

ADOPTED: 30 March 2023

doi: 10.2903/j.efsa.2023.8001

Pest categorisation of *Neoscytalidium dimidiatum*

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Abstract

The EFSA Plant Health Panel performed a pest categorisation of *Neoscytalidium dimidiatum*, a clearly defined plant pathogenic fungus of the family Botryosphaeriaceae. The pathogen affects a wide range of woody perennial crops and ornamental plants causing symptoms such as leaf spot, shoot blight, branch dieback, canker, pre- and post-harvest fruit rot, gummosis and root rot. The pathogen is present in Africa, Asia, North and South America, and Oceania. It has also been reported from Greece, Cyprus and Italy, with a restricted distribution. Nevertheless, there is a key uncertainty on the geographical distribution of *N. dimidiatum* worldwide and in the EU, because in the past, when molecular tools were not available, the two synanamorphs of the pathogen (*Fusicoccum*-like and *Scytalidium*-like) might have been misidentified based only on morphology and pathogenicity tests. *N. dimidiatum* is not included in Commission Implementing Regulation (EU) 2019/2072. Because of the wide host range of the pathogen, this pest categorisation focuses on those hosts for which there is robust evidence that the pathogen was formally identified by a combination of morphology, pathogenicity and multilocus sequence analysis. Plants for planting, fresh fruits and bark and wood of host plants as well as soil and other plant growing media are the main pathways for the further entry of the pathogen into the EU. Host availability and climate suitability factors occurring in parts of the EU are favourable for the further establishment of the pathogen. In the areas of its present distribution, including Italy, the pathogen has a direct impact on cultivated hosts. Phytosanitary measures are available to prevent the further introduction and spread of the pathogen into the EU. *N. dimidiatum* satisfies the criteria that are within the remit of EFSA to assess for this species to be regarded as potential Union quarantine pest.

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Keywords: *Neoscytalidium novaehollandiae*, *N. orchidacearum*, *N. hyalinum*, pest risk, plant health, plant pest, quarantine

Requestor: European Commission

Question number: EFSA-Q-2022-00398

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Declarations of interest: If you wish to access the declaration of interests of any expert contributing to an EFSA scientific assessment, please contact interestmanagement@efsa.europa.eu.

Acknowledgements: EFSA wishes to acknowledge the contribution to this opinion of Oresteia Sfyra (ISA expert) and Alex Gobbi (EFSA Plants Unit) for performing the systematic literature search and extracting the distribution data.

Suggested citation: EFSA PLH Panel (EFSA Panel on Plant Health), Bragard C, Baptista P, Chatzivassiliou E, Di Serio F, Gonthier P, Jaques Miret JA, Justesen AF, MacLeod A, Magnusson CS, Milonas P, Navas-Cortes JA, Parnell S, Potting R, Stefani E, Thulke H-H, Van der Werf W, Vicent Civera A, Yuen J, Zappalà L, Migheli Q, Vloutoglou I, Maiorano A, Pautasso M and Reignault PL, 2023. Scientific Opinion on the pest categorisation of *Neoscytalidium dimidiatum*. EFSA Journal 2023;21(5):8001, 56 pp. <https://doi.org/10.2903/j.efsa.2023.8001>

ISSN: 1831-4732

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The EFSA Journal is a publication of the European Food Safety Authority, a European agency funded by the European Union.



Table of contents

Abstract.....	1
1. Introduction.....	4
1.1. Background and Terms of Reference as provided by the requestor.....	4
1.1.1. Background	4
1.1.2. Terms of reference	4
1.2. Interpretation of the Terms of Reference.....	4
1.3. Additional information.....	5
2. Data and methodologies.....	5
2.1. Data.....	5
2.1.1. Information on pest status from NPPOs	5
2.1.2. Literature search	5
2.1.3. Database search	5
2.2. Methodologies.....	5
3. Pest categorisation.....	6
3.1. Identity and biology of the pest.....	6
3.1.1. Identity and taxonomy.....	6
3.1.2. Biology of the pest	8
3.1.3. Host range/species affected	9
3.1.4. Intraspecific diversity	9
3.1.5. Detection and identification of the pest.....	9
3.2. Pest distribution	11
3.2.1. Pest distribution outside the EU.....	11
3.2.2. Pest distribution in the EU.....	11
3.3. Regulatory status	12
3.3.1. Commission Implementing Regulation 2019/2072	12
3.3.2. Hosts or species affected that are prohibited from entering the Union from third countries.....	12
3.4. Entry, establishment and spread in the EU	15
3.4.1. Entry.....	15
3.4.2. Establishment	18
3.4.2.1. EU distribution of main host plants.....	19
3.4.2.2. Climatic conditions affecting establishment	19
3.4.3. Spread	20
3.5. Impacts.....	20
3.6. Available measures and their limitations.....	23
3.6.1. Identification of potential additional measures.....	23
3.6.1.1. Additional potential risk reduction options.....	23
3.6.1.2. Additional supporting measures	27
3.6.1.3. Biological or technical factors limiting the effectiveness of measures.....	28
3.7. Uncertainty	29
4. Conclusions.....	29
References.....	30
Abbreviations.....	37
Glossary	37
Appendix A – <i>Neoscytalidium dimidiatum</i> host plants/species affected.....	38
Appendix B – Distribution of <i>Neoscytalidium dimidiatum</i>	41
Appendix C – EU annual imports of fresh produce of hosts from countries where <i>Neoscytalidium dimidiatum</i> is present, 2016–2020 (in 100 kg).....	42
Appendix D – EU 27 and Member State cultivation/harvested/production area of <i>Neoscytalidium dimidiatum</i> (in 1,000 ha)	50

1. Introduction

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

1.1.1. Background

The new Plant Health Regulation (EU) 2016/2031, on the protective measures against pests of plants, is applying from 14 December 2019. Conditions are laid down in this legislation in order for pests to qualify for listing as Union quarantine pests, protected zone quarantine pests or Union regulated non-quarantine pests. The lists of the EU regulated pests together with the associated import or internal movement requirements of commodities are included in Commission Implementing Regulation (EU) 2019/2072. Additionally, as stipulated in the Commission Implementing Regulation 2018/2019, certain commodities are provisionally prohibited to enter in the EU (high risk plants, HRP). EFSA is performing the risk assessment of the dossiers submitted by exporting to the EU countries of the HRP commodities, as stipulated in Commission Implementing Regulation 2018/2018. Furthermore, EFSA has evaluated a number of requests from exporting to the EU countries for derogations from specific EU import requirements.

In line with the principles of the new plant health law, the European Commission with the Member States are discussing monthly the reports of the interceptions and the outbreaks of pests notified by the Member States. Notifications of an imminent danger from pests that may fulfil the conditions for inclusion in the list of the Union quarantine pest are included. Furthermore, EFSA has been performing horizon scanning of media and literature.

As a follow-up of the above-mentioned activities (reporting of interceptions and outbreaks, HRP, derogation requests and horizon scanning), a number of pests of concern have been identified. EFSA is requested to provide scientific opinions for these pests, in view of their potential inclusion by the risk manager in the lists of Commission Implementing Regulation (EU) 2019/2072 and the inclusion of specific import requirements for relevant host commodities, when deemed necessary by the risk manager.

1.1.2. Terms of reference

EFSA is requested, pursuant to Article 29(1) of Regulation (EC) No 178/2002, to provide scientific opinions in the field of plant health.

EFSA is requested to deliver 53 pest categorisations for the pests listed in Annex 1A, 1B, 1D and 1E (for more details see mandate M-2021-00027 on the [Open.EFSA](#) portal). Additionally, EFSA is requested to perform pest categorisations for the pests so far not regulated in the EU, identified as pests potentially associated with a commodity in the commodity risk assessments of the HRP dossiers (Annex 1C; for more details see mandate M-2021-00027 on the [Open.EFSA](#) portal). Such pest categorisations are needed in the case where there are not available risk assessments for the EU.

When the pests of Annex 1A are qualifying as potential Union quarantine pests, EFSA should proceed to phase 2 risk assessment. The opinions should address entry pathways, spread, establishment, impact and include a risk reduction options analysis.

Additionally, EFSA is requested to develop further the quantitative methodology currently followed for risk assessment, in order to have the possibility to deliver an express risk assessment methodology. Such methodological development should take into account the EFSA Plant Health Panel Guidance on quantitative pest risk assessment and the experience obtained during its implementation for the Union candidate priority pests and for the likelihood of pest freedom at entry for the commodity risk assessment of High Risk Plants.

1.2. Interpretation of the Terms of Reference

Neoscytalidium dimidiatum is one of a number of pests listed in Annex 1D to the Terms of Reference (ToR) to be subject to pest categorisation to determine whether it fulfils the criteria of a potential Union quarantine pest (QP) 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, and so inform EU decision making as to its appropriateness for potential inclusion in the lists of pests of Commission Implementing Regulation (EU) 2019/2072. If a pest fulfils the criteria to be potentially listed as a Union QP, risk reduction options will be identified.

1.3. Additional information

N. dimidiatum was an actionable pest in the commodity risk assessments of *Ficus carica* and *Persea americana* from Israel (EFSA PLH Panel, 2021a,b), as well as of *Prunus persica* and *P. dulcis* from Türkiye (EFSA PLH Panel, 2023) and is mentioned in Annex 1D of the mandate (List of pests identified by Horizon Scanning and selected for pest categorisation).

2. Data and methodologies

2.1. Data

2.1.1. Information on pest status from NPPOs

In the context of the current mandate, EFSA is preparing pest categorisations for new/emerging pests that are not yet regulated in the EU. When official pest status is not available in the European and Mediterranean Plant Protection Organization (EPPO) Global Database (EPPO, online), EFSA consults the NPPOs of the relevant MSs. To obtain information on the official pest status for *N. dimidiatum*, EFSA has consulted the NPPOs of Italy, Greece and Cyprus in February 2023. The results of this consultation are presented in Section 3.2.2.

2.1.2. Literature search

A literature search on *N. dimidiatum* 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. Papers relevant for the pest categorisation were reviewed, and further references and information were obtained from experts, as well as from citations within the references and grey literature.

2.1.3. Database search

Pest information, on host(s) and distribution, was retrieved from the EPPO Global Database, the CABI databases and scientific literature databases as referred above in Section 2.1.1.

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 and TRACES databases were 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 as a subproject of PHYSAN (Phyto-Sanitary Controls) specifically concerned with plant health information. TRACES is the European Commission's multilingual online platform for sanitary and phytosanitary certification required for the importation of animals, animal products, food and feed of non-animal origin and plants into the European Union, and the intra-EU trade and EU exports of animals and certain animal products. Up until May 2020, the Europhyt database managed 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. The recording of interceptions switched from Europhyt to TRACES in May 2020.

GenBank was searched to determine whether it contained any nucleotide sequences for *N. dimidiatum* which could be used as reference material for molecular diagnosis. GenBank® (www.ncbi.nlm.nih.gov/genbank/) is a comprehensive publicly available database that as of August 2019 (release version 227) contained over 6.25 trillion base pairs from over 1.6 billion nucleotide sequences for 450,000 formally described species (Sayers et al., 2020).

2.2. Methodologies

The Panel performed the pest categorisation for *N. dimidiatum*, following guiding principles and steps presented in the EFSA guidance on quantitative pest risk assessment (EFSA PLH Panel, 2018), the EFSA guidance on the use of the weight of evidence approach in scientific assessments (EFSA Scientific Committee, 2017) and the International Standards for Phytosanitary Measures No. 11 (FAO, 2013).

The criteria to be considered when categorising a pest as a potential Union QP is given in Regulation (EU) 2016/2031 Article 3 and Annex I, Section 1 of the Regulation. Table 1 presents the

Regulation (EU) 2016/2031 pest categorisation criteria on which the Panel bases its conclusions. In judging whether a criterion is met the Panel uses its best professional judgement (EFSA Scientific Committee, 2017) by integrating a range of evidence from a variety of sources (as presented above in Section 2.1) to reach an informed conclusion as to whether or not a criterion is satisfied.

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, deemed to be a risk management decision, the Panel will present a summary of the observed impacts in the areas where the pest occurs, and make a judgement about potential likely impacts in the EU. Whilst the Panel may quote impacts reported from areas where the pest occurs in monetary terms, the Panel will seek to express potential EU impacts in terms of yield and quality losses and not in monetary terms, in agreement with the EFSA guidance on quantitative pest risk assessment (EFSA PLH Panel, 2018). Article 3 (d) of Regulation (EU) 2016/2031 refers to unacceptable social impact as a criterion for QP status. Assessing social impact is outside the remit of the Panel.

Table 1: Pest categorisation criteria under evaluation, as derived from 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 (Article 3)
Identity of the pest (Section 3.1)	Is the identity of the pest clearly defined, 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 in a limited part of the EU or is it scarce, irregular, isolated or present infrequently? If so, the pest is considered to be not widely distributed.
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 for entry and spread.
Potential for consequences in the EU territory (Section 3.5)	Would the pests' introduction have an economic or environmental impact on the EU territory?
Available measures (Section 3.6)	Are there measures available to prevent pest entry, establishment, spread or impacts?
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.

3. Pest categorisation

3.1. Identity and biology of the pest

3.1.1. Identity and taxonomy

Is the identity of the pest clearly defined, or has it been shown to produce consistent symptoms and/or to be transmissible?

Yes, the identity of *Neoscytalidium dimidiatum* is clearly defined and the pathogen has been shown to produce consistent symptoms and to be transmissible.

Neoscytalidium dimidiatum (Penz.) Crous & Slippers is a plant pathogenic fungus of the family Botryosphaeriaceae. In the past, when molecular tools were not available, there was some confusion in the taxonomy of the pathogen mainly because it has two different asexual stages known as synanamorphs: the coelomycetous anamorph, which produces pycnidia and two-septate conidia with a darkened central cell, resembling *Fusicoccum*-like conidia, and the hyphomycetous anamorph that produces powdery arthric chains of conidia (arthroconidia or arthrospores or phragmospores), which

may have a central septum and resemble *Scytalidium*-like conidia (Natrass, 1933; Sutton and Dyko, 1989; Farr et al., 2005).

The pathogen was first described in 1883 as *Torula dimidiata* based on the arthric synanamorph (Penzig, 1883). In 1933, Natrass described the coelomycetous synanamorph as *Hendersonula toruloidea* (Natrass, 1933). Sutton and Dyko (1989) revised the taxonomy of *H. toruloidea* and established the genus *Natrassia* typified by *Natrassia mangiferae* to include the pycnidial morph. In addition, they synonymised *T. dimidiata* and *Scytalidium lignicola* by circumscribing the new species *S. dimidiatum* to accommodate the arthric morph. Farr et al. (2005) were the first to show that the original cultures studied by Sutton and Dyko, which produced both the pycnidial and the arthric synanamorphs clustered near the genus *Botryosphaeria* within the family Botryosphaeriaceae. Therefore, based mainly on morphological similarity of the pycnidial morph with *Fusicoccum* species, Farr et al. (2005) transferred *N. mangiferae* and *S. dimidiatum* to *Fusicoccum dimidiatum*, creating polyphyly. Crous et al. (2006) revised the taxonomy of the Botryosphaeriaceae based on DNA phylogeny and revealed that the genus *Scytalidium* was polyphyletic, because the ex-type strain (*S. lignicola*, CBS 233.57) clustered distantly to the Botryosphaeriaceae family. Moreover, Crous et al. (2006) established the new genus *Neoscytalidium* Crous & Slippers to accommodate *F. dimidiatum* as *Neoscytalidium dimidiatum* based on the powdery disarticulating production of aerial conidia (arthroconidia or phragmospores) and strongly supported its DNA-based phylogenetic position within the family Botryosphaeriaceae, thus stabilising a long and complicated taxonomic history. Based on molecular data, Zhang et al. (2021) recognised *N. dimidiatum* as the only species known in the genus *Neoscytalidium* and reduced two other species, namely *N. novaehollandiae* and *N. orchidacearum*, to synonyms of *N. dimidiatum*. Crous et al. (2021) confirmed the results of Zhang et al. (2021) study and moreover showed that *N. hyalinum* (as *Scytalidium hyalinum*) is also synonymous with *N. dimidiatum*.

The EPPO Global Database (EPPO, online) provides the following taxonomic identification for *N. dimidiatum*:

Preferred name: *Neoscytalidium dimidiatum* (Penz.) Crous & Slippers
 Order: Botryosphaeriales
 Family: Botryosphaeriaceae
 Genus: *Neoscytalidium*
 Species: *Neoscytalidium dimidiatum*

Common names: The following common names are provided by the EPPO Global Database (EPPO, online): branch wilt of apple, branch wilt of walnut, dieback of grapevine, gummosis of citrus, storage rot.

Based on the EPPO Global Database (EPPO, 2022), Index Fungorum (www.indexfungorum.org; accessed on 30 January 2023) and other literature sources, the following species are synonyms of *N. dimidiatum* (in alphabetical order):

- *Fusicoccum dimidiatum* (Penz.) D.F. Farr
- *Hendersonula toruloidea* Natrass
- *Natrassia toruloidea* (Natrass) Dyko and Sutton
- *Neoscytalidium dimidiatum* var. *hyalinum* (C.K. Campb. & J.L. Mulder) Madrid, Ruiz-Cendoya, Cano, Stchigel, Orofino & Guarro
- *N. hyalinum* (C.K. Campb. & J.L. Mulder) A.J.L. Phillips, M. Groenew. & Crous
- *N. novaehollandiae* Pavlic, T.I. Burgess & M.J. Wingf.
- *N. orchidacearum* S.K. Huang, Tangthir., J.C. Kang & K.D. Hyde
- *Scytalidium dimidiatum* (Penz.) B. Sutton & Dyko
- *S. hyalinum* C.K. Campb. & J.L. Mulder
- *Torula dimidiata* Penz.

The EPPO code¹ (Griessinger and Roy, 2015; EPPO, 2019) for this species is: HENLTO (EPPO, online).

¹ 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).

3.1.2. Biology of the pest

Like other fungal species in the family Botryosphaeriaceae, *N. dimidiatum* exhibits diverse lifestyles; it occurs as an endophyte in asymptomatic plant tissues and switch to pathogenic mode when its host is subjected to stress, as a pathogen causing diseases on a wide range of monocotyledonous, dicotyledonous and gymnosperm woody plants and as a saprophyte commonly found on dead woody plant tissues (Slippers and Wingfield, 2007; Sakalidis et al., 2011).

N. dimidiatum is also an opportunistic human pathogen causing chronic superficial infections of skin, nails and nose, onychomycosis, dermatomycosis, rhinosinusitis, brain abscesses and pulmonary disease (Bakhshizadeh et al., 2014; Dionne et al., 2015; Yang et al., 2019; González Cortés et al., 2021; Jo et al., 2021; Raiesi et al., 2022).

The life cycle of *N. dimidiatum* is not fully known. However, some stages of the pathogen's life cycle have been described on *Selenicereus* spp. (formerly *Hylocereus* spp.; pitahaya, dragon fruit) (Fullerton et al., 2018; Hong et al., 2022). The fungus produces two types of asexual spores: conidia (pycnidiospores) in ostiolate pycnidia embedded in mature lesions and phragmospores formed by the breaking up of individual or groups of cells of mature hyphae in dead tissues of the lesions (Chuang et al., 2012; Lan et al., 2012; Mohd et al., 2013). In culture, only arthroconidia are produced in abundance on the surface of the culture medium (Fullerton et al., 2018). The conidia are released from pycnidia formed on symptomatic plant tissues during wet weather and are splash-dispersed by water (overhead irrigation, rain, windblown rain) to infect susceptible host tissues.

