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# 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.



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

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## Table of contents

# 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 Turkiye (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?<br>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 (Nattrass, 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, Nattrass described the coelomycetous synanamorph as *Hendersonula toruloidea* (Nattrass, 1933). Sutton and Dyko (1989) revised the taxonomy of *H. toruloidea* and established the genus *Nattrassia* typified by *Nattrassia 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 *Neoscyatlidium 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* Nattrass
- *Nattrassia toruloidea* (Nattrass) Dyko and Sutton
- *Neoscytalidium dimidiatum* var. *hyalinum* (C.K. Campb. & J.L. Mulder) Madrid, Ruíz-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 code[1] (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-alpha (*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).

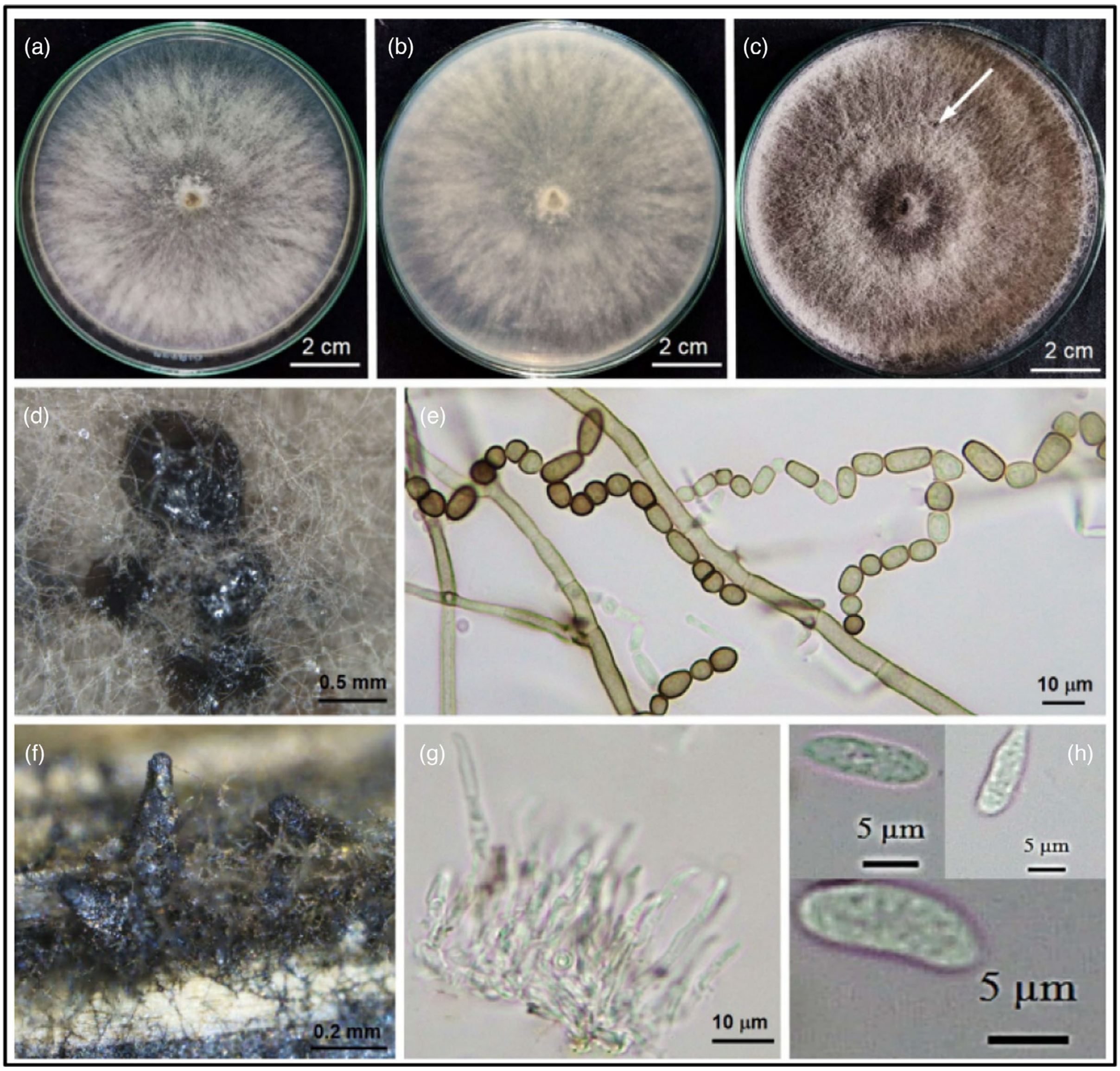


**Figure 1:** Morphological characteristics of *Neoscytalidium dimidiatum* on *Hylocereus polyrhizus*: (a) & (b) 3-day-old colony on PDA in top and bottom view, respectively, (c) 4-week-old colony on PDA developed small black conidiomata (arrow), (d) zoom view of conidiomata, (e) hyphae and phragmospores (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.

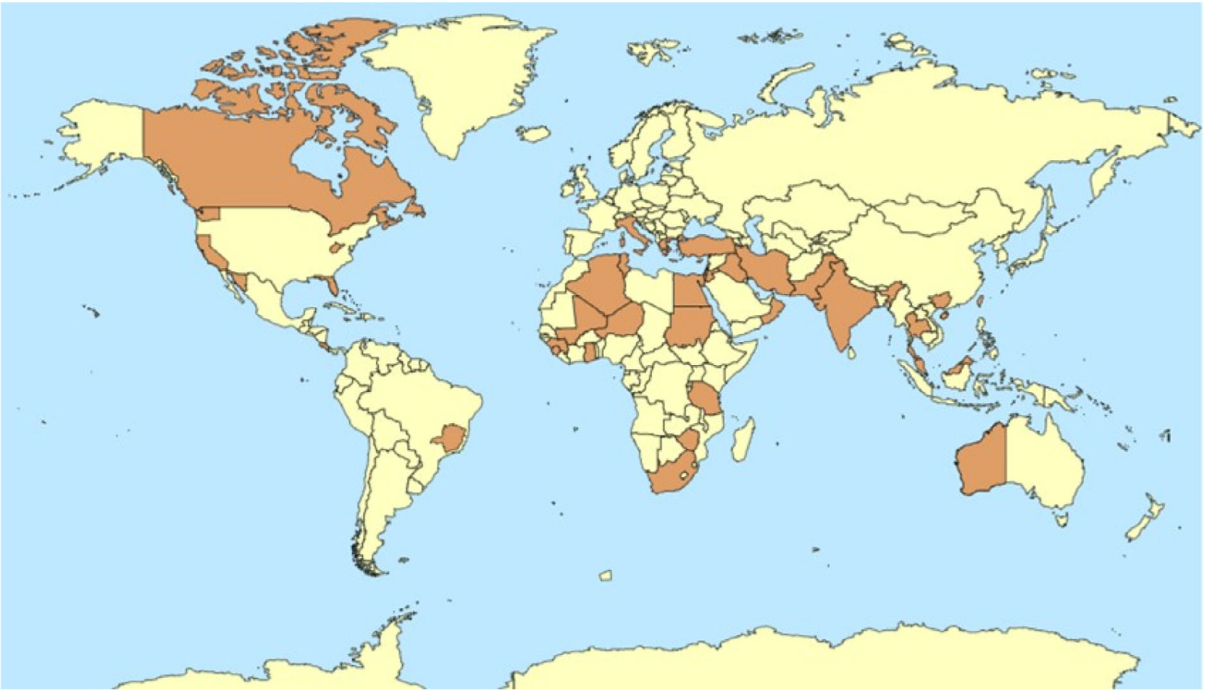

**Figure 2:** Global distribution of *Neoscytalidium dimidiatum* [Data Source: CABI CPC (online; last accessed on 1/2/2023), Farr and Rossman (online; last accessed on 1/2/2023) and other literature sources]. The presence of the pathogen in Greece and Cyprus is uncertain

