobium* in Council Directive 2000/29/EC

Annex I, Part A	**Harmful organisms whose introduction into, and spread within, all Member States shall be banned**
Section I	**Harmful organisms not known to occur in any part of the community and relevant for the entire Community**
(e)	Parasitic plants
	Species
1.	*Arceuthobium spp.* (non-European)

3.3.2. Legislation addressing the hosts of *Arceuthobium* spp. (non-EU)

Table 4: Regulated hosts and commodities that may involve *Arceuthobium* spp. (non-EU) in Annexes III, IV and V of Council Directive 2000/29/EC

Annex III, Part A	**Plants, plant products and other objects the introduction of which shall be prohibited in all Member States**	
	Description	Country of origin
	1. Plants of *Abies* Mill., *Cedrus* Trew, *Chamaecyparis* Spach, *Juniperus* L., *Larix* Mill., *Picea* A. Dietr., *Pinus* L., *Pseudotsuga* Carr. and *Tsuga* Carr., other than fruit and seeds	Non-European countries

3.4. Entry, establishment and spread in the EU

3.4.1. Host range

Most *Arceuthobium* spp. can parasitise more than one species of conifer host (Linhart et al., 2003).

Host species of *Arceuthobium* spp. (non-EU) include: *Abies grandis, Abies magnifica, Larix occidentalis, Picea engelmannii, Picea glauca, Picea mariana, Pinus attenuata, Pinus banksiana, Pinus contorta*, *Pinus jeffreyi*, *Pinus ponderosa, Pinus radiata, Pinus sylvestris, Pinus wallichiana, Pseudotsuga menziesii, Tsuga heterophylla* and *Tsuga mertensiana* (EPPO, 2018).

This list of *Arceuthobium* spp. (non-EU) hosts extracted from the EPPO Global Database is likely not complete, as no host species are listed for several *Arceuthobium* species (EPPO, 2018). Among the additional hosts, there are several Central American pine species reported to be hosts of *Arceuthobium aureum: Pinus caribaea, Pinus michoacana, Pinus montezumae, Pinus oaxacana, Pinus oocarpa, Pinus patula* and *Pinus pseudostrobus* (Hawksworth and Wiens, 1977). Similarly, *Arceuthobium rubrum* was reported on *Pinus cooperi, Pinus durangensis, Pinus engelmannii, Pinus herrerai, Pinus lawsonii, P. michoacana, P. oaxacana, P. pseudostrobus* and *Pinus teocote* (Hawksworth and Wiens, 1977).

Further North American host species can be found in Hawksworth and Wiens (1972, 1996) and include: *Abies concolor*, *Juniperus* spp., *Picea pungens*, *Pinus albicaulis*, *Pinus aristata*, *Pinus coulteri*, *Pinus edulis*, *Pinus flexilis, Pinus hartwegii, Pinus lambertiana* and *Pinus muricata.* Queijeiro-Bolaños et al. (2014) report *Cupressus* spp. as a possible host of *Arceuthobium globosum*.

Additional hosts of *Arceuthobium* spp. native to Asia include *Picea crassifolia*, *Picea purpurea* and *Pinus gerardiana* (Chaudhry and Badshah, 1984; Xia et al., 2017).

The introduction into the EU of *Arceuthobium minutissimum* (one dwarf mistletoe from the Himalaya, which affects *Pinus wallichiana*) was assessed to threaten five-needled pines found in Europe (the European *Pinus cembra* and the introduced *Pinus strobus*) (Vannini et al., 1995).

Artificial inoculation of *Arceuthobium* spp. has proven successful for conifers native to Europe such as *Larix decidua, Picea abies* and *Pinus pinea* (Hawksworth and Wiens, 1972). Moreover, *P. abies* was found to be parasitised naturally by *Arceuthobium campylopodum* in the USA (Mathiasen et al., 1998).

In Council Directive 2000/29/EC, the pest is not regulated on a particular host or commodity; its introduction into the EU is banned (Annex IAI).

3.4.2. Entry

Is the pest able to enter into the EU territory?

Yes, dwarf mistletoes could enter the EU on host plants for planting and cut branches.

The main pathways of entry (EPPO, 2018) are coniferous:

- plants for planting (including artificially dwarfed plants)
- and cut branches.

These pathways are closed due to Council Directive 2000/29/EC banning the import from non-European countries of plants, other than fruit and seeds, of *Abies, Juniperus, Larix, Picea, Pinus, Pseudotsuga and Tsuga* (see Section 3.3.2).