The role of phragmospores in the epidemiology of the diseases caused by *N. dimidiatum* is not known. Fullerton et al. (2018) assumed that the role of phragmospores in the dispersal potential of *N. dimidiatum* by wind is probably limited as those conidia are formed within the necrotic plant tissues and thus, they are not readily available for dispersal by wind. However, Mirtalebi et al. (2019) showed that chains of *N. dimidiatum* phragmospores were also formed on the surface of artificially inoculated melon, cantaloupe, tomato and watermelon fruits and assumed that they could potentially be disseminated by wind. Similarly, Alizadeh et al. (2022) concluded that the big masses of phragmospores formed on the bark of artificially inoculated with *N. dimidiatum* (as *N. novaehollandiae*) pine (*P. eldarica*) saplings could become air-borne and infect susceptible hosts. Conidia of the pathogen could also be dispersed on the bodies of arthropods, as shown by Yeganeh and Mohammadi (2022).

The pathogen enters its hosts via wounds created by pruning or grafting tools, insects or adverse climatic conditions (frost, hail) and natural openings (stomata, lenticels) (Sakalidis et al., 2011). Nevertheless, direct penetration of the cuticle with the formation of dark appressoria and colonisation of the underlying epidermal cells has also been observed after artificial inoculation of dragon fruit (Sakalidis et al., 2011; Fullerton et al., 2018). In the case of pitahaya infection, chlorotic lesions were observed on flattened leaf-like stems (cladodes) beneath groups of germinating conidia without the formation of appressoria (Fullerton et al., 2018). The evidence to date suggests that once infection is established, *N. dimidiatum* behaves primarily as a necrotroph, producing a diffusible toxin which can overcome successive physical barriers produced as a resistance response of the host, and killing tissues in advance of colonisation. The ability of cell-free culture filtrates to induce chlorosis in healthy cladodes of pitahaya provided further evidence of toxin production by the pathogen. These observations suggest that toxin production is an important feature of the pathogenicity of *N. dimidiatum* (Fullerton et al., 2018).

Favourable temperatures for conidial germination and mycelial growth of *N. dimidiatum* range between 20°C and 35°C (Hong et al., 2022). Based on a model developed at the University of Florida (USA), 50% of *N. dimidiatum* conidia germinated within 24 h at temperatures above 22°C, suggesting that the disease pressure could be high in the presence of abundant conidia and rising temperatures (Hong et al., 2022).

The pathogen is most likely to survive on infected dead plant organs (Moral et al., 2019) and on plant debris in the soil mainly in the form of mycelium and pycnidia, similarly to other members of the family Botryosphaeriaceae (Sakalidis et al., 2011). No sexual stage has been reported so far and production of survival structures (chlamydospores) by the pathogen has been observed only in pure cultures (Xie et al., 2021).

There is uncertainty on the seeds of host plants as a source of primary inoculum of *N. dimidiatum* because of lack of evidence. However, the results of the study conducted by Mirtalebi et al. (2019) suggested that the pathogen (as *N. hyalinum*) may be transmitted by seeds, as it moved from artificially inoculated melon, cantaloupe, tomato and watermelon fruits to the seed coats.

3.1.3. Host range/species affected

N. dimidiatum has been reported on a large number of monocotyledonous, dicotyledonous and gymnosperm, cultivated and wild, plant species worldwide. A detailed list of the cultivated and wild hosts of *N. dimidiatum* reported so far in the literature is included in Appendix A (last updated 8 February 2023).

Because of the very wide host range of the pathogen, this pest categorisation will focus on those hosts that are relevant for the EU and for which there is robust evidence in the literature that (a) the pathogen was isolated and identified by both morphological and molecular (multilocus gene sequencing analysis) methods, (b) the Koch's postulates were fulfilled through pathogenicity tests and (c) impacts on affected crops were reported. Using the above criteria, the Panel identified the following hosts (crops and ornamentals) as main hosts of *N. dimidiatum*: *Cattleya* spp. (Suwannarach et al., 2018; Chang et al., 2020), *Citrus* spp. (Polizzi et al., 2009; Adesemoye et al., 2014; Al-Sadi et al., 2014; Mayorquin et al., 2016; Alananbeh et al., 2020; Espargham et al., 2020), *Cucumis melo* (Mirtalebi et al., 2019), *Diospyros kaki* (Ören et al., 2020a), *Ficus benjamina* (Al-Bedak et al., 2018), *F. carica* (Ray et al., 2010; Xu et al., 2015; Gusella et al., 2021; Güney et al., 2022a), *Ipomoea batatas* (de Mello et al., 2019, 2021), *Juglans regia* (Chen et al., 2013; Derviş et al., 2019b), *Lavender* spp. (Güney et al., 2021), *Malus* spp. (Ören et al., 2021; Sha et al., 2022), *Mangifera indica* (Ray et al., 2010; Sakalidis et al., 2011; Ismail et al., 2013; Coutinho et al., 2018), *Melissa officinalis* (Özer et al., 2022), *Morus* spp. (Oksal, 2022), *Olea europaea* (Güney et al., 2022b), *Origanum onites* (Alkan et al., 2022), *Pinus* spp. (Türkölmez et al., 2019a; Alizadeh et al., 2022), *Pistacia vera* (Derviş et al., 2019a), *Populus* spp. (Hashemi and Mohammadi, 2016), *Prunus* spp. (Hajlaoui et al., 2018; Nouri et al., 2018; Oksal et al., 2020; Ören et al., 2020b, 2022b), *Pyrus communis* (Oksal and Özer, 2021), *Quercus* spp. (Sabernasab et al., 2019), *Salix alba* (Türkölmez et al., 2019b), *Salvia officinalis* (Derviş et al., 2021), *Solanum lycopersicum* (Türkölmez et al., 2019c; Derviş et al., 2020b), *Solanum tuberosum* (Derviş et al., 2020a) and *Vitis vinifera* (Rolshausen et al., 2013; Correia et al., 2016; Akgül et al., 2019; Oksal et al., 2019; Arkam et al., 2021; Moghadam et al., 2022).

Nevertheless, the actual host range of *N. dimidiatum* is still unknown, because of the different lifestyles of the fungus (endophyte, saprobe, pathogen). Moreover, there is uncertainty around the reports where the identification of the pathogen was not based on morphology combined with multigene phylogenetic analysis.

3.1.4. Intraspecific diversity

No information on intraspecific diversity of *N. dimidiatum* was found in the available literature. In addition, the sexual morph of the pathogen, which could potentially enhance its genomic plasticity and adaptation to various adverse environmental conditions, including fungicide exposure, is still unknown.

3.1.5. Detection and identification of the pest

Are detection and identification methods available for the pest?

Yes, there are methods available for the detection and identification of *N. dimidiatum* and its discrimination from other fungi of the family Botryosphaeriaceae.

N. dimidiatum can infect different parts of its host plants by causing diseases that show various symptoms on the aerial and/or underground plant organs (Polizzi et al., 2009; Sakalidis et al., 2011; Rolshausen et al., 2013; Nouri et al., 2018; de Mello et al., 2019; Oksal et al., 2019; Türkölmez et al., 2019a,b; Güney et al., 2022a). Nevertheless, the symptoms caused by the pathogen are similar to those caused by other biotic (fungi, bacteria, etc.) or abiotic agents. If fruiting structures of the *Fusicoccum*-like and/or *Scytalidium*-like synanamorphs (i.e. pycnidia with conidia and/or phragmospores) of the pathogen are detected on the symptomatic plant tissues using a magnifying lens, they are similar in morphology to those of other fungal species of the family Botryosphaeriaceae. In addition, the pathogen may remain quiescent or latent within its asymptomatic hosts (see Section 3.1.2 Biology of the pest). Based on the above, it is unlikely that *N. dimidiatum* could be detected only by visual inspection of its host plants.

N. dimidiatum can be readily isolated on culture media and description of its cultural and morphological characteristics is available in the literature (Crous et al., 2006, 2021; Nouri et al., 2018; Zhang et al., 2021; Dy et al., 2022) (Figure 1). In the past, the identification of species of the family

Botryosphaeriaceae, including *N. dimidiatum*, was based on cultural and morphological characteristics, resulting in many cases to misidentifications since conidial septation and pigmentation evolved more than once within different genera and are strongly influenced by the cultural conditions (Slippers et al., 2013). Recently, molecular tools based on combination of the internal transcribed spacers (ITS) of genomic rDNA together with protein-coding genes, such as the translation elongation factor 1- α (*TEF1-a*), β -tubulin (β -*tub*) and the large-subunit ribosomal RNA (LSU) genes have been used to reliably identify *N. dimidiatum* in culture and discriminate it from other morphologically similar species (Crous et al., 2006, 2021; Zhang et al., 2021).

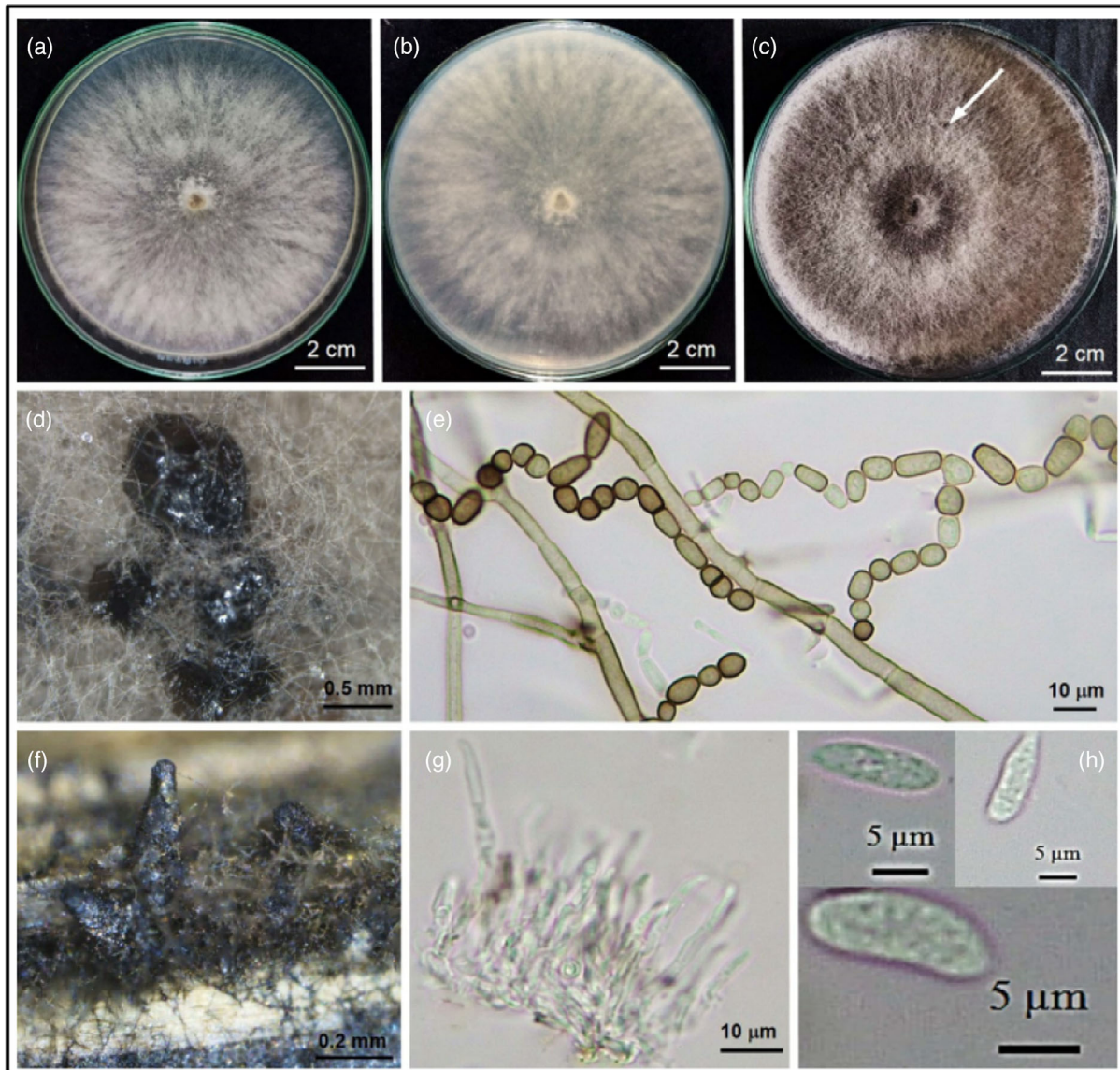


Figure 1: Morphological characteristics of *Neoscytalidium dimidiatum* on *Hylocereus polyrhizus*: (a) & (b) 3-day-old colony on PDA in top and bottom view, respectively, (c) 4-week-old colony on PDA developed small black conidiomata (arrow), (d) zoom view of conidiomata, (e) hyphae and phragmospores (arthroconidia), (f) pycnidia developed on dried Napier grasses, (g) conidiogenous cells and (h) conidia (pycnidiospores) (from Dy et al., 2022)

Nucleotide sequences of *N. dimidiatum* are available in GenBank (www.ncbi.nlm.nih.gov/genbank) and could be used as reference material for molecular diagnosis.

No EPPO Standard is available for the detection and identification of *N. dimidiatum*.

3.2. Pest distribution

3.2.1. Pest distribution outside the EU

N. dimidiatum has been reported to be present in Africa (Algeria, Egypt, Ghana, Guinea, Mali, Nigeria, Oman, Sierra Leone, South Africa, Sudan, Tanzania, Tunisia, Zimbabwe), North America (Canada, Costa Rica, Hawaii, Jamaica, Mexico, Puerto Rico, the USA (California, Florida, Washington, West Virginia)), South America (Brazil), Asia (China, India, Iran, Iraq, Israel, Jordan, Lebanon, Malaysia, Oman, Pakistan, Taiwan, Thailand, Türkiye) and Oceania (Australia). The current geographical distribution of *N. dimidiatum* is shown in Figure 2.

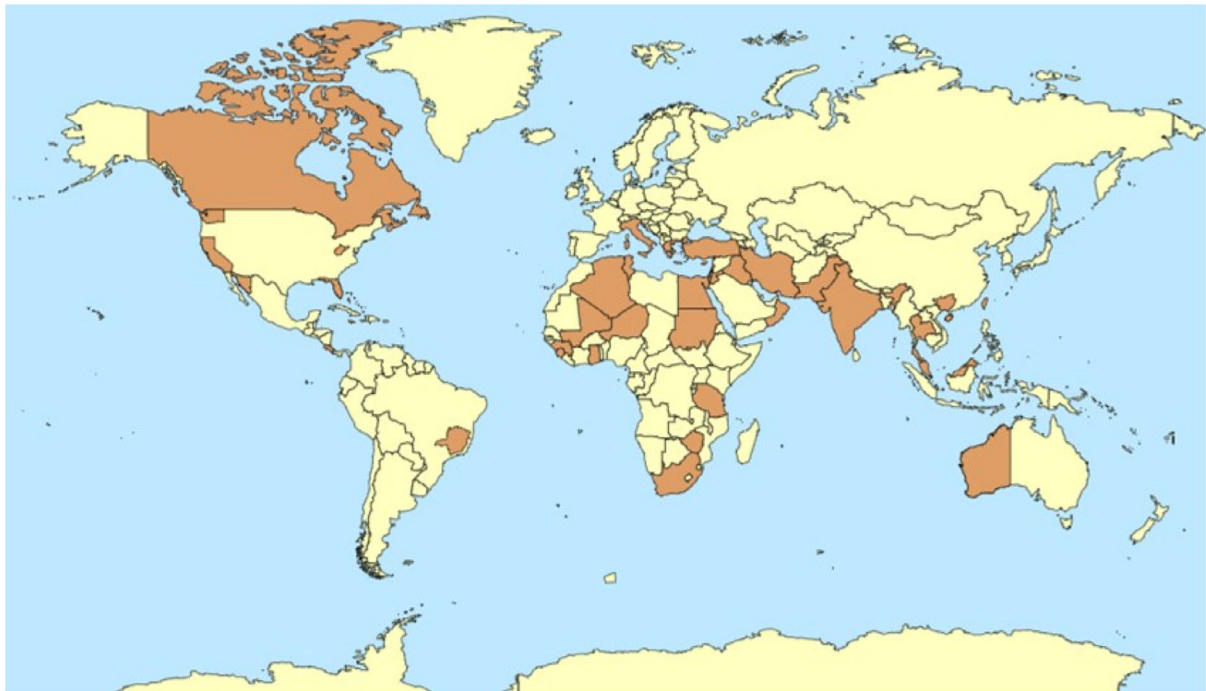


Figure 2: Global distribution of *Neoscytalidium dimidiatum* [Data Source: CABI CPC (online; last accessed on 1/2/2023), Farr and Rossman (online; last accessed on 1/2/2023) and other literature sources]. The presence of the pathogen in Greece and Cyprus is uncertain

A complete list of the countries and states/provinces from where *N. dimidiatum* has been reported is included in Appendix B. The records are based on CABI Invasive Species Compendium (2022); (accessed on 1/2/2022), Farr and Rossman (online; <https://nt.ars-grin.gov/fungalatabases/>; accessed on 1/2/2022) and other literature sources.

Nevertheless, the current geographical distribution of *N. dimidiatum* outside the EU might be wider than that reported, as in the past, when molecular tools (particularly multigene phylogenetic analysis) were not available, the two synanamorphs of the pathogen might have been misidentified based only on morphology and pathogenicity tests, which cannot reliably differentiate species within the genera *Fusicoccum* and *Scytalidium* or, in general, members of the Botryosphaeriaceae family.

3.2.2. Pest distribution in the EU

Is the pest present in the EU territory? If present, is the pest in a limited part of the EU or is it scarce, irregular, isolated or present infrequently? If so, the pest is considered to be not widely distributed.

Yes, *N. dimidiatum* has been reported from Cyprus, Greece and Italy.

N. dimidiatum has been reported from Cyprus (as *Hendersonula toruloidea*; Georghiou and Papadopoulos, 1957), Greece (as *H. toruloidea*; Tsaouridou and Thanassoulouopoulos, 2000) and Italy (eastern Sicily) (Polizzi et al., 2009). However, there is uncertainty on the reports of the presence of the

pathogen in Cyprus and Greece because (1) the report from Cyprus is a list of fungal species most probably identified based on morphology as no molecular tools were available at that time for a reliable identification of the pathogen and (2) in the report from Greece, the identification of the pathogen was based only on cultural and morphological characteristics, which cannot reliably identify the pathogen.

The Italian NPPO considers *N. dimidiatum* as (i) present, no details, on *Vitis vinifera*; (ii) absent, pest no longer present, on *Citrus* spp. and (iii) present, restricted distribution (only one tree) on *Meryta* spp. (communication of 21 March 2023).

The current geographical distribution of *N. dimidiatum* in the EU might be wider than that reported, for the reasons listed in Section 3.2.1.

3.3. Regulatory status

3.3.1. Commission Implementing Regulation 2019/2072

N. dimidiatum, including its synonyms, is not listed in Annex II of Commission Implementing Regulation (EU) 2019/2072, an implementing act of Regulation (EU) 2016/2031, or in any emergency plant health legislation.