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/fungaldatabases/; 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*.<br><br>**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*; Tsahouridou and Thanassoulopoulos, 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 [. . .] *Pinus* L., [. . .], other than fruit and seeds | ex 0602 20 20<br>ex 0602 20 80<br>ex 0602 90 41<br>ex 0602 90 45<br>ex 0602 90 46<br>ex 0602 90 47<br>ex 0602 90 50<br>ex 0602 90 70<br>ex 0602 90 99<br>ex 0604 20 20<br>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 *Quercus* L., with leaves, other than fruit and seeds | ex 0602 10 90<br>ex 0602 20 20<br>ex 0602 20 80<br>ex 0602 90 41<br>ex 0602 90 45<br>ex 0602 90 46<br>ex 0602 90 48<br>ex 0602 90 50<br>ex 0602 90 70<br>ex 0602 90 99<br>ex 0604 20 90<br>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 *Populus* L., with leaves, other than fruit and seeds | ex 0602 10 90<br>ex 0602 20 20<br>ex 0602 20 80<br>ex 0602 90 41<br>ex 0602 90 45<br>ex 0602 90 46<br>ex 0602 90 48<br>ex 0602 90 50<br>ex 0602 90 70<br>ex 0602 90 99<br>ex 0604 20 90<br>ex 1404 90 00 | Canada, Mexico, United States |
| 5. | Isolated bark of *Quercus* L., other than *Quercus suber* L. | ex 1404 90 00<br>ex 4401 40 90 | Canada, Mexico, United States |
| 7. | Isolated bark of *Populus* L. | ex 1404 90 00<br>ex 4401 40 90 | The Americas |
| 8. | Plants for planting of [. . .] *Malus* Mill., *Prunus* L., [. . .] and [. . .], other than dormant plants free from leaves, flowers and fruits | ex 0602 10 90<br>ex 0602 20 20<br>ex 0602 20 80<br>ex 0602 40 00<br>ex 0602 90 41<br>ex 0602 90 45<br>ex 0602 90 46<br>ex 0602 90 47<br>ex 0602 90 48<br>ex 0602 90 50<br>ex 0602 90 70<br>ex 0602 90 91<br>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 [. . .] *Malus* Mill., *Prunus* L. and [. . .] and their hybrids, [. . .] other than seeds | ex 0602 10 90<br>ex 0602 20 20<br>ex 0602 90 30<br>ex 0602 90 41<br>ex 0602 90 45<br>ex 0602 90 46<br>ex 0602 90 48<br>ex 0602 90 50<br>ex 0602 90 70<br>ex 0602 90 91<br>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 *Vitis* L., other than fruits | ex 0602 10 10<br>ex 0602 20 10<br>ex 0604 20 90<br>ex 1404 90 00 | Third countries other than Switzerland |
| 11. | Plants of *Citrus* L., [. . .] and their hybrids, other than fruits and seeds | ex 0602 10 90<br>ex 0602 20 20<br>ex 0602 20 30<br>ex 0602 20 80<br>ex 0602 90 45<br>ex 0602 90 46<br>ex 0602 90 47<br>ex 0602 90 50<br>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<br>ex 0602 90 99<br>ex 0604 20 90<br>ex 1404 90 00 | |
| 15 | Tubers of *Solanum tuberosum* L., seed potatoes | 0701 10 00 | Third countries other than Switzerland |
| 16 | Plants for planting of stolon- or tuber-forming species of Solanum L. or their hybrids, other than those tubers of *Solanum tuberosum* L. as specified in entry 15 | ex 0601 10 90<br>ex 0601 20 90<br>ex 0602 90 50<br>ex 0602 90 70<br>ex 0602 90 91<br>ex 0602 90 99 | Third countries other than Switzerland |
| 17 | Tubers of species of *Solanum* L., and their hybrids, other than those specified in entries 15 and 16 | ex 0601 10 90<br>ex 0601 20 90<br>0701 90 10<br>0701 90 50<br>0701 90 90 | Third countries other than:<br>a) Algeria, Egypt, Israel, Libya, Morocco, Syria, Switzerland, Tunisia and Türkiye,<br>or<br>b) those which fulfil the following provisions:<br>i) they are one of following:<br>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<br>and<br>(ii) — they are either recognised as being free from *Clavibacter sepedonicus* (Spieckermann and Kottho) Nouioui et al., in accordance with the procedure referred to in Article 107 of Regulation (EU) No 2016/2031, or<br>— their legislation, is recognised as equivalent to the Union rules concerning protection against *Clavibacter sepedonicus* (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<br>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 *Cocos nucifera* L., previously not used for growing of plants or for any agricultural purposes | ex 2530 10 00<br>ex 2530 90 00<br>ex 2703 00 00<br>ex 3101 00 00<br>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 *N. dimidiatum* 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).<br><br>Special requirements exist for the introduction into the Union (i) from Israel of plants for planting, other than seeds, of *Ficus carica, Albizia julibrissin* and *Robinia pseudoacacia* as well as of *Ulmus* wood [Commission Regulations (EU) 2021/1936 and 2020/1214] and (ii) from Türkiye of plants for planting, other than seeds, of *Juglans regia*, *Nerium oleander* and *Robinia pseudoacacia* [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 *Citrus, Solanum lycopersicum* and *Prunus* for sowing and (ii) all third countries of *Solanum tuberosum* 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 *Citrus* spp., *Diospyros kaki, Malus domestica, Mangifera indica, Prunus* spp., *Solanum lycopersicum* and *Vitis vinifera* [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 *Citrus* 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 *Ipomoea* and of *Prunus* L. and *Juglans* 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), *Juglans* and *Ulmus davidiana* and (ii) third countries, other than Switzerland, of isolated bark of *Populus* and *Quercus* (other than *Q. suber*) [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 *Quercus*, including wood which has not kept its natural round surface, (ii) Americas of wood of *Populus*, including wood which has not kept its natural round surface and (iii) certain third countries of wood of Conifers (Pinales), *Juglans* and *Prunus*, 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 chlamydospores | 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 chlamydospores | 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 *Cocos nucifera* 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 *in-vitro* plants | Possibly chlamydospores | 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 chlamydospores | 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 *Citrus aurantifolia, Citrus latifolia*' | 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 '*Citrus limon, Citrus limonum*' | 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.