Up to March 2018, there were no interceptions of *Arceuthobium* spp. (non-EU) in the Europhyt database.

3.4.3. Establishment

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

Yes, the pest could establish in the EU, as hosts are present and favourable climatic conditions are common.

3.4.3.1. EU distribution of main host plants

Conifer species hosts of *Arceuthobium* spp. (non-EU) (see Section 3.4.1) are common and widespread throughout the EU, from the Mediterranean to Scandinavia and from the Balkans to Scotland (Figure 2). Maps of the European distribution of *Abies* spp., *Larix* spp., *Pinus* spp., *Picea* spp. and *Pseudotsuga menziesii* have been provided in previous pest categorisations of forest fungi (EFSA PLH Panel, 2017, 2018a,b).

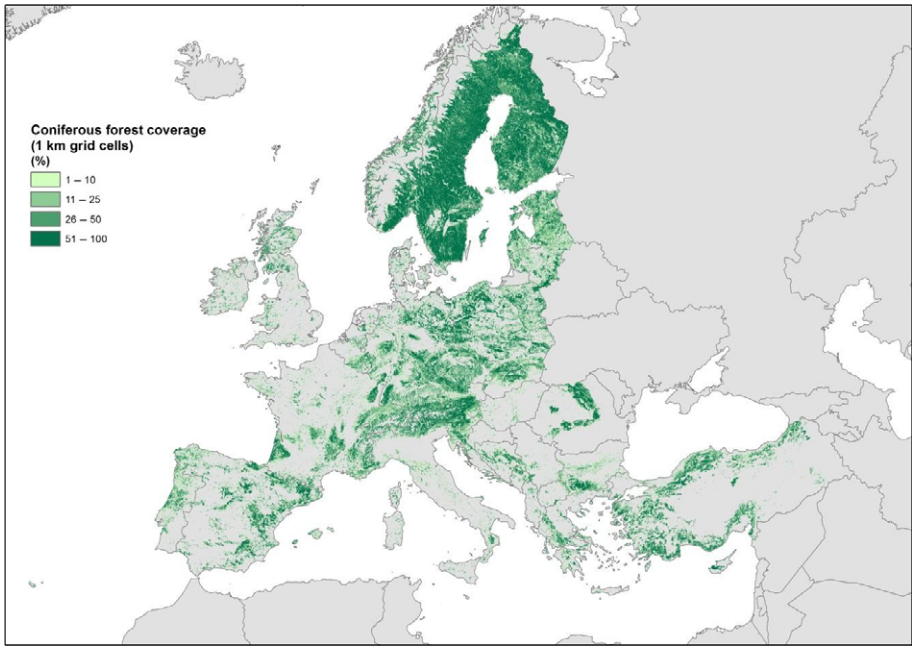

Figure 2: Cover percentage of coniferous forests in Europe (0–100%) at 1 km resolution (source: Corine Land Cover, year 2012, version 18.5, by European Environment Agency)

3.4.3.2. Climatic conditions affecting establishment

The distribution of *Arceuthobium* spp. (non-EU) in their native range covers a wide variety of climates, including those found throughout the EU regions with presence of hosts. Climate is thus assumed not to be a limiting factor for the establishment of dwarf mistletoes in the EU.

3.4.4. Spread

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

Yes, by movement of host plants for planting and cut branches, as well as dispersal of seeds by animals.

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

No, spread is not mainly via plants for planting, as it can also occur by movement of cut branches and by dispersal of seeds by animals.

Arceuthobium spp. disperse by explosive discharge of seeds followed by ballistic flight to a maximum distance of about 14–16 m (Robinson and Geils, 2006; Hill et al., 2017). Dwarf mistletoe seeds, however, normally only travel 2–4 m before sticking to a host twig due to the mucilaginous seed coating (Hawksworth and Wiens, 1996). Dwarf mistletoe seed dispersal has been modelled in a probabilistic and spatially explicit way for each host tree of two simulated open-canopy, treated against the parasite vs. untreated, *Pinus ponderosa* stands (Robinson and Geils, 2006).

Although seeds of *Arceuthobium* spp. are short-lived and are thus not likely to be important as long distance means of spread of dwarf mistletoes (EPPO, 1997), they can be carried externally by animals over medium distances and thus contribute to spread (Hill et al., 2017). Infected host plants have been assessed as the only likely means of international spread of dwarf mistletoes (EPPO, 1997).