3.3.2. Hosts or species affected that are prohibited from entering the Union from third countries

A list of main hosts included in Annex VI of Commission Implementing Regulation (EU) 2019/2072 is provided in Table 2. Hosts of the genera *Acacia*, *Albizia*, *Castanea*, *Diospyros*, *Ficus carica*, *Juglans*, *Malus*, *Populus*, *Prunus*, *Quercus*, *Robinia*, *Salix* and *Ulmus* are included in the Commission Implementing Regulation (EU) 2018/2019 on high-risk plants.

Table 2: List of plants, plant products and other objects that are *Neoscytalidium dimidiatum* main hosts whose introduction into the Union from certain third countries is prohibited (Source: Commission Implementing Regulation (EU) 2019/2072, Annex VI)

Annex VI of Commission Implementing Regulation (EU) 2019/2072			
List of plants, plant products and other objects whose introduction into the Union from certain third countries is prohibited			
	Description	CN ode	Third country, group of third countries or specific area of third country
1.	Plants of [...] <i>Pinus</i> L., [...], other than fruit and seeds	ex 0602 20 20 ex 0602 20 80 ex 0602 90 41 ex 0602 90 45 ex 0602 90 46 ex 0602 90 47 ex 0602 90 50 ex 0602 90 70 ex 0602 90 99 ex 0604 20 20 ex 0604 20 40	Third countries other than Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canary Islands, Faeroe Islands, Georgia, Iceland, Liechtenstein, Moldova, Monaco, Montenegro, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo-Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Türkiye, Ukraine and the United Kingdom
2.	Plants of [...] and <i>Quercus</i> L., with leaves, other than fruit and seeds	ex 0602 10 90 ex 0602 20 20 ex 0602 20 80 ex 0602 90 41 ex 0602 90 45 ex 0602 90 46 ex 0602 90 48 ex 0602 90 50 ex 0602 90 70 ex 0602 90 99 ex 0604 20 90 ex 1404 90 00	Third countries other than: Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canary Islands, Faeroe Islands, Georgia, Iceland, Liechtenstein, Moldova, Monaco, Montenegro, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo-Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Türkiye and Ukraine

Annex VI of Commission Implementing Regulation (EU) 2019/2072

List of plants, plant products and other objects whose introduction into the Union from certain third countries is prohibited

	Description	CN ode	Third country, group of third countries or specific area of third country
3.	Plants of <i>Populus</i> L., with leaves, other than fruit and seeds	ex 0602 10 90 ex 0602 20 20 ex 0602 20 80 ex 0602 90 41 ex 0602 90 45 ex 0602 90 46 ex 0602 90 48 ex 0602 90 50 ex 0602 90 70 ex 0602 90 99 ex 0604 20 90 ex 1404 90 00	Canada, Mexico, United States
5.	Isolated bark of <i>Quercus</i> L., other than <i>Quercus suber</i> L.	ex 1404 90 00 ex 4401 40 90	Canada, Mexico, United States
7.	Isolated bark of <i>Populus</i> L.	ex 1404 90 00 ex 4401 40 90	The Americas
8.	Plants for planting of [...] <i>Malus</i> Mill., <i>Prunus</i> L., [...] and [...], other than dormant plants free from leaves, flowers and fruits	ex 0602 10 90 ex 0602 20 20 ex 0602 20 80 ex 0602 40 00 ex 0602 90 41 ex 0602 90 45 ex 0602 90 46 ex 0602 90 47 ex 0602 90 48 ex 0602 90 50 ex 0602 90 70 ex 0602 90 91 ex 0602 90 99	Third countries other than Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canary Islands, Faeroe Islands, Georgia, Iceland, Liechtenstein, Moldova, Monaco, Montenegro, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo- Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Türkiye, Ukraine and the United Kingdom
9.	Plants for planting of [...] <i>Malus</i> Mill., <i>Prunus</i> L. and [...] and their hybrids, [...] other than seeds	ex 0602 10 90 ex 0602 20 20 ex 0602 90 30 ex 0602 90 41 ex 0602 90 45 ex 0602 90 46 ex 0602 90 48 ex 0602 90 50 ex 0602 90 70 ex 0602 90 91 ex 0602 90 99	Third countries other than Albania, Algeria, Andorra, Armenia, Australia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canada, Canary Islands, Egypt, Faeroe Islands, Georgia, Iceland, Israel, Jordan, Lebanon, Libya, Liechtenstein, Moldova, Monaco, Montenegro, Morocco, New Zealand, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo- Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo- Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Syria, Tunisia, Türkiye, Ukraine, the United Kingdom (1) and United States other than Hawaii
10.	Plants of <i>Vitis</i> L., other than fruits	ex 0602 10 10 ex 0602 20 10 ex 0604 20 90 ex 1404 90 00	Third countries other than Switzerland
11.	Plants of <i>Citrus</i> L., [...] and their hybrids, other than fruits and seeds	ex 0602 10 90 ex 0602 20 20 ex 0602 20 30 ex 0602 20 80 ex 0602 90 45 ex 0602 90 46 ex 0602 90 47 ex 0602 90 50 ex 0602 90 70	All third countries

Annex VI of Commission Implementing Regulation (EU) 2019/2072
List of plants, plant products and other objects whose introduction into the Union from certain third countries is prohibited

	Description	CN ode	Third country, group of third countries or specific area of third country
		ex 0602 90 91 ex 0602 90 99 ex 0604 20 90 ex 1404 90 00	
15	Tubers of <i>Solanum tuberosum</i> L., seed potatoes	0701 10 00	Third countries other than Switzerland
16	Plants for planting of stolon- or tuber-forming species of <i>Solanum</i> L. or their hybrids, other than those tubers of <i>Solanum tuberosum</i> L. as specified in entry 15	ex 0601 10 90 ex 0601 20 90 ex 0602 90 50 ex 0602 90 70 ex 0602 90 91 ex 0602 90 99	Third countries other than Switzerland
17	Tubers of species of <i>Solanum</i> L., and their hybrids, other than those specified in entries 15 and 16	ex 0601 10 90 ex 0601 20 90 0701 90 10 0701 90 50 0701 90 90	Third countries other than: a) Algeria, Egypt, Israel, Libya, Morocco, Syria, Switzerland, Tunisia and Türkiye, or b) those which fulfil the following provisions: i) they are one of following: Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canary Islands, Faeroe Islands, Georgia, Iceland, Liechtenstein, Moldova, Monaco, Montenegro, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo-Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Pri-volzhsky federalny okrug)), San Marino, Serbia and Ukraine and (ii) — they are either recognised as being free from <i>Clavibacter sepedonicus</i> (Spieckermann and Kottho) Nouioui et al., in accordance with the procedure referred to in Article 107 of Regulation (EU) No 2016/2031, or — their legislation, is recognised as equivalent to the Union rules concerning protection against <i>Clavibacter sepedonicus</i> (Spieckermann and Kottho) Nouioui et al. in accordance with the procedure referred to in Article 107 of Regulation (EU) No 2016/2031 have been complied with.
19.	Soil as such consisting in part of solid organic substances	ex 2530 90 00 ex 3824 99 93	Third countries other than Switzerland
20.	Growing medium as such, other than soil, consisting in whole or in part of solid organic substances, other than that composed entirely of peat or fibre of <i>Cocos nucifera</i> L., previously not used for growing of plants or for any agricultural purposes	ex 2530 10 00 ex 2530 90 00 ex 2703 00 00 ex 3101 00 00 ex 3824 99 93	Third countries other than Switzerland

3.4. Entry, establishment and spread in the EU

3.4.1. Entry

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

Yes, the pathogen can enter further into the EU territory via host plants for planting, fruits, parts of host plants (e.g. foliage, branches, bark, wood) and soil/plant growing media.

Comment on plants for planting as a pathway.

Plants for planting is a main pathway of the further entry of the pathogen into the EU.

The Panel identified the following main pathways for the further entry of *N. dimidiatum* into the EU territory:

- 1) host plants for planting,
- 2) fresh fruits of host plants,
- 3) bark and wood of host plants and
- 4) soil and other plant growing media.

all originating in infested third countries.

The pathogen could potentially enter further into the EU territory on plant parts (e.g. stems, branches) and cut flowers of its hosts for medicinal or ornamental purposes. However, this is considered a minor pathway for the further entry of the pathogen into the EU.

N. dimidiatum and other fungi of the family Botryosphaeriaceae have been shown to be seed-transmitted (Mirtalebi et al., 2019). Although there is no evidence so far of *N. dimidiatum* being transmitted from the seeds to the emerging seedlings, seeds of host plants are likely to be a pathway of further entry of the pathogen into the EU.

The pathogen is unlikely to enter further into the EU by natural means (e.g. rain, wind-driven rain, insects) because of the long distance between the infested third countries and the EU MS. More specifically, the only infested third country neighbouring the EU territory is Türkiye, where the pathogen has been reported from the following areas: Şanlıurfa, Sur district of Diyarbakir, Akçakale, Gaziantep, Malatya and Manisa Provinces (Derviş et al., 2019a; Türkölmez et al., 2019b,c; Alkan et al., 2022; Ören et al., 2022a,b). Of the above-mentioned Provinces, the first five are located in the south-eastern Anatolia Region and the sixth one in the Western Region. Although none of the above-mentioned areas neighbours any EU MS, entry of the pathogen from Türkiye into the EU cannot be excluded, as there is uncertainty about the presence of the pathogen in the parts of Türkiye neighbouring Greece and Bulgaria.

Although there are no quantitative data available, conidia of the pathogen may also be present as contaminants on other substrates or objects (e.g. non-host plants, second hand agricultural machinery and equipment, crates, etc.) imported into the EU. Nevertheless, these are considered minor pathways for the further entry of the pathogen into the EU territory.

A list of all the potential pathways for the further entry of the pathogen into the EU territory is included in Table 3.

Table 3: Potential pathways for the further entry of *Neoscytalidium dimidiatum* into the EU 27

Pathways	Life stage	Relevant mitigations [e.g. prohibitions (Annex VI), special requirements (Annex VII) or phytosanitary certificates (Annex XI) within Implementing Regulation 2019/2072]
Host plants for planting, other than seeds	Mycelium, pycnidia, phragmospores	Plants for planting, other than seeds, that are hosts of <i>N. dimidiatum</i> and are prohibited to be imported from third countries (Regulation 2019/2072, Annex VI) are listed in Table 2. There is a temporary prohibition for high-risk plants (Regulation 2018/2019). Special requirements exist for the introduction into the Union (i) from Israel of plants for planting, other than seeds, of <i>Ficus carica</i> , <i>Albizia julibrissin</i> and <i>Robinia pseudoacacia</i> as well as of <i>Ulmus</i> wood [Commission Regulations (EU) 2021/1936 and 2020/1214] and (ii) from Türkiye of plants for planting, other than seeds, of <i>Juglans regia</i> , <i>Nerium oleander</i> and <i>Robinia pseudoacacia</i> [Commission Implementing Regulation (EU) 2022/490].
Seeds of host plants for sowing	Mycelium, phragmospores	A phytosanitary certificate is required for the introduction into the Union from (i) third countries, other than Switzerland, of seeds of <i>Citrus</i> , <i>Solanum lycopersicum</i> and <i>Prunus</i> for sowing and (ii) all third countries of <i>Solanum tuberosum</i> true seeds for sowing [Annex XI, Part A (8) of Commission Implementing Regulation (EU) 2019/2072].
Fresh fruits of host plants	Mycelium, pycnidia, phragmospores	A phytosanitary certificate is required for the introduction into the Union from third countries, other than Switzerland, of fruits (fresh or chilled) of <i>Citrus</i> spp., <i>Diospyros kaki</i> , <i>Malus domestica</i> , <i>Mangifera indica</i> , <i>Prunus</i> spp., <i>Solanum lycopersicum</i> and <i>Vitis vinifera</i> [Annex XI, Part A (5) of Commission Implementing Regulation (EU) 2019/2072]. Special requirements also exist for the introduction into the EU from third countries of <i>Citrus</i> spp. fruits [Annex VII (57) of Commission Implementing Regulation (EU) 2019/2072].
Parts of host plants, other than fruits and seeds	Mycelium, pycnidia, phragmospores	A phytosanitary certificate is required for the introduction into the Union from (i) certain third countries of fresh vegetable products of <i>Ipomoea</i> and of <i>Prunus</i> L. and <i>Juglans</i> L. plant parts, other than fruit and seeds, (ii) third countries, other than Switzerland, of foliage, branches and other parts of conifer (Pinales) plants, without flowers or flower buds and of potato tubers (fresh or chilled), other than seed potatoes [Annex XI of Commission Implementing Regulation (EU) 2019/2072].
Bark of host plants	Mycelium, pycnidia, phragmospores	A phytosanitary certificate is required for the introduction into the Union from (i) certain third countries of isolated bark of Conifers (Pinales), <i>Juglans</i> and <i>Ulmus davidiana</i> and (ii) third countries, other than Switzerland, of isolated bark of <i>Populus</i> and <i>Quercus</i> (other than <i>Q. suber</i>) [Annex XI, Part A (11) of Commission Implementing Regulation (EU) 2019/2072].
Wood of host plants	Mycelium, phragmospores	A phytosanitary certificate is required for the introduction into the Union from (i) the United States of wood of <i>Quercus</i> , including wood which has not kept its natural round surface, (ii) Americas of wood of <i>Populus</i> , including wood which has not kept its natural round surface and (iii) certain third countries of wood of Conifers (Pinales), <i>Juglans</i> and <i>Prunus</i> , including wood which has not kept its natural round surface [Annex XI, Part A (12) of Commission Implementing Regulation (EU) 2019/2072].

Pathways	Life stage	Relevant mitigations [e.g. prohibitions (Annex VI), special requirements (Annex VII) or phytosanitary certificates (Annex XI) within Implementing Regulation 2019/2072]
Soil as such not attached or associated with plants for planting	Possibly chlamydo spores	The introduction into the Union from third countries, other than Switzerland, of soil consisting in part of solid organic substances is banned [Annex VI (19) of Commission Implementing Regulation (EU) 2019/2072].
Growing medium as such, other than soil not attached or associated with plants for planting	Possibly chlamydo spores	The introduction into the Union from third countries, other than Switzerland, of growing medium, other than soil, consisting in whole or in part of solid organic substances, other than that composed entirely of peat or fibre of <i>Cocos nucifera</i> L., previously not used for growing of plants or for any agricultural purposes is banned [Annex VI (20) of Commission Implementing Regulation (EU) 2019/2072].
Growing medium, attached to or associated with host and non-host plants for planting, with the exception of sterile medium of <i>in-vitro</i> plants	Possibly chlamydo spores	A phytosanitary certificate is required for the introduction into the Union from third countries, other than Switzerland, of growing medium attached to or associated with plants, intended to sustain the vitality of the plants [Annex XI, Part A (1) of Commission Implementing Regulation (EU) 2019/2072]. Special requirements also exist for this commodity [Annex VII (1) of Commission Implementing Regulation (EU) 2019/2072].
Machinery and vehicles with contaminated soil and/or infected debris of host plants.	Mycelium, pycnidia, phragmospores and possibly chlamydo spores	A phytosanitary certificate is required for the introduction into the Union of machinery and vehicles from third countries, other than Switzerland [Annex XI, Part A (1) of Commission Implementing Regulation (EU) 2019/2072]. Special requirements also exist for this commodity [Annex VII (2) of Commission Implementing Regulation (EU) 2019/2072].

The quantity of fresh produce of main hosts imported into the EU from countries where *N. dimidiatum* is present is provided in Table 4 and Appendix C.

Table 4: EU 27 annual imports of fresh produce and wood of main hosts from countries where *Neoscytalidium dimidiatum* is present, 2016–2020 (in 100 kg) Source: Eurostat accessed on 9/2/2023)

Commodity	HS code	2016	2017	2018	2019	2020
Fresh or dried limes <i>Citrus aurantifolia</i> , <i>Citrus latifolia</i> '	0805 50 90	1,081,050.40	1,095,790.84	1,227,951.07	1,171,894.04	1,154,174.81
Fresh or dried clementines incl. monreales	0805 22 00	0	290,814.28	300,818.69	306,490.35	293,622.58
Fresh or dried lemons ' <i>Citrus limon</i> , <i>Citrus limonum</i> '	0805 50 10	1,505,362.67	1,481,679.15	2,321,724.81	1,855,246.38	2,422,494.44
Fresh or dried grapefruit	0805 40 00	3,214,644.79	3,079,607.44	3,352,403.04	2,994,543.29	3,123,328.15
Fresh or dried mandarins incl. tangerines and satsumas (excl. clementines)	0805 21	0	914,551.77	1,084,787.35	1,240,125.42	1,675,446.12
Fresh or dried oranges	0805 10 80	6,103,560.88	6,673,244.38	7,079,009.73	5,992,603.37	7,423,844.66

Commodity	HS code	2016	2017	2018	2019	2020
Melons, incl. watermelons and papaws 'papayas', fresh	0 807	2,543,091.67	2,718,105.17	3,009,307.11	3,014,621.48	3,029,006.56
Fresh pears	0808 30	983,026.06	891,575.81	842,726.71	740,007.41	797,381.67
Fresh persimmons	0810 70 00	3,341.69	4,375.09	1,708.98	9,014.30	8,684.53
Fresh figs	0804 20 10	107,515.86	120,973.16	127,574.46	143,341.66	157,403.10
Sweet potatoes, fresh, chilled, frozen or dried, whether or not sliced or in the form of pellets	0714 20	815,920.17	1,096,594.26	1,257,945.87	1,327,850.01	1,599,313.93
Fresh or dried walnuts, in shell	0802 31 00	416,675.47	432,604.76	357,678.32	423,678.33	405,812.60
Fresh apples	0808 10	473,391.39	514,744.37	628,598.01	410,516.90	453,361.60
Fresh or dried guavas, mangoes and mangosteens	0804 50 00	1,403,280.17	1,496,550.59	1,576,429.47	1,852,189.33	1,946,110.09
Fresh or chilled olives (excl. for oil production)	0709 92 10	63.51	3.5	9.06	78.83	130.13
Fresh or dried pistachios, in shell	0802 51 00	539,268.77	707,847.84	685,815.34	773,416.1	828,469.9
Tomatoes, fresh or chilled	0702 00 00	839,665.98	1,132,712.61	1,247,189.15	1,188,348.77	1,451,890.16
Potatoes, fresh or chilled	0 701	2,919,354.73	3,497,324.24	3,009,480.75	4,217,040.95	3,553,637.68
Fresh table grapes	0806 10 10	2,722,357.92	3,260,540.06	3,081,577.83	3,257,960.46	3,110,412.62
Indoor rooted cuttings and young plants (excl. cacti)	0602 90 70	19,191.31	39,999.56	62,092.41	89,621.55	66,209.92
Wood in the rough, whether or not stripped of bark or sapwood, or roughly squared	4403	885,348.63	740,695.24	1,072,076.38	1,398,851.75	2,140,410.41
	Sum	26,576,112.07	30,190,334.12	32,326,904.54	32,407,440.68	35,641,145.66

Notifications of interceptions of harmful organisms began to be compiled in Europhyt in May 1994 and in TRACES in May 2020. As of 13 March 2023, there were no records of interception of *N. dimidiatum* or its synonyms in the Europhyt and TRACES databases. However, since *N. dimidiatum* is not a QP, the EU MS have no obligation to notify interceptions of the pathogen via Europhyt.