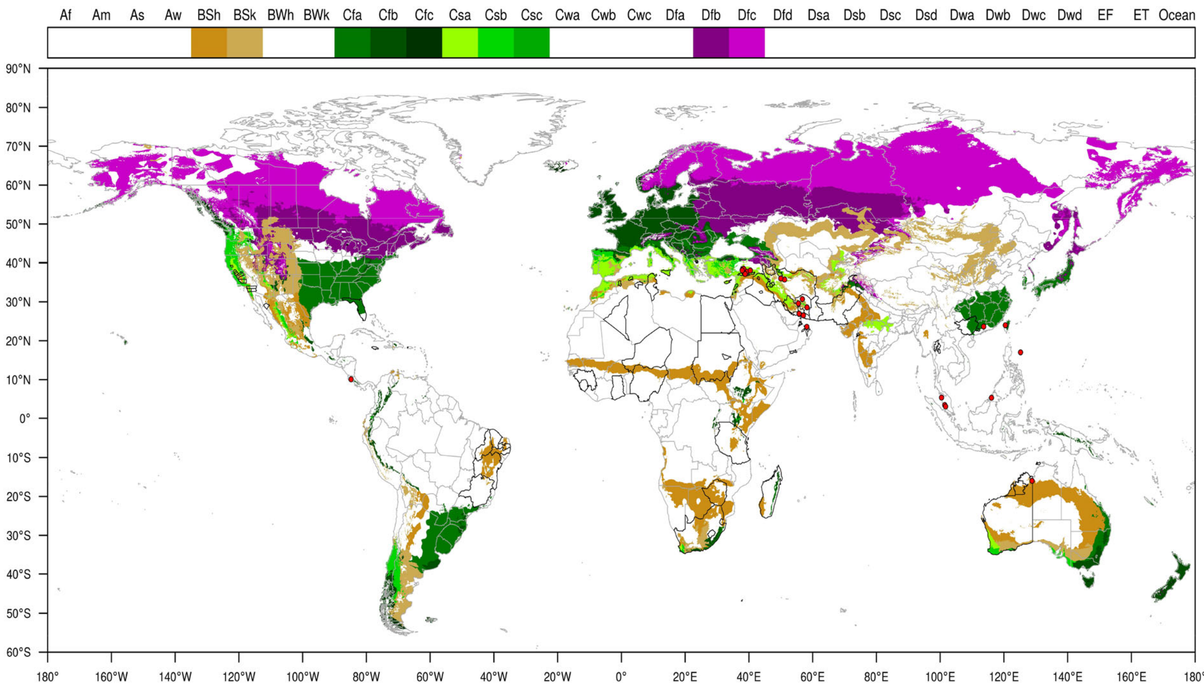


**Figure 3:** Distribution of 10 Köppen–Geiger climate types, i.e. Bsh, Bsk, Cfa, Cfb, Cfc, Csa, Csb, Csc, Dfb and Dfc that occur in the EU and in third countries where *Neoscytalidium dimidiatum* has been reported. The legend shows the list of Köppen–Geiger climates. Red dots indicate point locations 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 *Lasiodiplodia 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 (Alananbeh 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 Solaneceous 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* (Tűrkölmez 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 (Blue underline = Zenodo doc, Blue = WIP) | 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 |
| Growing plants in isolation | 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.<br>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** | 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.<br>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.<br><br>Although *N. dimidiatum* 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 *N. dimidiatum*, their control could potentially make the micro-climatic conditions less favourable (e.g. by reducing moisture) to pathogen infection and spread. | Establishment/Spread/Impact |
| **Roguing and pruning** | 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.<br><br>*Neoscytalidium dimidiatum* 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. | Spread/Impact |
| Biological control and behavioural manipulation | Pest control such as:<br>a) Biological control<br><br>A mixture of *Bacillus subtilis* 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). | Entry, Establishment, Spread, Impact |
| Chemical treatments on crops including reproductive material | Several fungicides (e.g. $Cu_2O$-Cu nanoparticles stabilised by alginate, Floupyram +Tebuconazole, Cyprodinil+Fludioxonil) showed *in vitro* promising results against *Neoscytalidium dimidiatum*, but none of them was tested under field conditions (Du et al., 2019; Sűr and Oksal, 2021). | Entry, Establishment, Spread, Impact |
| Chemical treatments on consignments or during processing | Use of chemical compounds that may be applied to plants or to plant products after harvest, during process or packaging operations and storage.<br><br>The treatments addressed in this information sheet are:<br>a) fumigation;<br>b) spraying/dipping pesticides;<br>c) surface disinfectants;<br>d) process additives;<br>e) protective compounds<br><br>The application of fungicides to plants or plant products after harvest, during process or packaging | Entry/Spread/Impact |

| Control measure/Risk reduction option (Blue underline = Zenodo doc, Blue = WIP) | RRO summary | Risk element targeted (entry/establishment/ spread/impact) |