3.5. Impacts

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

Yes, the introduction of dwarf mistletoes would have economic and environmental impacts in conifer woodlands, plantations and nurseries.

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?[4]

Yes, the presence of dwarf mistletoes on plants for planting would have an economic impact on their intended use.

Prevalence values of dwarf mistletoes are variable not only among systems, places, and species but also within species in a given area (Queijeiro-Bolaños et al., 2014). Nonetheless, on the whole timber volume losses due to dwarf mistletoe are estimated at 3.8 million m^3 annually in western Canada and 11.3 million m^3 in the western USA (Shamoun et al., 2003). Because of their wide distribution and broad host range, dwarf mistletoes have been claimed to cause more losses to timber production in western North America than any other group of pathogens (Mehl et al., 2013). Dwarf mistletoes have also been reported from nurseries (Hawksworth and Wiens, 1977).

Seedlings and saplings are severely damaged by dwarf mistletoes (Geils and Hawksworth, 2002). Infection of young trees by *Arceuthobium* spp. results in high mortality, while infection of mature trees leads to decreased (i) needle length, (ii) length of needle-bearing branches, (iii) needle surface area, and (iv) total number of needles. This reduction in photosynthetic area, in turn, translates into (i) lower tree growth and fitness, (ii) branch and stem deformations and (iii), in some host-parasite combinations, to increased tree mortality rates (Hawksworth and Wiens, 1996). Moreover, stem infections (Figure 3) also provide entrance points for decay fungi (Hoffman, 2010).

In addition to the provision of deadwood, an important habitat for many forest species, dwarf mistletoes can enhance forest biodiversity by providing food and shelter for animal species (Watson, 2001; Shaw et al., 2004; Hoffman, 2010; Hill et al., 2017). Notwithstanding, witches' brooms caused by dwarf mistletoes are more flammable than normal conifer branches and thus increase fire severity, especially in Douglas fir stands (Hoffman, 2010). Hence, dwarf mistletoes can increase forest ecosystem diversity by indirectly increasing understory light and plant productivity (Hill et al., 2017). Dwarf mistletoes are now recognised as important forest disturbance agents with distinct ecological functions (Geils and Hawksworth, 2002).

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

Should non-EU dwarf mistletoes be introduced into the EU, impacts can be expected to coniferous woodland, plantations, ornamental trees and nurseries.

Figure 3: American dwarf mistletoe (*Arceuthobium americanum*) on lodgepole pine (*Pinus contorta*), Wyoming, USA. Photo by Brytten Steed, USDA Forest Service, Bugwood.org. Available online: https://www.forestryimages.org/browse/detail.cfm?imgnum=2141085

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, 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, production of plants for planting in pest free areas can prevent pest presence on plants for planting.

3.6.1. Identification of additional measures

Phytosanitary measures are currently applied to plants of the various conifer genera hosting dwarf mistletoes (see Section 3.3.2).

3.6.1.1. Control measures

Potential additional control measures are listed in Table 5 (those already included in Council Directive 2000/29/EC are not repeated here).

Table 5: Selected options for control. Control measures are measures that have a direct effect on pest abundance

Nr	Information sheet title	Risk Reduction Option (RRO) summary	Risk component (entry/establishment/ spread/impact)	Link to the document
1.12	Roguing and pruning	Pruning brooms and infected branches can be a management option for ornamental trees (Muir and Geils, 2002)	Impact	https://doi.org/10.5281/zenodo.1181436
1.14	Heat and cold treatments	Prescribed fire can reduce the abundance of dwarf mistletoes, as heavily affected trees are less likely to survive ground fire than less affected trees (Hoffman, 2010)	Impact	https://doi.org/10.5281/zenodo.1181640

3.6.1.2. Supporting measures

Potential supporting measures are listed in Table 6.

Table 6: Selected supporting measures. Supporting measures are organisational measures or procedures supporting the choice of appropriate risk reduction options that do not directly affect pest abundance.

Nr	Information sheet title	Supporting measure summary	Risk component (entry/establishment/ spread/impact)	Link to the document
1.02	Timing of planting and harvesting	Replacing affected stands with regeneration free of dwarf mistletoes has been suggested as control measure (Hoffman, 2010)	Impact	Work in progress, not yet available
1.16	Biological control and behavioural manipulation	The use of hyperparasitic fungi as potential biological control agents of dwarf mistletoes has been investigated (Shamoun et al., 2003)	Impact	Work in progress, not yet available

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

- The abundance of dwarf mistletoes tends to increase more rapidly in low-density stands, and increased incidence following thinning has been reported for several host–mistletoe combinations (Mehl et al., 2013).