3.4.2. Establishment

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

Yes, *N. dimidiatum* has already established in Italy (see Section 3.2.2). The pathogen has also been reported from Cyprus and Greece. However, the status of the pathogen in those two MSs is uncertain. Both the biotic (host availability) and abiotic (climate suitability) factors occurring in the EU suggest that the pathogen could further establish in other parts of the EU territory.

Based on its biology, *N. dimidiatum* could potentially be transferred from the pathways of entry to the host plants grown in the EU via splash-dispersed conidia, contaminated soil or other plant growing media associated with plants for planting, as well as by surface (rain or irrigation) water. The frequency of this transfer will depend on the volume and frequency of the imported commodities, their destination (e.g. nurseries, retailers, packinghouses) and proximity to the hosts grown in the EU territory, as well as on the management of plant debris and fruit waste.

3.4.2.1. EU distribution of main host plants

As noted above and shown in Appendix A, *N. dimidiatum* has a very wide host range. In addition, most of its main hosts (see Section 3.1.3) are widely distributed in the EU territory, in commercial production (fields, orchards, greenhouses) and in home gardens. The harvested area of most of the main hosts of *N. dimidiatum* cultivated in the EU 27 in recent years is shown in Table 5. Appendix D provides production statistics for individual MS. In addition, data are available which indicate that the pistachio production area in Spain (the main producer in the EU) is approximately 60,000 ha (<https://www.mapa.gob.es/es/agricultura/temas/producciones-agricolas/frutas-y-hortalizas/Analisis%20realidad%20productiva%20frutos%20de%20cascara.aspx>).

Table 5: Harvested area of some of the *Neoscytalidium dimidiatum* hosts in the EU (27), 2016–2020 (1,000 ha). Source: EUROSTAT (accessed on 9/2/2023; for individual Member States see Appendix D). https://ec.europa.eu/eurostat/databrowser/view/apro_cpsh1/default/table?lang=en

Crop	HS Code	2016	2017	2018	2019	2020
Potatoes (including seeds)	R1000	1,550.50	1,601.18	1,562.85	1,603.70	1,462.78
Aromatic, medicinal and culinary plants	I5000	277.06	218.04	218.87	227.88	301.08
Tomatoes	V3100	253.95	247.95	239.48	242.52	227.58
Apples	F1110	505.66	504.61	506.27	491.08	484.63
Peaches	F1210	156.39	154.06	150.80	144.78	137.07
Apricots	F1230	72.52	72.23	72.57	73.22	76.24
Cherries	F1240	172.45	173.37	175.49	176.30	179.07
Plums	F1250	152.79	153.88	153.43	154.51	159.51
Figs	F2100	23.74	24.63	24.99	25.59	27.23
Walnuts	F4100	72.61	74.15	80.60	87.62	97.02
Almonds	F4300	689.68	742.78	773.88	809.56	852.95
Citrus fruits	T0000	519.01	502.84	508.99	512.83	519.98
Grapes	W1000	3,136.15	3,133.32	3,135.50	3,155.20	3,145.71
Olives	O1000	5,043.87	5,056.93	5,098.62	5,071.59	5,105.12
Pears	F1120	115.13	113.81	113.54	110.66	107.76

3.4.2.2. Climatic conditions affecting establishment

Based on the data available in the literature on the geographical coordinates of the locations from where *N. dimidiatum* has been reported, the pathogen is present in non-EU areas with BSh, BSk, Cfa, Cfb, Cfc, Csa, Csb, Csc, Dfb and Dfc Köppen–Geiger climate zones. These climate zones also occur in the EU territory, where susceptible hosts of *N. dimidiatum* are also grown (Figure 3). Dfc and Dfb climate types appear in a very limited area (mountain area) of Pakistan and there is no additional information about where exactly the pathogen was detected, so there is uncertainty about the suitability of those climate types.

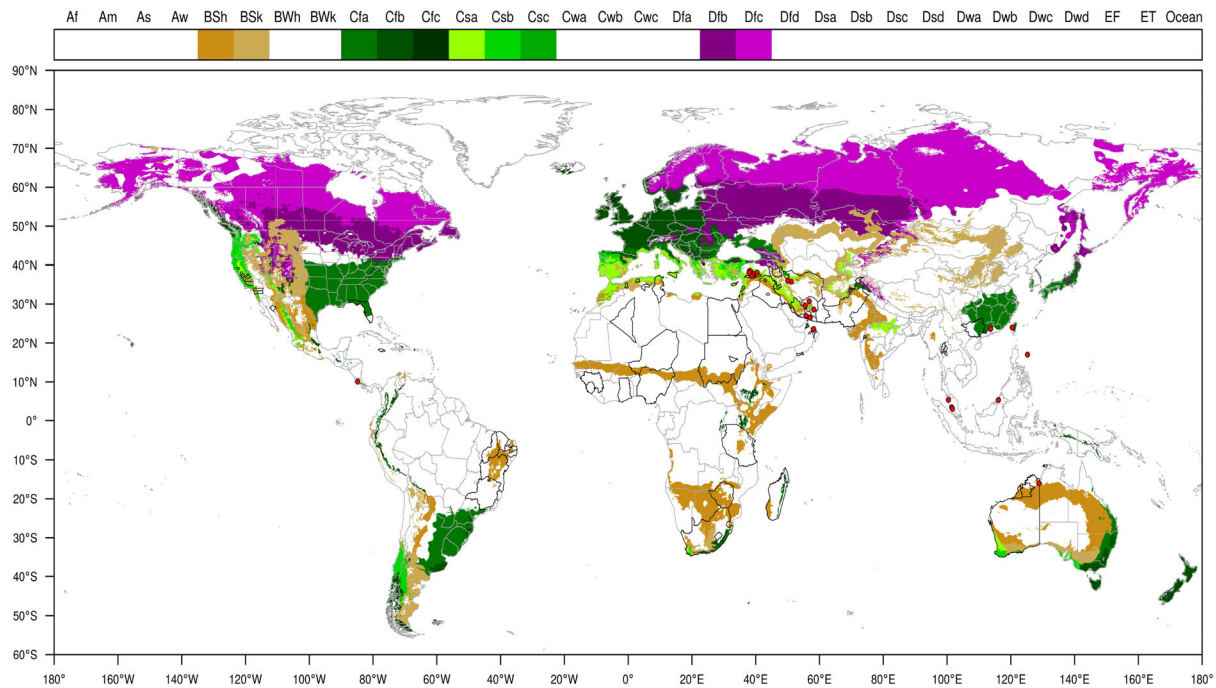


Figure 3: Distribution of 10 Köppen-Geiger climate types, i.e. Bsh, Bsk, Cfa, Cfb, Cfc, Csa, Csb, Csc, Dfa, Dfb and Dfc that occur in the EU and in third countries where *Neoscytalidium dimidiatum* has been reported. The legend shows the list of Köppen-Geiger climates. Red dots indicate point locations where *N. dimidiatum* was reported.

3.4.3. Spread

N. dimidiatum could potentially spread within the EU by both natural and human-assisted means. Host plants for planting is a main means of spread of the pathogen within the EU territory.

N. dimidiatum could potentially spread within the EU via natural and human-assisted means.

Spread by natural means. Conidia of the pathogen, like those of other fungi of the family Botryosphaeriaceae, can spread over relatively short distances by water splash (rain, overhead irrigation) (Fullerton et al., 2018). Wind may increase the dispersal distance of water-splashed conidia, although this has not been studied in the case of *N. dimidiatum*. Yeganeh and Mohammadi (2022) demonstrated that conidia of the pathogen could also be dispersed on the bodies of arthropods. Birds, rodents and other small animals could potentially disperse the pathogen via infected fruits and seeds (Corlett, 2017). Although it has not been documented, phragmospores of the pathogen formed on the surface of infected hosts could potentially be disseminated by wind (see Section 3.1.2).

Spread by human-assisted means. The pathogen can spread over long distances via the movement of infected host plants for planting (rootstocks, grafted plants, scions, etc.), including dormant plants, as well as fresh fruits, contaminated soil/plant growing media and agricultural machinery, tools, etc.

Mirtalebi et al. (2019) demonstrated that the pathogen can colonise the seed coat. Nevertheless, it has not been studied so far if *N. dimidiatum* could potentially spread via the seeds of its host plants.

3.5. Impacts

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

Yes, the further introduction and/or spread of *N. dimidiatum* into the EU is expected to have yield and quality impacts in parts of the territory where susceptible hosts are grown. Nevertheless, the magnitude of the impacts is not known, especially in cases where other members of the family Botryosphaeriaceae or other wood decay fungal pathogens co-infect the same host.

In the non-EU areas of its current distribution, *N. dimidiatum* affects a wide range of woody perennial crops and ornamental plants causing a variety of symptoms, which include leaf spot, leaf scorch, leaf/needle blight, shoot blight, branch dieback, canker, blossom decline, pre-harvest and post-harvest fruit rot, stem-end rot, gummosis, root rot, decline and even the death of the hosts (Pavlic et al., 2008; Polizzi et al., 2011; Sakalidis et al., 2011; Mohd et al., 2013; Rolshausen et al., 2013; Machado et al., 2014; Yi et al., 2015; Mayorquin et al., 2016; Lin et al., 2017; Nouri et al., 2018; de Mello et al., 2019; Oksal et al., 2019; Sabernasab et al., 2019; Türkölmez et al., 2019a,b; Hong et al., 2020; Nourian et al., 2021; Özer et al., 2022; Güney et al., 2022a; Ören et al., 2022a,b).

A disease incidence of 6% caused by *N. dimidiatum* was reported by Ören et al. (2021) in a commercial apple (*Malus domestica*, var. Gala) orchard in Sur district of Diyarbakir, Türkiye. Affected trees exhibited symptoms of dark black lesions on the outer bark, branch dieback, vascular discoloration, stem canker and tree death. Similarly, during a survey conducted in 2020 in apple orchards in Aral, Xinjiang China, 17% of the trees showed bark necrosis, branch dieback, vascular bundle browning and tree death due to *N. dimidiatum* infection (Sha et al., 2022).

During the period 2010–2011, *N. dimidiatum* together with several other members of the family Botryosphaeriaceae were found to be associated with bot gummosis symptoms, such as branch cankers, dieback and gumming, on *Citrus* spp. trees in the main citrus-producing counties of California (Riverside, San Diego, San Luis Obispo, Tulare and Ventura), USA (Adesemoye et al., 2014). During a survey carried out from December 2009 to May 2011 in 17 administrative districts and 166 citrus orchards located in seven geographical regions in Oman, *N. dimidiatum* together with *Lasiodyplodia hormozganensis*, *L. theobromae* and *Fusarium solani* were identified as the causal agents of dieback symptoms observed in 8.8 and 15.9% of acid lime (*C. aurantifolia*) and sweet lime (*C. limettioides*) trees, respectively (Al-Sadi et al., 2014). A survey conducted in 2017 in commercial citrus (clementine, grapefruit, pummelo) orchards in Northern Shoneh, Jordan, showed that *N. dimidiatum* was the causal agent of shoot blight, branch dieback, vascular discoloration and gummosis observed on approximately 10% of the trees (Alanbeh et al., 2019). In spring 2014, *Neoscytalidium dimidiatum* (as *N. hyalinum*) and several other species of the families Botryosphaeriaceae and Togninaceae were identified as the causal agents of a severe decline of citrus trees in Bushehr province, Iran (Espargham et al., 2020). External disease symptoms included chlorosis of leaves, defoliation, branch and shoot cankers and dieback. Internal wood symptoms ranged from brown to black wood streaking and black spots to wedge-shaped necrosis, irregular wood discoloration, central necrosis and arch-shaped necrosis.

In June 2018, decline symptoms and cankers on stems and/or branches caused by *N. dimidiatum* were observed on about 6 to 15% of 5- to 35-year-old pistachio (*Pistacia vera*, cvs Uzun and Kırmızı) trees in commercial orchards of Şanlıurfa (Haliliye, Bozova and Siverek districts), south-eastern Anatolia Region, Türkiye (Derviş et al., 2019a). Young trees exhibited deep bark cracks or cankers on trunks and main branches including shoot blight, whole tree decline, defoliation and death. Older trees (20- to 35-year-old) showed lack of vigour, foliar chlorosis, branch cankers with reduced foliage and dead branches. When bark of trunks was peeled off, tan to dark brown necrosis was observed on the underlying wood. Declining trees in all orchards exhibited dry root rot symptoms extending from taproot to the crown.

According to Hajlaoui et al. (2018), in 2017, a serious decline and dieback of plum (*Prunus domestica*) trees as a result of *N. dimidiatum* infection was observed in many orchards in Tunisia. Varieties Black Star and Sun Gold were the most affected, with a disease incidence of up to 20%. Symptoms included leaf scorching, shoot blight, branch wilt, dark brown wood discoloration, decline and death of trees. Similar symptoms caused by the pathogen (as *N. novaehollandiae*) were observed in 2019 during a survey of diseased almond (*Prunus amygdalus*) trees in commercial orchards in Sur, Çermik and Eğil Counties of Diyarbakir province, Türkiye (Ören et al. (2020b)). *N. dimidiatum* (as *N. novaehollandiae*) was identified by Ören et al. (2022b) as the causal agent of the decline of 8% of sweet cherry (*Prunus avium*) trees in a commercial orchard in Sur County of Diyarbakir province, Türkiye, with the affected trees exhibiting symptoms of shoot blight, branch canker, dieback and dark wood discoloration.

According to Oksal and Özer (2021), *N. dimidiatum* (as *N. novaehollandiae*) was the causal agent of shoot blight, branch canker, dark wood discoloration and dieback of approximately 10% of pear (*Pyrus communis*, cv. Deveci) trees in two commercial orchards in Battalgazi and Doğanşehir districts of Malatya Province, Türkiye.

In July 2018, an incidence of up to 10% of dieback symptoms, including shoot blight, leaf chlorosis, cankers and internal wood necrosis, caused by *N. dimidiatum*, was observed in five vineyards

(*Vitis vinifera*) in the Arapgir district of Malatya, Türkiye (Oksal et al., 2019). Symptoms of shoot blight and wilting, leaf necrosis, drying and shrivelling of berries, wood cankers in the spurs, cordons and trunks and apoplexia of affected vines in the middle of the growing season were some of the symptoms associated with the decline of table grapevines in the Coachella valley, Riverside County, California, USA (Rolshausen et al., 2013). Dieback symptoms caused by the pathogen were also recorded during a survey conducted in 14 vineyards of São Francisco Valley, north-eastern Brazil. The symptoms were prevalent in 40.9% of vineyards surveyed, mainly in mature plants (Correia et al., 2016). Akgül et al. (2019) reported that *N. dimidiatum* and *Lasiodiplodia exigua* were the causal agents of cankers, xylem necrosis and lack of spring growth observed in 2017 in 20-year-old grapevines (cvs Cabernet Sauvignon and Horoz Karasi) in Manisa and Gaziantep provinces in Türkiye. *N. dimidiatum* was among the 24 species of fungal pathogens most frequently associated with grapevine trunk diseases in Kourdistan Province, Iran (Moghadam et al., 2022).

In 2019, during a survey of table- and oil-producing olive (*Olea europaea*) cultivars in commercial groves in Akçakale, Şanlıurfa Province, Southeast Anatolia Region, Türkiye, *N. dimidiatum* was identified as the causal agent of an unusual and serious disease resembled olive leaf scorch disease caused by the bacterium *Xylella fastidiosa* (Güney et al., 2022b). Despite the similarities, scorched leaves exhibited black sporulation mostly on the abaxial surface, unlike typical *X. fastidiosa* infections, and were accompanied by cankers on twigs and branches and ultimately, death of affected trees.

In Brazil, *N. dimidiatum* and four *Lasiodiplodia* species (*L. euphorbicola*, *L. hormozganensis*, *L. parva* and *L. theobromae*) were shown to be the causal agents of black root rot and stem cutting dry rot of cassava (*Manihot esculenta*), two diseases that greatly reduce yield and compromise product quality (Brito et al., 2020).

During summer 2018, serious decline symptoms associated with stem and branch cankers and dry root rot because of *N. dimidiatum* infection were observed in a 3- and 12-year-old commercial walnut (*Juglans regia*) orchards in Şanlıurfa Province, south-eastern Anatolia Region, Türkiye (Derviş et al., 2019b). The disease incidence in the younger orchard grown with cv. Chandler was 62%, whereas that in the older orchard grown with cv. Kaman was 40%. According to Derviş et al. (2019b), by the end of 2018, all symptomatic trees had died.

According to Türkölmez et al. (2019a), *N. dimidiatum* was identified as the causal agent of a shoot and needle blight disease observed in 2018 on 3- to 20-year-old pine (*Pinus nigra*, *P. sylvestris* and *P. eldarica*) trees grown in urban areas (e.g. parks, streets, boulevards) of Şanlıurfa Province, south-eastern Anatolia Region, Türkiye. The blight was most pronounced in the lower part of the crown whereas its most damaging effect was observed on young trees. Disease incidence and severity varied significantly among the pine species, with *P. eldarica* trees being the most severely affected (disease incidence and severity 70 and 80%, respectively). In 2019, *Pinus eldarica* trees grown in urban areas of Tehran and Qazvin Provinces, Iran, showed dieback symptoms caused by *N. dimidiatum* (as *N. novaehollandiae*) (Alizadeh et al., 2022). Disease symptoms included necrosis of green needles, branch dieback and tree decline with an incidence of 80% in both Provinces.

N. dimidiatum (as *N. novaehollandiae*) was the causal agent of a dieback disease which affected 10% of white mulberry (*Morus alba*) trees grown in commercial orchards in Malatya Province, south-eastern Anatolia Region, Türkiye (Oksal, 2022). Disease symptoms included drying of branches, leaf scorching, branch cankers and internal vascular discoloration.

In June 2020, 25% of 2-year-old sage (*Salvia officinalis*, cv. Elif) plants grown in commercial fields of Koruklu village, Akçatepe district of Şanlıurfa Province, Türkiye, were affected by *N. dimidiatum* (as *N. novaehollandiae*). Leaf chlorosis and blight, defoliation and root rot were some of the symptoms caused by the pathogen prior to plant death (Derviş et al., 2021).

The pathogen has also been reported to affect Solanaceous crops. More specifically, among 338 commercial tomato (*Solanum lycopersicum*) fields surveyed in 2017 in three Provinces (Şanlıurfa, Diyarbakir and Mardin) of the south-eastern Anatolia Region, Türkiye, 47 fields (13.9%) were found to be severely infected by *N. dimidiatum* (Türkölmez et al., 2019c). The disease incidence in the affected fields varied between 3 and 75% with an average disease severity of 1.4%. Diseased plants exhibited symptoms of blight with necrotic lesions on leaves, petioles, shoots, stems, flowers and peduncles, leaf chlorosis and defoliation, pith necrosis and fruit and root rot. The pathogen was identified by Derviş et al. (2020a) as the causal agent of pre- and post-harvest rot of tubers in 5% of potato (*Solanum tuberosum*) plants grown in two commercial fields in Şanlıurfa Province, Türkiye. Affected tubers showed black, necrotic, depressed lesions on their surface which expanded to the centre of the tubers.

N. dimidiatum was reported from Italy (eastern Sicily) in 2008 causing shoot blight, canker and gummosis symptoms on 12% of a total of 1,500 2-year-old sweet orange (*Citrus sinensis*, cv. Tarocco Scirè) trees regrafted on sour orange rootstock in a commercial citrus orchard (Polizzi et al., 2009).

Based on the above and given that *N. dimidiatum* has a wide range of hosts some of which are relevant for the EU territory, it is expected that further introduction into and/or spread of the pathogen within the EU would potentially cause yield and quality losses in parts of the territory where susceptible hosts are grown. However, the magnitude of this impact is not known, especially in cases where the pathogen co-infects the same hosts with other fungal pathogens (e.g. other members of the family Botryosphaeriaceae). Moreover, it is not known whether the agricultural practices and chemical control measures currently applied in the EU could potentially reduce this impact.

3.6. Available measures and their limitations

Are there measures available to prevent pest entry, establishment, spread or impacts such that the risk becomes mitigated?

Yes. Although not specifically targeted against *N. dimidiatum*, existing phytosanitary measures (see Sections 3.3.2 and 3.4.1) mitigate the likelihood of the pathogen's further entry into the EU territory on certain host plants. Potential additional measures are also available to further mitigate the risk of further entry, establishment, spread and impacts of the pathogen in the EU (see Section 3.6.1).

3.6.1. Identification of potential additional measures

Phytosanitary measures (prohibitions) are currently applied to some host plants for planting (see Section 3.3.2).

Additional potential risk reduction options and supporting measures are shown in Sections 3.6.1.1 and 3.6.1.2.

3.6.1.1. Additional potential risk reduction options

Potential additional control measures are listed in Table 6.

Table 6: Selected control measures (a full list is available in EFSA PLH Panel et al., 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

Control measure/Risk reduction option <u>(Blue underline = Zenodo doc, Blue = WIP)</u>	RRO summary	Risk element targeted (entry/establishment/spread/impact)
Require pest freedom	Plants, plant products and other objects come from a pest-free country or a pest-free area or a pest-free place of production	Entry/Spread
<u>Growing plants in isolation</u>	Description of possible exclusion conditions that could be implemented to isolate the crop from pests and if applicable relevant vectors. E.g. a dedicated structure such as glass or plastic greenhouses. Growing nursery plants in isolation may represent an effective control measure.	Entry/Establishment/Spread
Managed growing conditions	Proper field drainage, plant distancing, use of pathogen-free agricultural tools (e.g. pruning scissors, saws and grafting blades) and removal of infected plants and plant debris in the field could potentially mitigate the likelihood of infection at origin as well as the spread of the pathogen	Entry/Spread/Impact

Control measure/Risk reduction option (Blue underline = Zenodo doc, Blue = WIP)	RRO summary	Risk element targeted (entry/establishment/spread/impact)
Crop rotation, associations and density, weed/volunteer control	<p>Crop rotation, associations and density, weed/volunteer control are used to prevent problems related to pests and are usually applied in various combinations to make the habitat less favourable for pests.</p> <p>The measures deal with (1) allocation of crops to field (over time and space) (multi-crop, diversity cropping) and (2) to control weeds and volunteers as hosts of pests/vectors.</p> <p>Although <i>N. dimidiatum</i> has a wide host range (Appendix A), crop rotation (wherever feasible) may represent an effective means to reduce inoculum sources and potential survival of the pathogen. Although weeds have not been reported as hosts for <i>N. dimidiatum</i>, their control could potentially make the micro-climatic conditions less favourable (e.g. by reducing moisture) to pathogen infection and spread.</p>	Establishment/Spread/Impact
Roguing and pruning	<p>Roguing is defined as the removal of infested plants and/or uninfested host plants in a delimited area, whereas pruning is defined as the removal of infested plant parts only without affecting the viability of the plant.</p> <p><i>Neoscytalidium dimidiatum</i> overwinters on infected attached plant organs which can act as inoculum sources. Thus, pruning of the symptomatic plant organs may be important in reducing the sources of inoculum and spread capacity.</p>	Spread/Impact
Biological control and behavioural manipulation	<p>Pest control such as:</p> <p>a) Biological control</p> <p>A mixture of <i>Bacillus subtilis</i> supernatant and sodium bicarbonate has been shown to prevent the infection of dragon fruit plants by the pathogen under field conditions (Ratanaprom et al., 2021).</p>	Entry, Establishment, Spread, Impact
Chemical treatments on crops including reproductive material	<p>Several fungicides (e.g. Cu₂O-Cu nanoparticles stabilised by alginate, Floupyram +Tebuconazole, Cyprodinil+Fludioxonil) showed <i>in vitro</i> promising results against <i>Neoscytalidium dimidiatum</i>, but none of them was tested under field conditions (Du et al., 2019; Súr and Oksal, 2021).</p>	Entry, Establishment, Spread, Impact
Chemical treatments on consignments or during processing	<p>Use of chemical compounds that may be applied to plants or to plant products after harvest, during process or packaging operations and storage.</p> <p>The treatments addressed in this information sheet are:</p> <ol style="list-style-type: none"> fumigation; spraying/dipping pesticides; surface disinfectants; process additives; protective compounds <p>The application of fungicides to plants or plant products after harvest, during process or packaging</p>	Entry/Spread/Impact

Control measure/Risk reduction option <u>(Blue underline = Zenodo doc, Blue = WIP)</u>	RRO summary	Risk element targeted (entry/establishment/spread/impact)
	operations and storage may contribute to mitigate the likelihood of entry or spread of <i>Neoscytalidium dimidiatum</i> .	
<u>Physical treatments on consignments or during processing</u>	This information sheet deals with the following categories of physical treatments: irradiation/ionisation; mechanical cleaning (brushing, washing); sorting and grading and; removal of plant parts (e.g. debarking wood). This information sheet does not address: heat and cold treatment (information sheet 1.14); roguing and pruning (information sheet 1.12). Physical treatments (irradiation, mechanical cleaning, sorting, etc.) may reduce or mitigate the risk of entry/spread, but no specific information for <i>N. dimidiatum</i> is available.	Entry/Spread
<u>Cleaning and disinfection of facilities, tools and machinery</u>	The physical and chemical cleaning and disinfection of facilities, tools, machinery, transport means, facilities and other accessories (e.g. boxes, pots, pallets, palox, supports, hand tools). The measures addressed in this information sheet are: washing, sweeping and fumigation. <i>Neoscytalidium dimidiatum</i> commonly enters its host plants through wounds created by pruning or grafting. Therefore, cleaning and surface sterilisation of pruning and grafting tools as well as of equipment and facilities (including premises, storage areas) are good cultural and handling practices employed in the production and marketing of any commodity and may mitigate the likelihood of further entry or spread of the pathogen.	Entry/Spread
Limits on soil	<i>Neoscytalidium dimidiatum</i> survives in soil and plant debris. Therefore, plants, plant products and other objects (e.g. used farm machinery) should be free from soil to ensure freedom from the pathogen.	Entry/Establishment/Spread
<u>Soil treatment</u>	The control of soil organisms by chemical and physical methods listed below: a) Fumigation; b) Heating; c) Solarisation; d) Flooding; e) Soil suppression; f) Augmentative Biological control; g) Biofumigation Given that <i>N. dimidiatum</i> survives in the soil and despite the lack of specific studies for <i>N. dimidiatum</i> , it is likely that soil and substrate disinfestation with chemical, biological or physical (heat, soil solarisation) means could potentially reduce the persistence and availability of inoculum sources.	Entry/Establishment/Spread/Impact
<u>Use of non-contaminated water</u>	Chemical and physical treatment of water to eliminate waterborne microorganisms. The measures addressed in this information sheet are: chemical treatments (e.g. chlorine, chlorine dioxide, ozone); physical treatments (e.g. membrane filters, ultraviolet radiation, heat); ecological treatments (e.g. slow sand filtration).	Entry/Spread/Impact

Control measure/Risk reduction option (Blue underline = Zenodo doc, Blue = WIP)	RRO summary	Risk element targeted (entry/establishment/spread/impact)
	Although <i>N. dimidiatum</i> , could potentially spread via contaminated irrigation water, physical or chemical treatment of irrigation water is likely not to be feasible under field conditions but may be applied in nurseries and greenhouses.	
<u>Waste management</u>	Treatment of the waste (deep burial, composting, incineration, chipping, production of bioenergy. . .) in authorised facilities and official restriction on the movement of waste. Waste management (incineration, production of bioenergy) that takes place in authorised facilities and official restriction on the movement of infected plant material is in force to prevent the pest from escaping. On-site proper management of pruning residues is recommended as an efficient measure	Entry/Establishment/Spread
<u>Heat and cold treatments</u>	Controlled temperature treatments aimed to kill or inactivate pests without causing any unacceptable prejudice to the treated material itself. The measures addressed in this information sheet are: autoclaving; steam; hot water; hot air; cold treatment Although no specific studies are available for <i>N. dimidiatum</i> , hot water treatment at 50–55°C for 2–5 min with or without fungicide, may be applied to reduce or eradicate inoculum sources of the pathogen on plant organs, such as fruits.	Entry/Spread
<u>Conditions of transport</u>	Specific requirements for mode and timing of transport of commodities to prevent escape of the pest and/or contamination. a) physical protection of consignment b) timing of transport/trade If plant material, potentially infected or contaminated with <i>N. dimidiatum</i> (including waste material) must be transported, specific transport conditions (type of packaging/protection, transport means) should be defined to prevent the pathogen from escaping. These may include, albeit not exclusively: physical protection, sorting prior to transport, sealed packaging, etc.	Entry/Spread
<u>Post-entry quarantine and other restrictions of movement in the importing country</u>	This information sheet covers post-entry quarantine (PEQ) of relevant commodities; temporal, spatial and end-use restrictions in the importing country for import of relevant commodities; Prohibition of import of relevant commodities into the domestic country. 'Relevant commodities' are plants, plant parts and other materials that may carry pests, either as infection, infestation, or contamination. Recommended for plant species known to be host of <i>N. dimidiatum</i> . Nevertheless, this measure does not apply to fruits of host plants.	Establishment/Spread

3.6.1.2. Additional supporting measures

Potential additional supporting measures are listed in Table 7.

Table 7: Selected supporting measures (a full list is available in EFSA PLH Panel et al., 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

Supporting measure	Summary	Risk element targeted (entry/establishment/spread/impact)
Inspection and trapping	<p>Inspection is defined as the official visual examination of plants, plant products or other regulated articles to determine if pests are present or to determine compliance with phytosanitary regulations (ISPM 5). The effectiveness of sampling and subsequent inspection to detect pests may be enhanced by including trapping and luring techniques.</p> <p>The symptoms caused by <i>N. dimidiatum</i> on host plants are similar to those caused by other members of the family Botryosphaeriaceae or by other biotic agents or abiotic agents. Moreover, the pathogen may remain quiescent or latent within the asymptomatic host tissues. Therefore, it is unlikely that the pathogen could be detected based on visual inspection only.</p>	Entry/Establishment/Spread
Laboratory testing	<p>Examination, other than visual, to determine if pests are present using official diagnostic protocols. Diagnostic protocols describe the minimum requirements for reliable diagnosis of regulated pests.</p> <p>Multilocus gene sequencing analysis combined with cultural and morphological characteristics of fungal colonies, pycnidia with conidia and phragmospores is required for the reliable detection and identification of <i>N. dimidiatum</i> (see Section 3.1.5).</p>	Entry/Establishment/Spread
Sampling	<p>According to ISPM 31, it is usually not feasible to inspect entire consignments, so phytosanitary inspection is performed mainly on samples obtained from a consignment. It is noted that the sampling concepts presented in this standard may also apply to other phytosanitary procedures, notably selection of units for testing.</p> <p>For inspection, testing and/or surveillance purposes the sample may be taken according to a statistically based or a non-statistical sampling methodology.</p> <p>Necessary as part of other risk reduction options.</p>	Entry/Establishment/Spread
Phytosanitary certificate and plant passport	<p>An official paper document or its official electronic equivalent, consistent with the model certificates of the IPPC, attesting that a consignment meets phytosanitary import requirements (ISPM 5)</p> <ul style="list-style-type: none"> a) export certificate (import) b) plant passport (EU internal trade) <p>Recommended for plant species known to be hosts of <i>N. dimidiatum</i>, including plant parts (e.g. branches) and seeds for sowing.</p>	Entry/Spread
Certified and approved premises	<p>Mandatory/voluntary certification/approval of premises is a process including a set of procedures and of actions implemented by producers, conditioners and traders contributing to ensure the phytosanitary compliance of consignments. It can be a part of a larger system</p>	Entry/Spread

Supporting measure	Summary	Risk element targeted (entry/establishment/spread/impact)
	<p>maintained by the NPPO in order to guarantee the fulfilment of plant health requirements of plants and plant products intended for trade. Key property of certified or approved premises is the traceability of activities and tasks (and their components) inherent the pursued phytosanitary objective. Traceability aims to provide access to all trustful pieces of information that may help to prove the compliance of consignments with phytosanitary requirements of importing countries.</p> <p>Certified and approved premises may reduce the likelihood of the plants and plant products originating in those premises to be infected by <i>N. dimidiatum</i>.</p>	
Certification of reproductive material (voluntary/official)	<p>Plants come from within an approved propagation scheme and are certified pest free (level of infestation) following testing; Used to mitigate against pests that are included in a certification scheme.</p> <p>The risk of entry and/or spread of <i>N. dimidiatum</i> is reduced if host plants for planting are produced under an approved certification scheme and tested free of the pathogen</p>	Entry/Spread
Delimitation of Buffer zones	<p>ISPM 5 defines a buffer zone as 'an area surrounding or adjacent to an area officially delimited for phytosanitary purposes in order to minimise the probability of spread of the target pest into or out of the delimited area, and subject to phytosanitary or other control measures, if appropriate' (ISPM 5). The objectives for delimiting a buffer zone can be to prevent spread from the outbreak area and to maintain a pest free production place (PFPP), site (PFPS) or area (PFA).</p> <p>Delimitation of a buffer zone around an outbreak area can prevent spread of the pathogen and maintain a pest-free area, site or place of production.</p>	Spread
Surveillance	<p>Surveillance to guarantee that plants and produce originate from a Pest Free Area could be an option.</p> <p><i>Neoscytalidium dimidiatum</i> has been reported to be present in the EU. Therefore, surveillance would be an efficient supporting measure to define pest-free areas or pest-free places of production as well as to prevent further spread of the pathogen.</p>	Spread

3.6.1.3. Biological or technical factors limiting the effectiveness of measures

- Latently infected (asymptomatic) host plants and plant products are unlikely to be detected by visual inspection.
- The similarity of symptoms caused by *N. dimidiatum* and of signs (e.g. pycnidia with conidia, phragmospores) formed by the two asexual states of the pathogen with those of other *Fusicoccum* or *Scytalidium* species or other fungi of the family Botryosphaeriaceae makes impossible the detection and identification of the pathogen based solely on visual inspection.
- The lack of rapid diagnostic methods based on molecular approaches does not allow proper *in planta* identification of the pathogen at entry. In addition, thorough post-entry laboratory analyses may not be feasible for certain commodities as isolation in pure culture is needed prior to DNA extraction as well as molecular identification based on multigene sequencing.
- The wide host range of the pathogen limits the possibility to develop standard diagnostic protocols for all potential hosts.

3.7. Uncertainty

There is uncertainty with respect to the geographical distribution of *N. dimidiatum* in the EU, as in the past, when molecular tools (particularly multigene phylogenetic analysis) were not available, the two syanamorphs of the pathogen might have been misidentified based only on morphology and pathogenicity tests.

4. Conclusions

N. dimidiatum has been reported in the EU (Cyprus, Greece and Italy), but with a restricted distribution. Therefore, *N. dimidiatum* satisfies the criteria that are within the remit of EFSA to assess for this species to be regarded as potential Union QP (Table 8).

Table 8: 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	Key uncertainties
Identity of the pest (Section 3.1)	The identity of <i>N. dimidiatum</i> is clearly defined. The pathogen has been shown to produce consistent symptoms and to be transmissible.	None
Absence/presence of the pest in the EU (Section 3.2)	<i>Neoscytalidium dimidiatum</i> is known to be present in Cyprus, Greece (with uncertainty) and Italy, but with a restricted distribution.	The geographical distribution of <i>N. dimidiatum</i> in the EU, as in the past, the two syanamorphs of the pathogen might have been misidentified based only on morphology and pathogenicity tests.
Pest potential for entry, establishment and spread in the EU (Section 3.4)	<i>Neoscytalidium dimidiatum</i> has already entered the EU and it may be further introduced and spread within the EU territory. The main pathways for the further entry of the pathogen into and spread within the EU territory are: (i) host plants for planting, (ii) fresh fruits of host plants, (iii) bark and wood of host plants and (iv) soil and other plant growing media, originating in infested third countries. <i>Neoscytalidium dimidiatum</i> is present in the EU, which indicates that both the biotic (host availability) and abiotic (climate suitability) factors occurring in parts of the EU are favourable for the further establishment of the pathogen. <i>Neoscytalidium dimidiatum</i> could potentially spread within the EU by both natural and human-assisted means.	None
Potential for consequences in the EU (Section 3.5)	The further introduction and spread of <i>N. dimidiatum</i> into the EU are expected to have yield and quality as well as environmental impacts in parts of the territory where susceptible hosts are grown.	None
Available measures (Section 3.6)	Although not specifically targeted against <i>N. dimidiatum</i> , existing phytosanitary measures mitigate the likelihood of the pathogen's further introduction and spread in the EU territory. Potential additional measures also exist to further mitigate the risk of further introduction and spread of the pathogen in the EU.	None

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Key uncertainties
Conclusion (Section 4)	<i>Neoscytalidium dimidiatum</i> satisfies all the criteria that are within the remit of EFSA to assess for this species to be regarded as potential Union quarantine pest.	None
Aspects of assessment to focus on/scenarios to address in future if appropriate:	The main knowledge gap concerns the present distribution of <i>N. dimidiatum</i> within the EU territory. To reduce this uncertainty, systematic surveys would need to be carried out and isolates of <i>N. dimidiatum</i> and its synonyms in culture collections would need to be re-evaluated using appropriate pest identification methods (e.g. multilocus gene sequencing analysis) to define the current geographical distribution of <i>N. dimidiatum</i> in the EU territory.	

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Abbreviations

EPPO	European and Mediterranean Plant Protection Organization
FAO	Food and Agriculture Organization
IPPC	International Plant Protection Convention
ISPM	International Standards for Phytosanitary Measures
LSU	large-subunit ribosomal RNA
MS	Member State
PLH	EFSA Panel on Plant Health
PZ	Protected Zone
β-tub	β-tubulin
TEF1-a	translation elongation factor 1-alpha
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, 2022)
Control (of a pest)	Suppression, containment or eradication of a pest population (FAO, 2022)
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, 2022)
Eradication (of a pest)	Application of phytosanitary measures to eliminate a pest from an area (FAO, 2022)
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2022)
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.
Hitchhiker	An organism sheltering or transported accidentally via inanimate pathways including with machinery, shipping containers and vehicles; such organisms are also known as contaminating pests or stowaways (Toy and Newfield, 2010).
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, 2022)
Pathway	Any means that allows the entry or spread of a pest (FAO, 2022)
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, 2018)
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, 2018)
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, 2022)

Appendix A – *Neoscytalidium dimidiatum* host plants/species affected

Source: EPPO Global Database (EPPO online), Farr and Rossman (online; <https://nt.ars-grin.gov/fungaldatabases/>) and other literature sources.