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

- Visible shoots of dwarf mistletoes develop only 2 to 5 years after infection (see Section 3.1.2).

3.7. Uncertainty

There is uncertainty on the precise distribution and host range of several non-EU *Arceuthobium* spp. However, no reports of the presence in the EU for *Arceuthobium* spp. that are only native outside of the EU are available and all hosts of dwarf mistletoes are coniferous trees of the families Pinaceae and Cupressaceae.

There is less information on the Asian *Arceuthobium* spp. and their impacts compared to dwarf mistletoes from North America.

Some conifer species native to the EU have been shown to be hosts of dwarf mistletoes based on artificial inoculation, but there is uncertainty about their susceptibility level in the field. However, *P. abies* has been found to be naturally infected by dwarf mistletoes in the USA (see Section 3.4.1).

4. Conclusions

Arceuthobium species (non-EU) meet the criteria assessed by EFSA for consideration as potential quarantine pests (Table 7).

Table 7: The Panel's conclusions on the pest categorisation criteria defined in Regulation (EU) 2016/2031 on protective measures against pests of plants (the number of the relevant sections of the pest categorisation is shown in brackets in the first column)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union regulated non-quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of non-EU *Arceuthobium* spp. as a group of species is clear	The identity of non-EU *Arceuthobium* spp. as a group of species is clear	None
Absence/ presence of the pest in the EU territory (Section 3.2)	*Arceuthobium* spp. (non-EU) are not reported to be present in the EU	*Arceuthobium* spp. (non-EU) are not reported to be present in the EU	None
Regulatory status (Section 3.3)	*Arceuthobium* spp. (non-EU) are regulated by Council Directive 2000/29/EC (Annex IAI) as harmful organisms whose introduction into, and spread within, all Member States shall be banned	*Arceuthobium* spp. (non-EU) are regulated by Council Directive 2000/29/EC (Annex IAI) as harmful organisms whose introduction into, and spread within, all Member States shall be banned	None
Pest potential for entry, establishment and spread in the EU territory (Section 3.4)	Entry: dwarf mistletoes could enter the EU via plants for planting and cut branches of Cupressaceae and Pinaceae Establishment: hosts and favourable climatic conditions are widespread in the risk assessment area Spread: dwarf mistletoes would be able to spread following establishment by movement of plants for planting and cut branches of Cupressaceae and Pinaceae, as well as natural spread	Plants for planting are not the main pathway of spread, given the potential contribution of cut branches and natural spread	There is uncertainty on the precise distribution and host range of several non-EU *Arceuthobium* spp.
Potential for consequences in the EU territory (Section 3.5)	The introduction of non-EU dwarf mistletoes would have economic and environmental impacts in coniferous woodlands, plantations, ornamental trees and nurseries	The introduction of non-EU dwarf mistletoes could have an impact on the intended use of plants for planting	Some conifer species native to the EU have been shown to be hosts of non-EU dwarf mistletoes based on artificial inoculation, but there is uncertainty about their susceptibility level in the field

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
Available measures (Section 3.6)	Import prohibition of host plants for planting is an available measure to reduce the risk of introduction Replacing affected stands with regeneration free of dwarf mistletoes has been suggested as control measure	Production of plants for planting in pest free areas can prevent pest presence on plants for planting	None
Conclusion on pest categorisation (Section 4)	The criteria assessed by the Panel for consideration of *Arceuthobium* spp. (non-EU) as a potential quarantine pest are met	The criterion on the pest presence in the EU is not met	
Aspects of assessment to focus on/ scenarios to address in future if appropriate	The main knowledge gap is the precise distribution and host range of several non-EU *Arceuthobium* spp. However, this uncertainty does not affect the conclusion of the pest categorisation on non-EU *Arceuthobium* spp. as a group of organisms		

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Abbreviations

DG SANTE	Directorate General for Health and Food Safety
EPPO	European and Mediterranean Plant Protection Organization
FAO	Food and Agriculture Organization
IPPC	International Plant Protection Convention
MS	Member State
PCR	polymerase chain reaction
PLH	EFSA Panel on Plant Health
RNQP	Regulated Non-Quarantine Pest
TFEU	Treaty on the Functioning of the European Union
ToR	Terms of Reference