Host status	Host name	Plant family	Common name	Reference
Cultivated hosts	<i>Acacia</i> spp.	Fabaceae	Acacias	Chandra (1974)
	<i>Albizia lebbbeck</i>	Fabaceae	Siris tree	Elshafie and Ba-Omar (2002)
	<i>Agave</i> sp.	Asparagaceae		Kranz (1963)
	<i>Agave sisalana</i>	Asparagaceae	Sisal	Xie et al. (2021)
	<i>Anacardium occidentale</i>	Anacardiaceae	Cashew	Coutinho et al. (2018)
	<i>Ananas comosus</i>	Bromeliaceae	Pineapple	Kuruppu et al. (2021)
	<i>Arachnis</i> sp.	Orchidaceae	Scorpion orchid	Williams and Liu (1976)
	<i>Araucaria</i> sp.	Araucariaceae		Peregrine and Kassim (1982)
	<i>Arbutus menziesii</i>	Ericaceae	Madrone	Davison (1972)
	<i>Arbutus unedo</i>	Ericaceae	Strawberry tree	Tsahouridou and Thanassouloupoulos (2000)
	<i>Azadirachta indica</i>	Meliaceae	Neem	Ghasemi-Sardareh and Mohammadi (2020)
	<i>Capsicum annuum</i>	Solanaceae	Pepper	Ebbels and Allen (1979)
	<i>Castanea sativa</i>	Fagaceae	Sweet chestnut	French (1987, 1989)
	<i>Casuarina</i> sp.	Fagales		Boa and Lenné (1994)
	<i>Cattleya</i> spp.	Orchidaceae	Orchids	Suwannarach et al. (2018); Chang et al. (2020)
	<i>Citrus aurantifolia</i>	Rutaceae	Lime	French (1987); Al-Sadi et al. (2014)
	<i>Citrus x clementina</i>	Rutaceae	Clementine	Alananbeh et al. (2020)
	<i>C. maxima</i> (syn. <i>C. grandis</i>)	Rutaceae	Pomelo	French (1987, 1989); Alananbeh et al. (2020)
	<i>C. latifolia</i>	Rutaceae	Persian lime	French (1987, 1989)
	<i>C. limettioides</i>	Rutaceae	Sweet lime	Al-Sadi et al. (2014)
	<i>C. limon</i>	Rutaceae	Lemon	French (1987, 1989); Mayorquin et al. (2016)
	<i>C. limonium</i>	Rutaceae	Lemon	Georghiou and Papadopoulos (1957)
	<i>C. meyerii</i>	Rutaceae	Meyer lemon	French (1987)
	<i>C. paradisi</i>	Rutaceae	Grapefruit	Adesemoye et al. (2014); Mayorquin et al. (2016);
	<i>C. reticulata</i>	Rutaceae	Mandarin	French (1987, 1989)
	<i>C. sinensis</i>	Rutaceae	Sweet orange	French (1987, 1989); Polizzi et al. (2009);
	<i>Citrus</i> spp.	Rutaceae		French (1989); Espargham et al. (2020)
	<i>Citrus x paradisi</i>	Rutaceae	Grapefruit	French (1987, 1989)
	<i>Citrus x tangelo</i>	Rutaceae	Tangelo	French (1987, 1989)
	<i>Crotalaria</i> spp.	Fabaceae	Rattlepods	Pavlic et al. (2008)
	<i>Cucumis melo</i>	Cucurbitaceae	Melon	Mirtalebi et al. (2019)
	<i>Delonix regia</i>	Fabaceae	Royal poinciana	Al Raish et al. (2020)

Host status	Host name	Plant family	Common name	Reference
	<i>Dioscorea</i> spp.	Dioscoreaceae	Yam	Lin et al. (2017); Arrieta-Guerra et al. (2021)
	<i>Diospyros kaki</i>	Ebenaceae	Persimmon	Ören et al. (2020a)
	<i>Eucalyptus</i> spp.	Myrtaceae	Eucalypt	Baban et al. (1995)
	<i>Ficus benghalensis</i>	Moraceae	Banyan tree	Yeganeh and Mohammadi (2022)
	<i>F. benjamina</i> (syn. <i>F. nitida</i>)	Moraceae	Benjamin fig	Al-Bedak et al. (2018)
	<i>F. carica</i>	Moraceae	Fig	Georghiou and Papadopoulos (1957); French (1987, 1989); Ray et al. (2010); Xu et al. (2015); Gusella et al. (2021; Güney et al., 2022a)
	<i>Furcraea gigantea</i> (syn. <i>F. foetida</i>)	Asparagaceae	Green aloe	Johnston (1960)
	<i>Gladiolus</i> sp.	Iridaceae	Gladiolus	French (1989)
	<i>Grevillea agrifolia</i>	Proteaceae	Blue grevillea	Pavlic et al. (2008)
	<i>Hevea brasiliensis</i>	Euphorbiaceae	Rubber tree	Jayasinghe and Silva (1994)
	<i>Hymenocallis littoralis</i>	Amarillidaceae	White spider lily	Nurul Nadiah et al. (2017)
	<i>Ipomoea batatas</i>	Convolvulaceae	Sweet potato	Johnston (1960); de Mello et al. (2019, 2021)
	<i>Jatropha curcas</i>	Euphorbiaceae	Physic nut	Machado et al. (2012); Coutinho et al. (2018)
	<i>Juglans californica</i>	Juglandaceae	California black walnut	French (1987)
	<i>Juglans regia</i>	Juglandaceae	Walnut	Sommer (1955); Farr et al. (2005); Chen et al. (2013); Derviş et al. (2019b)
	<i>Lavandula</i> sp.	Lamiaceae	Lavender	Güney et al. (2021)
	<i>Magnolia grandiflora</i>	Magnoliaceae	Bull bay	Jamali and Banihashemi (2010)
	<i>Malus domestica</i>	Rosaceae	Apple	Mathur (1979); Ören et al. (2022a)
	<i>Mangifera indica</i>	Anacardiaceae	Mango	Mendes et al. (1998); Ray et al. (2010); Ismail et al. (2013); Coutinho et al. (2018)
	<i>Manihot esculenta</i>	Euphorbiaceae	Cassava	Machado et al. (2014); Brito et al. (2020)
	<i>Melia azedarach</i>	Meliaceae	Chinaberry tree	Ahmad et al. (1997)
	<i>Meryta</i> spp.	Araliaceae	–	Comm. from Italian NPP0 (2023)
	<i>Melissa officinalis</i>	Lamiaceae	Lemon balm	Özer et al. (2022)
	<i>Morus</i> spp.	Moraceae	Mulberries	Ahmad et al. (1997)
	<i>Musa acuminata</i>	Musaceae	Banana	Raabe et al. (1981)
	<i>M. nana</i>	Musaceae	Dwarf banana	Meredith (1963)
	<i>Nopalea cochenillifera</i>	Cactaceae	Cactus prickly pear	Feijo et al. (2019)
	<i>Olea europaea</i>	Oleaceae	Olive	Güney et al. (2022b)
	<i>Origanum onites</i>	Lamiaceae	Cretan oregano	Alkan et al. (2022)
	<i>Persea americana</i>	Lauraceae	Avocado	EFSA PLH Panel et al. (2021b)
	<i>Phoenix dactylifera</i>	Arecaceae	Date palm	Juber et al. (2015)
	<i>Pinus</i> spp.	Pinaceae	Pine	Türkölmez et al. (2019a)

Host status	Host name	Plant family	Common name	Reference
	<i>Pistacia vera</i>	Anacardiaceae	Pistachio	Derviş et al. (2019a)
	<i>Populus alba</i>	Salicaceae	Silver poplar	Georghiou and Papadopoulos (1957)
	<i>P. fremontii</i>	Salicaceae	Frémont's cottonwood	Ogawa (1954)
	<i>P. nigra</i>	Salicaceae	Black poplar	Hashemi and Mohammadi (2016)
	<i>Prunus amygdalus</i> (syn <i>P. dulcis</i>)	Rosaceae	Almond	French (1987, 1989); Nouri et al. (2018); Ören et al. (2020b); Holland et al. (2020)
	<i>P. armeniaca</i>	Rosaceae	Apricot	French (1987, 1989); Georghiou and Papadopoulos (1957); Oksal et al. (2020)
	<i>P. avium</i>	Rosaceae	Cherry	Ören et al. (2022b)
	<i>P. domestica</i>	Rosaceae	Plum	Hajlaoui et al. (2018)
	<i>P. persica</i>	Rosaceae	Peach	French (1987, 1989)
	<i>Psidium guajava</i>	Myrtaceae	Guava	Watson (1971); Ismail et al. (2021)
	<i>Punica granatum</i>	Lythraceae	Pomegranate	Mirtalebi et al. (2019)
	<i>Pyrus communis</i>	Rosaceae	Pear	Oksal and Özer (2021)
	<i>Quercus brantii</i>	Fagaceae	Persian oak	Alidadi et al. (2019)
	<i>Robinia pseudoacacia</i>	Fabaceae	Black locust	Jamali and Banihashemi (2010)
	<i>Salix alba</i>	Salicaceae	White willow	Hashemi and Mohammadi (2016); Türkölmez et al. (2019b)
	<i>Salvia officinalis</i>	Lamiaceae	Sage	Derviş et al. (2021)
	<i>Sansevieria</i> spp.	Asparagaceae	Dracaena	Kranz (1963); Kee et al. (2017); Monteles et al. (2020)
	<i>Selenicereus</i> spp. (syn. <i>Hylocereus</i> spp.)	Cactaceae	Pitahaya, dragon fruit	Chuang et al. (2012); Ezra et al. (2013); Mohd et al. (2013); Yi et al. (2015); Xu et al. (2018); Hong et al. (2020); Serrato-Diaz and Goenaga (2021); Balendres et al. (2022)
	<i>Solanum lycopersicum</i>	Solanaceae	Tomato	Türkölmez et al. (2019c); Derviş et al. (2020b)
	<i>S. tuberosum</i>	Solanaceae	Potato	Derviş et al. (2020a)
	<i>Syzygium cumini</i>	Myrtaceae	Black plum	Panahandeh et al. (2019)
	<i>Thaumatococcus</i> <i>bipinnatifidum</i> (syn. <i>Philodendron bipinnatifidum</i>)	Araceae	Split-leaf philodendron	Mathur (1979)
	<i>Ulmus</i> sp.	Ulmaceae	Elm	Hashemi et al. (2017)
	<i>Vitis vinifera</i>	Vitaceae	Grapevine	Wangikar et al. (1969); Al-Saadoon et al. (2012); Rolshausen et al. (2013); Correia et al. (2016); Jayawardena et al. (2018); Akgul et al. (2019); Oksal et al. (2019); Arkam et al. (2021);
Wild weed hosts	<i>Adansonia</i> spp.	Malvaceae	Baobabs	Sakalidis et al. (2011)
	<i>Aloidendron dichotomum</i>	Asphodeloideae	Quiver tree	Crous et al. (2021)
	<i>Avicennia marina</i>	Acanthaceae	Mangrove	Goudarzi and Moslehi (2020)
	<i>Ficus religiosa</i>	Moraceae	Sacred fig	Mirtalebi et al. (2019)
	<i>Rhizophora mucronata</i>	Rhizophoraceae	Mangrove	Goudarzi and Moslehi (2020)
Artificial/ experimental host				

Appendix B – Distribution of *Neoscytalidium dimidiatum*

Distribution records based on CABI CPC (CABI, online), Farr and Rossman (online; <https://nt.ars-grin.gov/fungaldatabases/>) and other literature sources.

Region	Country	Sub-national (e.g. State)	Status	References
North America	Canada		Present	Binns (1986)
	Costa Rica		Present	Retana-Sanchez et al. (2019)
	Hawaii		Present	Raabe et al. (1981)
	Jamaica		Present	Meredith (1963)
	Mexico	Sonora	Present	Fernández-Herrera et al. (2017)
	Puerto Rico	Mayaguez; San Sebastian	Present	Serrato-Diaz and Goenaga (2021)
	USA	California	Present	Chen et al. (2013)
		Florida		Sanahuja et al. (2016)
South America	Brazil	Minas Gerais	Present	Correia et al. (2016); de Mello et al. (2019)
EU	Greece	Chalkidiki		Tsahouridou and Thanassouloupoulos (2000)
	Cyprus			Georgiou and Papadopoulos (1957)
	Italy	Eastern Sicily	Present	Polizzi et al. (2009)
Africa	Algeria			Arkam et al. (2021)
	Egypt			Farr et al. (2005)
	Ghana			Punithalingam and Waterston (1970)
	Guinea			Kranz (1963)
	Mali			Mayorquin et al. (2016)
	Nigeria			Punithalingam and Waterston (1970)
	Oman			Al-Sadi et al. (2014)
	Sierra Leone			Punithalingam and Waterston (1970)
	South Africa			Crous et al. (2021)
	Sudan		Present	Elshafie and Ali (2005)
	Tanzania			Ebbels and Allen (1979)
	Tunisia		Present	Hajlaoui et al. (2018)
	Zimbabwe			Punithalingam and Waterston (1970)
	Asia	China	Guangxi; Hainan	Present
India			Present	Mangle and Patil (2012)
Iran				Mirtalebi et al. (2019)
Iraq			Present	Haleem et al. (2013)
Israel			Present	Ezra et al. (2013)
Jordan			Present, few occurrences	Alananbeh et al. (2020)
Lebanon				Al-Zarari et al. (1979)
Malaysia			Present	Kee et al. (2017); Ismail et al. (2021)
Oman				Al-Sadi et al. (2014)
Pakistan				Ahmad et al. (1997)
Taiwan			Present	Chang et al. (2020)
Thailand				Suwannarach et al. (2018)
Türkiye			Present	Oksal et al. (2020)
Oceania		Australia	Ord River Irrigation Area (Western Australia)	

Appendix C – EU annual imports of fresh produce of hosts from countries where *Neoscytalidium dimidiatum* is present, 2016–2020 (in 100 kg)

Source: Eurostat accessed on 9/2/2023

		2016	2017	2018	2019	2020
Fresh or dried limes '<i>Citrus aurantifolia</i>, <i>Citrus latifolia</i>'	South Africa	121.32	559.45	237.38	308.48	679.54
	Australia	243.08	100.78	301.50	547.62	5.75
	Egypt	430.06	560.68	275.31	63.49	885.54
	Jordan	:	:	1.98	0.90	11.80
	Mexico	413,060.08	419,216.51	506,796.59	350,538.06	285,276.99
	Iraq	:	:	:	:	20.00
	Malaysia	0.60	3.12	:	:	:
	Thailand	13.85	15.09	38.20	9.64	12.70
	India	0.01	:	33.75	0.00	0.50
	Türkiye	:	159.50	369.89	583.99	748.50
	Sudan	:	:	2.10	:	0.03
	Brazil	665,306.22	674,078.28	716,931.21	818,120.52	865,842.28
	Tanzania	:	:	0.20	:	:
	Israel	1,099.70	596.30	2,217.02	1,203.31	156.28
	Iran,	591.45	389.91	331.99	313.55	534.19
	China	:	2.10	:	:	0.01
	United States	184.03	109.12	413.95	204.48	0.70
	Lebanon	1.56	:	5.68	5.40	0.99
Ghana	279.32	348.24	99.50	:	:	
Sum	1,081,050.40	1,095,790.84	1,227,951.07	1,171,894.04	1,154,174.81	

		2016	2017	2018	2019	2020
Fresh or dried clementines incl. monreales	South Africa	:	225,938.09	263,220.07	260,470.06	251,522.16
	Egypt	:	4,477.74	5,837.08	3,495.86	23,046.26
	Tunisia	:	1,419.60	18.82	684.50	:
	Türkiye	:	9,154.54	8,130.70	15,322.76	1,752.46
	Brazil	:	:	469.00	:	:
	Israel	:	49,824.31	23,119.09	26,517.17	17,301.70
	United States	:	:	23.93	:	:
	Sum	0	290,814.3	300,818.7	306,490.4	293,622.6

		2016	2017	2018	2019	2020
Fresh or dried lemons '<i>Citrus limon</i>, <i>Citrus limonum</i>'	South Africa	442,956.45	561,372.93	819,548.63	944,497.78	1,448,266.86
	Australia	0.60	:	31.24	:	:
	Egypt	13,812.62	30,202.08	28,533.97	22,376.25	44,453.57
	Jordan	1.16	:	1.81	0.50	0.01
	Tunisia	18,883.10	3,504.01	2,682.30	1,566.11	:
	Mexico	1,904.56	:	51.84	376.52	210.24
	Iraq	:	3.60	6.30	:	:
	Malaysia	3.58	2.42	2.46	0.81	:
	Thailand	:	8.10	33.80	4.36	2.40
	Pakistan	:	:	2.25	0.59	:
	India	79.91	1.00	:	17.16	0.00
	Türkiye	999,403.65	883,803.57	1,438,402.80	884,850.03	915,294.04
	Sudan	:	:	:	:	20.05
	Brazil	9,742.20	296.79	18,286.68	:	1,079.75

	Israel	15,911.18	2,079.32	13,600.66	779.16	259.96
	Iran	351.83	277.30	531.70	508.87	639.11
	China	260.72	:	1.02	44.48	6,397.14
	United States	2,051.11	128.03	7.35	223.76	5,871.31
	Sum	1,505,362.67	1,481,679.15	2,321,724.81	1,855,246.38	2,422,494.44

		2016	2017	2018	2019	2020
Fresh or dried grapefruit	South Africa	818,033.13	851,594.34	978,681.31	921,280.18	854,916.87
	Egypt	2,701.17	1,580.15	3,261.41	4,411.51	3,048.70
	Tunisia	32.35	78.17	110.40	24.49	:
	Mexico	132,997.10	128,233.11	77,846.41	89,037.20	55,247.60
	Malaysia	:	:	7.82	:	:
	Thailand	376.42	1,224.53	484.17	548.33	149.62
	India	5.00	:	:	7.89	:
	Türkiye	915,654.17	609,314.62	917,895.49	594,337.57	785,367.30
	Sudan	:	:	:	:	0.50
	Brazil	:	:	1,449.55	:	:
	Tanzania	9.90	:	3.40	9.78	:
	Israel	257,904.61	208,679.65	218,945.84	141,834.58	230,981.55
	Iran	:	:	56.60	:	19.45
	China	827,310.17	1,084,839.19	1,023,348.37	1,108,528.93	1,092,246.65
United States	259,620.77	194,063.68	130,312.27	134,522.83	101,349.91	
Sum	3,214,644.79	3,079,607.44	3,352,403.04	2,994,543.29	3,123,328.15	

		2016	2017	2018	2019	2020
Fresh or dried mandarins incl. tangerines and satsumas (excl. clementines)	South Africa	:	178,354.64	234,820.75	269,990.60	417,220.09
	Australia	:	:	:	0.09	
	Egypt	:	8,947.32	42,130.39	54,774.13	171,978.91
	Jamaica	:	3,325.11	374.86	:	:
	Tunisia	:	602.98	8.55	6.22	:
	Thailand	:	2.20	30.50	2.96	5.00
	Pakistan	:	:	0.20		
	India	:	:	415.87		
	Türkiye	:	199,253.52	391,113.38	426,236.32	618,524.15
	Brazil	:		1,324.33	470.40	
	Israel	:	524,064.37	413,748.63	488,476.55	467,696.43
	Iran,	:	:	:	153.84	14.50
	China	:	:	800.37	10.24	7.04
	United States	:	1.63	19.52	4.07	:
Sum	0	914,551.8	1,084,787	1,240,125	1,675,446	

		2016	2017	2018	2019	2020
Fresh or dried oranges	South Africa	3,475,375.89	3,831,825.30	3,937,334.80	3,604,948.17	4,537,447.36
	Australia	1,768.00		161.12	8,302.75	2,286.45
	Egypt	1,905,494.20	2,197,905.83	2,557,329.62	2,116,970.46	2,562,885.51
	Tunisia	155,874.95	166,176.90	122,438.23	131,617.93	75,620.02
	Mexico	22,441.06	6,171.20	3,960.00	3,472.00	8,680.00
	Thailand	6.20	12.75	29.13	13.01	12.27
	Taiwan	0.17	:	:	:	:
	Canada	:	2.35	:	:	:

India	161.88	:	:	61.51	51.55
Türkiye	310,324.38	213,921.85	274,620.09	109,579.86	192,580.03
Brazil	189,577.07	228,550.16	161,287.18	3,322.02	35,642.02
Tanzania	170.00	190.01	140.52	26.00	75.50
Israel	41,998.83	28,337.72	21,546.68	13,801.61	8,210.14
Iran	89.10	130.14	159.37	436.68	334.03
China	260.60	1.98	1.10	1.21	19.74
United States	18.55	18.19	1.89	50.16	0.04
Sum	6,103,560.88	6,673,244.38	7,079,009.73	5,992,603.37	7,423,844.66

		2016	2017	2018	2019	2020
Melons, incl. watermelons and papaws 'papayas', fresh	South Africa	23,475.34	53,012.58	43,692.54	67,473.80	47,359.69
	Australia	:	:	:	0.76	:
	Egypt	13,608.33	10,538.47	16,014.45	8,505.00	7,735.67
	Jamaica	817.95	31.12	20.83	:	:
	Jordan	39.20	11.61	23.55	25.34	:
	Tunisia	42,604.02	46,478.07	42,050.33	88,190.57	57,988.80
	Mexico	456.77	2,827.84	2,640.91	2,920.65	2,199.75
	Malaysia	1,497.68	115.83	12.85	39.59	0.27
	Thailand	6,567.61	7,387.95	7,852.59	7,601.01	4,562.04
	Taiwan	:	0.00	:	1.99	:
	Pakistan	55.37	79.56	38.39	11.28	3.69
	India	266.19	494.28	378.99	564.48	130.91
	Türkiye	281,069.68	169,135.79	343,268.21	322,368.37	457,690.99
	Sudan	:	0.20	1.34	2.30	0.34
	Brazil	2,132,826.27	2,393,383.10	2,493,394.32	2,460,399.61	2,433,818.21
	Tanzania	:	0.78	0.56	:	:
	Guinea	:	:	:	0.23	:
	Israel	7,385.60	3,730.86	937.60	603.11	277.70
	Iran	31,989.90	30,779.41	58,858.96	55,730.01	17,196.24
	China	9.75	10.92	:	161.00	:
United States	422.01	86.80	120.69	22.38	42.26	
Sum	2,543,091.67	2,718,105.17	3,009,307.11	3,014,621.48	3,029,006.56	

		2016	2017	2018	2019	2020
Fresh pears	South Africa	865,862.63	759,193.32	655,428.91	590,939.08	583,331.56
	Australia	:	:	1,224.72	:	:
	Egypt	:	31.50	0.90	:	225.00
	Türkiye	13,874.34	32,003.71	67,690.28	63,998.83	113,683.44
	Brazil	208.68	:	251.27	926.88	:
	Israel	:	664.59	:	569.20	219.49
	China	102,076.61	98,191.53	116,993.12	82,741.84	99,293.92
	United States	214.47	454.76	471.49	12.54	:
	Sum	982,236.73	890,539.41	842,060.69	739,188.37	796,753.41

		2016	2017	2018	2019	2020
Fresh persimmons	South Africa	823.16	817.79	206.08	7,857.42	4,974.49
	Thailand	:	:	0.07	:	:
	Pakistan	:	:	:	0.52	:
	Türkiye	62.88	10.29	1.50	:	52.88
	Brazil	33.63	315.72	337.60	974.78	428.63
	Israel	2,404.45	3,231.29	1,158.64	181.58	3,211.13
	China	17.57	:	5.09	:	17.40
	Sum	3,341.69	4,375.09	1,708.98	9,014.30	8,684.53

		2016	2017	2018	2019	2020
Fresh figs	South Africa	493.50	697.57	624.33	464.30	471.60
	Egypt	7.46	10.53	13.41	44.08	60.26
	Jordan	4.69	:	3.72	5.53	4.68
	Tunisia	17.30	166.24	5.00	12.80	37.00
	Mexico	79.83	189.76	153.89	118.92	94.08
	India	145.14	59.70	15.48	20.64	7.96
	Türkiye	95,562.59	107,988.68	114,596.40	131,193.76	147,002.04
	Brazil	8,888.47	10,560.50	10,755.17	10,622.06	9,115.87
	Israel	2,316.88	1,300.18	1,406.99	859.53	604.66
	Iran	:	:	0.07	:	4.95
	United States	:	:	:	0.04	:
	Sum	107,515.86	120,973.16	127,574.46	143,341.66	157,403.10

		2016	2017	2018	2019	2020
Sweet potatoes, fresh, chilled, frozen or dried, whether or not sliced or in the form of pellets	South Africa	13,407.03	15,204.75	5,991.94	21,824.66	3,306.90
	Australia	:	:	0.16	5,680.93	1,876.00
	Egypt	61,209.52	52,963.12	106,345.04	227,672.50	352,241.47
	Jamaica	:	5.50	50.41	3.01	:
	Mexico	:	:	5.00	:	:
	Thailand	0.65	4.73	0.11	0.01	0.01
	Canada	360.03	1,302.05	:	:	3.80
	Mali	:	:	:	:	2.50
	Pakistan	200.90	3.97	0.30	0.45	:
	India	5.11	4.61	0.64	5.70	9.46
	Türkiye	:	:	2.56	:	9.15
	Brazil	5,351.09	12,392.49	14,475.89	30,274.22	37,609.58
	Tanzania	:	:	67.68	:	:
	Guinea	:	:	:	:	2.00
	Israel	74,522.19	43,219.12	54,094.50	32,579.82	27,067.87
	China	32,772.48	55,766.94	47,406.22	85,601.95	131,943.20
	United States	628,091.17	915,726.98	1,029,505.42	924,206.76	1,045,241.99
Sum	815,920.17	1,096,594.26	1,257,945.87	1,327,850.01	1,599,313.93	

		2016	2017	2018	2019	2020
Fresh or dried walnuts, in shell	South Africa	1,032.94	930.25		1,092.50	1,126.07
	Australia	23,795.20	46,968.60	31,801.80	24,101.30	30,369.20
	Egypt	0.30	:	:	:	:
	Tunisia	:	:	:	:	1,532.25
	Taiwan	:	:	0.82	:	:
	Canada	602.46	199.58	952.57	800.05	0.02
	Pakistan	2.80	:	:	:	0.46
	India	:	1.13	0.09	:	0.10
	Türkiye	1,405.05	426.60	422.02	463.47	228.11
	Israel	:	0.68	:	0.47	1.55
	Iran	0.54	0.04	1.27	1.02	0.71
	China	21.11	198.20	708.85	776.63	1,518.23
	United States	389,815.07	383,879.68	323,790.90	396,442.89	371,035.90
Sum	416,675.47	432,604.76	357,678.32	423,678.33	405,812.60	

		2016	2017	2018	2019	2020
Fresh apples	South Africa	298,162.64	252,068.96	334,615.90	258,077.03	329,086.35
	Australia	1,048.66	4,926.09	9,159.46	8,311.03	3,638.72
	Egypt	3,161.05	3,234.13	2,299.68	:	2,501.73
	Jordan	572.72	:	:	206.52	:
	Tunisia	:	152.00	:	:	:
	Thailand	:	3.79	:	:	:
	Canada	23.38	0.16	:	:	:
	Pakistan	:	:	:	1.95	0.08
	India	0.01	:	:	:	0.45
	Türkiye	240.22	1,610.74	17,594.86	2,311.21	19,023.31
	Brazil	154,768.58	249,520.21	242,632.64	139,015.43	92,900.91
	Israel	2,225.55	1,037.58	936.63	1,813.20	755.03
	Iran	:	:	2,945.28	0.38	676.65
	China	13,188.53	1,644.89	15,539.34	780.15	4,778.37
	United States	0.05	545.82	2,874.22	:	:
	Sum	473,391.39	514,744.37	628,598.01	410,516.90	453,361.60

		2016	2017	2018	2019	2020
Fresh or dried guavas, mangoes and mangosteens	South Africa	8,550.13	13,015.45	9,739.99	12,116.95	8,656.28
	Australia	25.72	94.18	62.92	:	:
	Egypt	4,135.64	9,186.69	4,855.57	6,407.46	12,233.16
	Jordan	4.00	:	:	:	:
	Tunisia	0.08	:	:	:	:
	Mexico	35,095.07	40,848.36	46,001.68	50,935.79	51,841.89
	Malaysia	289.86	197.22	170.64	72.72	44.56
	Thailand	6,460.81	7,401.80	6,911.89	6,743.91	5,260.84
	Taiwan	:	:	3.48	17.34	0.92
	Canada	:	0.01	0.00	0.23	0.00
	Mali	72,965.87	53,045.00	68,743.59	91,829.06	85,458.70
	Oman	:	:	:	223.93	:
	Pakistan	17,149.78	15,912.58	21,867.43	29,207.33	16,196.50
	India	5,989.34	8,148.87	9,470.36	9,315.51	7,347.61
	Türkiye	0.12	0.21	24.09	68.86	38.93
	Sudan	34.71	43.30	215.93	29.99	10.00

Brazil	1,025,325.37	1,158,717.06	1,241,860.63	1,437,569.20	1,577,043.99
Tanzania	:	:	0.50	1.14	:
Guinea	4,598.88	3,846.36	3,303.14	3,106.88	875.01
Israel	143,726.08	140,551.30	108,353.48	121,875.16	98,143.59
Iran	15.65	12.12	3.00	9.10	1.56
China	38.95	51.87	180.81	78.23	104.34
United States	78,874.11	45,478.21	54,660.34	82,580.54	82,852.21
Sum	1,403,280.17	1,496,550.59	1,576,429.47	1,852,189.33	1,946,110.09

		2016	2017	2018	2019	2020
Fresh or chilled olives (excl. for oil production)	South Africa	:	:	:	0.09	:
	Egypt	:	:	:	21.16	130.13
	Jordan	63.51	3.50	9.06	57.58	:
	Sum	63.51	3.5	9.06	78.83	130.13

		2016	2017	2018	2019	2020
Fresh or dried pistachios, in shell	South Africa	:	:	:	390.10	239.35
	Australia	726.00	:	:	:	:
	Egypt	:	:	107.00	199.58	:
	Jordan	0.02	47.40	:	:	13.39
	Tunisia	:	:	6.01	:	0.02
	Iraq	:	:	2.00	4.50	48.24
	Thailand	:	0.05	:	:	:
	Canada	:	41.60	:	9.10	:
	Oman	:	:	:	:	0.10
	Pakistan	2.00	0.08	:	:	5.67
	India	0.03	0.03	0.01	0.37	1.30
	Türkiye	1,136.98	595.35	1,160.66	2,094.93	1,046.79
	Israel	0.21	0.95	195.30	2.70	0.38
	Iran	190,612.84	163,614.36	160,472.69	51,644.32	151,918.03
	China	3.07	0.39	777.73	400.89	798.23
	United States	346,787.62	543,547.63	523,093.94	718,669.61	674,398.40
Sum	539,268.8	707,847.8	685,815.3	773,416.1	828,469.9	

		2016	2017	2018	2019	2020
Tomatoes, fresh or chilled	Australia	:	:	:	2.52	:
	Egypt	9,135.43	14,023.94	15,102.55	18,876.68	9,491.42
	Jordan	364.60		208.35	21.60	151.41
	Tunisia	101,703.12	101,127.84	149,456.18	162,662.04	186,037.72
	Mexico	:	:	:	:	0.80
	Thailand	0.08	0.08	0.08	0.02	0.02
	Oman	:	:	:	:	1.27
	India	:	:	:	0.01	:
	Türkiye	711,723.54	1,006,308.14	1,076,029.29	1,006,003.21	1,256,058.26
	Brazil	:	27.60	:	:	:
	Israel	16,739.21	10,861.22	6,392.59	782.65	138.00
	Iran	:	363.79	:		11.13
	United States	:	:	0.11	0.04	0.13
Sum	839,666	1,132,712.6	1,247,189.2	1,188,348.8	1,451,890.2	

		2016	2017	2018	2019	2020
Potatoes, fresh or chilled	South Africa	2.00	:	:	235.95	
	Egypt	1,488,601.48	2,118,574.29	1,737,561.60	2,887,875.53	2,537,298.72
	Jordan	:	:	:	:	2,362.37
	Tunisia	10,161.26	8,790.21	8,323.20	12,047.91	10,555.79
	Mexico	0.05	:	:	0.14	1.04
	Thailand	:	0.05	2.05	0.60	:
	Taiwan	:	:	0.71	:	:
	Canada	:	0.27	1,080.00	811.76	:
	Mali	:	:	8.45	:	:
	India	0.01	:	:	:	:
	Türkiye	53,965.03	58,461.50	5,076.59	12,070.55	10,052.44
	Israel	1,366,623.28	1,311,430.16	1,257,417.27	1,303,937.89	993,329.82
	China	0.09	5.00	:	:	0.43
	United States	1.53	62.76	10.88	60.62	37.07
	Sum	2,919,354.73	3,497,324.24	3,009,480.75	4,217,040.95	3,553,637.68

		2016	2017	2018	2019	2020
Fresh table grapes	South Africa	1,244,196.24	1,388,338.79	1,418,505.53	1,395,775.68	1,397,162.80
	Australia	:	0.50	:	:	:
	Egypt	330,040.63	404,015.02	428,993.01	440,776.12	461,383.25
	Tunisia	657.82	:	239.62	40.60	192.00
	Mexico	:	358.96	:	39.11	184.62
	Thailand	:	:	0.16	:	0.65
	Canada	:	164.64	:	164.64	:
	India	640,933.67	827,331.17	722,649.04	950,246.40	733,534.40
	Türkiye	297,498.44	375,141.07	226,426.06	272,090.16	287,310.41
	Brazil	194,152.79	249,279.81	271,987.56	196,465.22	228,091.31
	Israel	13,164.66	7,041.42	6,397.33	318.24	1,080.90
	Iran	:	:	1,969.60	186.00	399.80
	United States	1,713.67	8,868.68	4,409.92	1,858.29	1,072.48
	Sum	2,722,357.92	3,260,540.06	3,081,577.83	3,257,960.46	3,110,412.62

		2016	2017	2018	2019	2020
Indoor rooted cuttings and young plants (excl. cacti)	South Africa	1,350.18	3,955.46	3,726.06	3,245.41	2,856.00
	Australia	128.71	347.76	354.52	369.02	384.96
	Egypt	18.06	35.42	84.34	51.13	33.11
	Mexico	1.28	0.30	:	:	:
	Malaysia	162.98	130.92	208.38	692.96	481.63
	Thailand	5,088.95	5,155.52	5,186.67	5,025.07	5,508.39
	Taiwan	808.70	878.53	815.69	842.29	480.22
	Canada	0.84	1.02	2.76	0.08	0.25
	India	457.56	672.09	4,428.20	4,581.08	4,284.74
	Türkiye	1,416.01	1,710.10	2,039.26	2,570.49	1,728.18
	Brazil	21.51	165.09	656.62	247.66	54.81
	Tanzania	1,476.58	12,105.37	26,386.95	52,854.67	26,873.49
	Guinea	4.44	3.71	2.74	6.64	4.93
	Israel	5,296.44	4,669.39	4,532.24	4,572.86	4,385.72
	Iran	:	1.44	:	:	:
	China	2,752.64	9,997.46	13,466.13	14,163.88	19,018.51

	United States	206.43	169.98	201.85	398.31	114.98
	Sum	19,191.31	39,999.56	62,092.41	89,621.55	66,209.92

		2016	2017	2018	2019	2020
Wood in the rough, whether or not stripped of bark or sapwood, or roughly squared (excl. rough-cut wood for walking sticks, umbrellas, tool shafts and the like; wood in the form of railway sleepers; wood cut into boards or beams, etc.)	South Africa	40,262.35	28,925.20	38,092.88	30,289.10	27,127.77
	Australia	323.49	99.99	154.93	934.60	879.51
	Egypt	:	2,719.30	:	:	1,278.35
	Jamaica	:	49.16	200.00	200.00	400.00
	Tunisia	0.19	10.14	0.22	:	:
	Mexico	7,372.68	4,084.73	6,029.38	7,703.67	7,012.45
	Malaysia	5,080.86	5,043.04	8,347.47	7,741.71	6,407.28
	Thailand	96.50	77.03	21.00	104.70	742.61
	Taiwan	4,602.01	3,568.16	241.17	65.10	184.41
	Canada	4,221.21	1,234.15	2,032.68	2,285.14	2,728.96
	Pakistan	:	:	:	14.75	30.73
	India	1,012.39	702.74	93.67	670.93	6.38
	Türkiye	1,808.75	6,986.10	5,289.58	4,402.52	82.41
	Sudan	:	:	:	9.52	:
	Brazil	2,173.76	1,186.88	62,750.29	786,081.61	1,575,043.54
	Tanzania	:	:	203.60	460.00	:
	Guinea	:	:	203.70	:	:
	Israel	0.01	:	28.68	734.30	2,148.20
	China	56,224.96	23,079.75	12,979.50	10,474.35	24,651.13
	United States	762,169.47	662,928.87	935,407.63	546,679.75	491,686.67
Sum	885,348.63	740,695.24	1,072,076.38	1,398,851.75	2,140,410.40	

Appendix D – EU 27 and Member State cultivation/harvested/production area of *Neoscytalidium dimidiatum* (in 1,000 ha)

Pears	2016	2017	2018	2019	2020
EU27	115.13	113.81	113.54	110.66	107.76
Belgium	9.69	10.02	10.15	10.37	10.66
Bulgaria	0.41	0.45	0.57	0.70	0.50
Czechia	0.74	0.71	0.75	0.80	0.83
Denmark	0.30	0.30	0.29	0.30	0.30
Germany	1.93	2.14	2.14	2.14	2.14
Greece	4.08	4.07	4.41	4.34	5.42
Spain	22.55	21.89	21.33	20.62	20.22
France	5.30	5.25	5.24	5.25	5.38
Croatia	0.93	0.71	0.80	0.86	0.73
Italy	32.29	31.73	31.34	28.71	26.60
Cyprus	0.07	0.07	0.06	0.06	0.07
Latvia	0.20	0.20	0.20	0.20	0.20
Lithuania	0.80	0.82	0.82	0.82	0.85
Luxembourg	0.02	0.02	0.02	0.02	0.01
Hungary	2.87	2.90	2.84	2.81	2.62
Netherlands	9.40	9.70	10.00	10.09	10.00
Austria	0.46	0.46	0.49	0.50	0.54
Poland	7.49	7.26	7.30	7.22	5.80
Portugal	11.99	11.54	11.21	11.33	11.33
Romania	3.15	3.12	3.10	3.08	3.09
Slovenia	0.20	0.20	0.21	0.21	0.22
Slovakia	0.11	0.11	0.12	0.11	0.10
Finland	0.04	0.04	0.05	0.04	0.05
Sweden	0.12	0.12	0.11	0.10	0.11
Potatoes (including seed potatoes)	2016	2017	2018	2019	2020
EU 27	1,550.50	1,601.18	1,562.85	1,603.70	1,462.78
Belgium	89.21	92.85	93.33	98.19	97.34
Bulgaria	8.38	12.81	14.10	9.29	9.95
Czechia	23.41	23.42	22.89	22.89	23.88
Denmark	46.10	49.70	52.00	56.70	62.80
Germany	242.50	250.50	252.20	271.60	273.50
Estonia	3.71	3.45	3.27	3.40	3.38
Ireland	9.04	9.18	8.23	8.67	8.89
Greece	19.13	18.82	16.83	15.95	15.73
Spain	72.14	70.88	67.49	66.65	65.40
France	179.13	194.06	199.56	207.16	214.50
Croatia	9.87	9.83	9.27	9.39	9.33
Italy	48.14	48.57	46.43	46.81	47.35
Cyprus	5.04	4.22	4.54	3.88	3.80
Latvia	10.90	21.50	9.90	10.00	8.50
Lithuania	21.64	18.88	18.69	18.22	18.87
Luxembourg	0.62	0.62	0.63	0.60	0.62
Hungary	16.41	14.66	13.51	13.29	10.27
Malta	0.77	0.69	0.69	0.69	0.57
Netherlands	155.59	160.79	164.60	165.73	164.50

Potatoes (including seed potatoes)	2016	2017	2018	2019	2020
Austria	21.22	22.99	23.76	23.97	24.26
Poland	300.70	321.26	290.97	302.48	226.07
Portugal	23.30	23.74	20.80	17.99	17.53
Romania	186.24	171.39	173.30	174.12	101.03
Slovenia	3.16	3.17	2.81	2.80	2.97
Slovakia	8.26	7.45	7.76	8.19	7.00
Finland	21.70	21.20	21.40	21.40	20.70
Sweden	24.21	24.57	23.91	23.65	24.07
Aromatic, medicinal and culinary plants	2016	2017	2018	2019	2020
EU 27	277.06	218.04	218.87	227.88	301.08
Belgium	0.14	0.16	0.19	0.71	0.84
Bulgaria	50.46	44.87	32.37	46.26	53.14
Czechia	5.30	7.46	8.55	6.06	5.66
Germany	7.10	6.80	7.20	8.00	8.30
Estonia	1.06	1.40	2.56	1.64	2.86
Ireland	0.03	0.04	0.06	0.06	0.03
Greece	9.96	11.08	11.51	12.54	13.85
Spain	12.79	19.20	17.18	17.83	23.06
France	44.50	44.13	50.06	56.10	61.52
Croatia	6.62	8.37	9.23	6.17	7.24
Italy	0.00	0.00	0.00	0.00	2.46
Latvia	2.10	1.60	2.50	1.50	1.00
Lithuania	6.67	7.04	7.74	4.50	4.17
Luxembourg	0.01	0.01	0.01	0.01	0.01
Hungary	4.86	4.50	5.54	4.91	3.96
Malta	0.00	0.00	0.00	0.00	0.00
Netherlands	0.64	0.75	0.79	0.66	0.69
Austria	3.45	4.14	4.49	4.18	4.08
Poland	103.30	30.56	36.18	29.88	84.52
Portugal	0.00	1.64	1.64	1.00	1.00
Romania	4.40	3.19	1.78	1.75	1.76
Slovenia	0.09	0.14	0.11	0.12	0.15
Slovakia	2.60	3.17	3.49	5.42	5.77
Finland	11.00	17.80	15.70	18.60	15.00
Fresh vegetables (including melons)	2016	2017	2018	2019	2020
EU 27	2,058.43	2,034.21	2,013.75	2,029.16	1,994.80
Belgium	59.63	64.29	65.62	67.33	68.68
Bulgaria	38.84	28.05	28.40	28.68	23.87
Czechia	10.20	10.24	10.40	10.22	11.14
Denmark	10.68	11.32	11.67	12.22	11.95
Germany	117.39	124.96	122.69	123.86	123.04
Estonia	2.04	2.35	2.09	2.06	2.05
Ireland	4.32	4.28	4.24	4.32	4.45
Greece	81.69	82.70	78.66	69.52	73.26
Spain	373.77	380.08	372.88	380.22	380.98
France	249.50	259.14	257.82	256.18	267.99

Fresh vegetables (including melons)	2016	2017	2018	2019	2020
Croatia	9.62	9.42	9.77	8.71	8.44
Italy	430.00	418.38	418.12	420.86	413.74
Cyprus	2.92	2.79	2.73	2.68	2.69
Latvia	2.70	2.40	2.80	3.28	3.70
Lithuania	10.98	10.13	11.04	11.64	12.07
Luxembourg	0.11	0.13	0.15	0.16	0.17
Hungary	92.53	94.11	91.01	89.31	83.22
Malta	1.99	0.00	0.00	0.00	0.00
Netherlands	87.94	92.50	92.18	97.40	96.53
Austria	17.33	17.78	17.64	18.00	18.22
Poland	217.44	191.98	190.39	190.10	175.80
Portugal	52.43	53.88	47.80	50.48	59.25
Romania	141.50	138.56	140.35	143.31	113.02
Slovenia	5.52	5.43	5.25	6.43	6.98
Slovakia	8.45	6.24	5.97	7.00	6.58
Finland	11.24	12.28	12.24	12.12	12.29
Sweden	17.70	10.79	11.85	13.09	14.70
Tomatoes	2016	2017	2018	2019	2020
EU 27	253.95	247.95	239.48	242.52	227.58
Belgium	0.51	0.52	0.55	0.57	0.62
Bulgaria	4.20	5.01	4.52	5.15	3.09
Czechia	0.34	0.24	0.30	0.16	0.26
Denmark	0.03	0.03	0.03	0.03	0.03
Germany	0.34	0.37	0.40	0.39	0.38
Estonia	0.01	0.00	0.00	0.00	0.01
Ireland	0.01	0.01	0.01	0.01	0.01
Greece	14.01	13.32	16.02	15.01	15.82
Spain	62.72	60.85	56.13	56.94	55.47
France	5.65	5.75	5.74	5.66	5.95
Croatia	0.37	0.45	0.49	0.32	0.40
Italy	103.94	99.75	97.09	99.02	99.78
Cyprus	0.22	0.26	0.29	0.28	0.24
Lithuania	0.57	0.55	0.57	0.56	0.68
Hungary	2.08	2.19	2.50	2.41	1.82
Netherlands	1.78	1.79	1.79	1.80	1.87
Austria	0.18	0.18	0.20	0.20	0.20
Poland	12.42	12.64	13.11	13.50	7.80
Portugal	20.85	20.87	15.83	15.89	15.04
Romania	22.71	22.21	22.97	23.78	17.47
Slovenia	0.21	0.20	0.19	0.22	0.26
Slovakia	0.68	0.60	0.59	0.48	0.22
Finland	0.11	0.11	0.10	0.09	0.10
Sweden	0.04	0.04	0.04	0.04	0.05
Apples	2016	2017	2018	2019	2020
EU 27	505.66	504.61	506.27	491.08	484.63
Belgium	6.49	6.16	5.99	5.79	5.48
Bulgaria	4.11	3.97	3.98	4.14	3.56
Czechia	7.49	7.35	7.25	7.32	7.19

Apples	2016	2017	2018	2019	2020
Denmark	1.35	1.28	1.42	1.39	1.38
Germany	31.74	33.98	33.98	33.98	33.98
Estonia	0.51	0.48	0.60	0.57	0.62
Ireland	0.70	0.70	0.71	0.71	0.71
Greece	10.04	9.60	10.35	9.82	14.38
Spain	30.87	30.55	29.93	29.64	29.49
France	49.65	50.31	50.54	50.37	50.15
Croatia	5.89	4.84	4.73	4.95	4.36
Italy	56.16	57.26	57.44	55.00	54.91
Cyprus	0.53	0.37	0.37	0.37	0.41
Latvia	2.40	3.30	3.20	3.44	3.50
Lithuania	9.70	9.82	10.13	10.18	10.50
Luxembourg	0.26	0.27	0.27	0.27	0.08
Hungary	32.49	32.17	31.84	30.97	25.97
Netherlands	7.30	7.00	6.60	6.42	6.20
Austria	6.67	6.67	6.74	6.59	6.43
Poland	164.76	162.53	166.15	155.62	152.60
Portugal	14.16	13.85	13.61	14.31	14.31
Romania	55.53	55.60	53.94	52.74	52.34
Slovenia	2.42	2.36	2.33	2.27	2.16
Slovakia	2.31	2.18	2.14	2.06	1.80
Finland	0.62	0.63	0.63	0.65	0.67
Sweden	1.54	1.40	1.41	1.52	1.44
Peaches	2016	2017	2018	2019	2020
EU 27	156.39	154.06	150.80	144.78	137.07
Bulgaria	3.66	3.73	3.40	3.02	2.70
Czechia	0.39	0.37	0.38	0.34	0.34
Germany	0.00	0.11	0.11	0.11	0.11
Greece	33.47	33.68	34.76	33.61	32.94
Spain	52.88	52.14	49.87	47.94	44.42
France	4.83	4.80	4.69	4.65	4.75
Croatia	0.79	0.71	0.64	0.68	0.61
Italy	47.03	45.49	44.42	41.93	41.04
Cyprus	0.24	0.21	0.21	0.22	0.23
Hungary	5.42	5.34	4.93	4.79	3.89
Austria	0.16	0.16	0.18	0.18	0.18
Poland	2.23	2.13	2.12	2.15	0.80
Portugal	2.94	2.97	2.84	2.87	2.88
Romania	1.68	1.62	1.64	1.72	1.62
Slovenia	0.30	0.28	0.26	0.25	0.25
Slovakia	0.37	0.32	0.36	0.35	0.31
Apricots	2016	2017	2018	2019	2020
EU 27	72.52	72.23	72.57	73.22	76.24
Bulgaria	2.55	2.90	2.55	2.91	1.84
Czechia	1.15	1.10	1.15	1.15	1.17
Germany	0.00	0.23	0.23	0.23	0.23
Greece	7.34	7.31	7.94	8.35	12.24
Spain	20.35	21.00	20.57	20.24	19.78
France	12.18	12.20	12.27	12.28	12.19

Apricots	2016	2017	2018	2019	2020
Croatia	0.28	0.28	0.27	0.26	0.29
Italy	18.92	17.36	17.81	17.91	17.81
Cyprus	0.22	0.19	0.18	0.18	0.20
Hungary	4.91	4.97	5.04	4.99	5.94
Austria	0.79	0.79	0.83	0.82	0.83
Poland	0.99	0.96	0.97	1.06	0.90
Portugal	0.43	0.56	0.56	0.54	0.52
Romania	2.20	2.11	1.97	2.04	2.03
Slovenia	0.07	0.08	0.08	0.08	0.09
Slovakia	0.16	0.19	0.16	0.18	0.20
Cherries	2016	2017	2018	2019	2020
EU 27	172.45	173.37	175.49	176.30	179.07
Belgium	1.32	1.40	1.14	1.14	1.12
Bulgaria	9.60	10.06	11.23	12.16	11.73
Czechia	2.19	2.11	2.07	2.16	2.15
Denmark	0.79	0.66	0.56	0.53	0.61
Germany	7.14	7.96	7.94	7.94	7.89
Estonia	0.00	0.01	0.00	0.00	0.01
Greece	15.57	15.83	16.21	16.24	20.70
Spain	26.95	27.59	27.50	27.60	27.91
France	8.14	8.01	8.13	8.03	7.96
Croatia	3.43	3.53	2.94	2.85	3.12
Italy	29.97	29.27	29.16	29.21	29.01
Cyprus	0.21	0.23	0.22	0.23	0.23
Latvia	0.10	0.10	0.10	0.12	0.10
Lithuania	0.72	0.73	0.76	0.77	0.77
Hungary	15.49	15.65	15.88	15.93	16.62
Netherlands	0.82	0.81	0.79	0.78	0.79
Austria	0.24	0.25	0.30	0.30	0.30
Poland	36.81	36.44	36.91	37.29	35.20
Portugal	6.43	6.30	6.14	6.50	6.49
Romania	6.13	6.02	7.06	6.09	5.94
Slovenia	0.18	0.19	0.20	0.21	0.22
Slovakia	0.17	0.19	0.21	0.20	0.16
Sweden	0.04	0.03	0.03	0.03	0.04
Plums	2016	2017	2018	2019	2020
EU 27	152.79	153.88	153.43	154.51	159.51
Belgium	0.03	0.03	0.03	0.04	0.04
Bulgaria	6.71	6.82	7.36	8.02	8.57
Czechia	1.88	1.76	1.82	1.88	1.89
Denmark	0.06	0.06	0.07	0.08	0.09
Germany	4.35	4.83	4.82	4.83	4.84
Estonia	0.00	0.02	0.02	0.02	0.02
Greece	2.60	2.06	2.20	2.18	2.44
Spain	15.28	15.20	14.64	14.85	14.41
France	14.81	15.06	14.97	14.83	14.83
Croatia	4.83	4.36	4.28	4.46	3.39
Italy	11.57	11.68	11.72	11.94	11.89
Cyprus	0.45	0.38	0.37	0.38	0.43

Plums	2016	2017	2018	2019	2020
Latvia	0.10	0.10	0.10	0.06	0.10
Lithuania	0.73	0.73	0.72	0.74	0.75
Luxembourg	0.04	0.04	0.04	0.04	0.04
Hungary	7.98	7.94	7.92	7.96	7.06
Netherlands	0.25	0.26	0.26	0.28	0.27
Austria	0.18	0.19	0.20	0.20	0.21
Poland	13.39	13.31	13.48	13.63	18.70
Portugal	1.80	1.78	1.80	1.83	1.83
Romania	65.11	66.68	65.91	65.58	67.01
Slovenia	0.04	0.04	0.05	0.05	0.06
Slovakia	0.58	0.52	0.61	0.61	0.59
Sweden	0.04	0.04	0.04	0.04	0.04
Figs	2016	2017	2018	2019	2020
EU 27	23.74	24.63	24.99	25.59	27.23
Bulgaria	0.00	0.00	0.00	0.01	0.03
Greece	3.79	3.82	3.77	3.99	4.40
Spain	12.61	13.56	13.98	14.60	15.72
France	0.38	0.40	0.44	0.44	0.44
Croatia	0.35	0.27	0.27	0.42	0.57
Italy	2.39	2.26	2.23	2.15	2.06
Cyprus	0.10	0.16	0.14	0.16	0.19
Portugal	4.10	4.13	4.13	3.81	3.81
Slovenia	0.01	0.01	0.01	0.02	0.02
Walnuts	2016	2017	2018	2019	2020
EU 27	72.61	74.15	80.60	87.62	97.02
Belgium	0.05	0.05	0.08	0.10	0.10
Bulgaria	6.28	5.05	6.18	6.36	7.10
Czechia	0.18	0.19	0.17	0.13	0.16
Germany	0.00	0.29	0.29	0.29	0.29
Greece	12.04	13.19	15.27	14.82	20.27
Spain	9.63	10.37	11.00	11.44	12.29
France	21.36	21.63	22.17	25.88	24.99
Croatia	5.40	5.55	6.70	7.21	8.11
Italy	4.54	4.35	4.50	4.67	4.93
Cyprus	0.21	0.19	0.18	0.21	0.22
Luxembourg	0.01	0.01	0.01	0.01	0.01
Hungary	4.85	5.08	5.40	6.00	6.40
Austria	0.14	0.14	0.17	0.17	0.18
Poland	2.47	2.38	2.31	2.27	3.00
Portugal	3.32	3.54	3.85	5.37	5.40
Romania	1.67	1.60	1.59	1.62	1.91
Slovenia	0.27	0.34	0.38	0.44	0.48
Slovakia	0.19	0.21	0.36	0.63	1.17
Almonds	2016	2017	2018	2019	2020
EU 27	689.68	742.78	773.88	809.56	852.95
Bulgaria	0.99	0.94	1.09	1.01	0.93
Greece	11.93	13.17	14.14	15.13	23.71
Spain	583.67	633.56	657.77	687.23	718.54

Almonds	2016	2017	2018	2019	2020
France	1.20	1.24	1.22	1.18	1.23
Croatia	0.43	0.46	0.42	0.62	0.81
Italy	57.42	57.60	57.99	52.04	52.65
Cyprus	2.38	2.20	2.31	2.71	2.38
Hungary	0.20	0.21	0.26	0.31	0.35
Portugal	31.46	33.40	38.68	49.35	52.34
Slovenia	0.01	0.01	0.01	0.00	0.01
Citrus fruits	2016	2017	2018	2019	2020
EU 27	519.01	502.84	508.99	512.83	519.98
Greece	45.86	43.47	46.26	44.23	45.62
Spain	295.33	294.26	297.62	296.48	297.97
France	4.22	4.27	4.39	4.61	4.68
Croatia	2.19	2.06	1.97	2.20	2.10
Italy	147.65	135.36	134.64	140.74	145.10
Cyprus	3.41	2.92	3.05	3.20	3.03
Portugal	20.36	20.51	21.07	21.37	21.48
Grapes	2016	2017	2018	2019	2020
EU 27	3,136.15	3,133.32	3,135.50	3,155.20	3,145.71
Belgium	0.24	0.24	0.30	0.38	0.49
Bulgaria	36.55	34.11	34.11	30.05	28.74
Czechia	15.80	15.81	15.94	16.08	16.14
Germany					
Greece	98.09	101.75	100.34	101.85	104.21
Spain	935.11	937.76	939.92	936.89	931.63
France	751.69	750.46	750.62	755.47	759.06
Croatia	23.40	21.90	20.51	19.82	21.45
Italy	673.76	670.09	675.82	697.91	703.90
Cyprus	6.07	5.93	6.67	6.67	6.18
Luxembourg	1.26	1.26	1.25	1.24	1.24
Hungary	68.12	67.08	66.06	64.92	59.63
Malta	0.68	0.68	0.42	0.42	0.45
Netherlands	0.14	0.16	0.17	0.16	0.17
Austria	46.49	46.33	46.50	46.36	46.16
Poland	0.62	0.67	0.73	0.74	1.00
Portugal	179.17	178.95	179.25	175.65	175.67
Romania	174.17	175.32	172.80	176.34	165.60
Slovenia	15.84	15.86	15.65	15.57	15.29
Slovakia	8.71	8.47	8.01	7.92	7.73
Sweden	0.05	0.04	0.05	0.05	0.08
Olives	2016	2017	2018	2019	2020
EU 27	5,043.87	5,056.93	5,098.62	5,071.59	5,105.12
Greece	969.07	940.52	963.12	903.08	906.02
Spain	2,521.69	2,554.83	2,579.00	2,601.90	2,623.72
France	17.38	17.38	17.40	17.72	17.62
Croatia	18.18	18.68	18.70	18.61	20.28
Italy	1,144.95	1,149.47	1,142.12	1,139.47	1,145.52
Cyprus	10.61	10.83	10.76	11.06	9.69
Portugal	360.81	363.97	366.23	378.39	380.85
Slovenia	1.17	1.24	1.30	1.37	1.42