|---|---|---|
| | operations and storage may contribute to mitigate the likelihood of entry or spread of *Neoscytalidium dimidiatum*. | |
| **Physical treatments on consignments or during processing** | 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).<br><br>Physical treatments (irradiation, mechanical cleaning, sorting, etc.) may reduce or mitigate the risk of entry/spread, but no specific information for *N. dimidiatum* is available. | Entry/Spread |
| Cleaning and disinfection of facilities, tools and machinery | 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.<br><br>*Neoscytalidium dimidiatum* 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 | *Neoscytalidium dimidiatum* 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 |
| Soil treatment | The control of soil organisms by chemical and physical methods listed below:<br>a) Fumigation; b) Heating; c) Solarisation; d) Flooding; e) Soil suppression; f) Augmentative Biological control; g) Biofumigation<br><br>Given that *N. dimidiatum* survives in the soil and despite the lack of specific studies for *N. dimidiatum*, 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 |
| **Use of non-contaminated water** | 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 *N. dimidiatum*, 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. | |
| Waste management | Treatment of the waste (deep burial, composting, incineration, chipping, production of bioenergy...) in authorised facilities and official restriction on the movement of waste.<br><br>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 |
| Heat and cold treatments | 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<br><br>Although no specific studies are available for *N. dimidiatum*, 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 |
| Conditions of transport | Specific requirements for mode and timing of transport of commodities to prevent escape of the pest and/or contamination.<br>a) physical protection of consignment<br>b) timing of transport/trade<br><br>If plant material, potentially infected or contaminated with *N. dimidiatum* (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 |
| Post-entry quarantine and other restrictions of movement in the importing country | 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.<br>'Relevant commodities' are plants, plant parts and other materials that may carry pests, either as infection, infestation, or contamination.<br>Recommended for plant species known to be host of *N. dimidiatum*. 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** | 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).<br>The effectiveness of sampling and subsequent inspection to detect pests may be enhanced by including trapping and luring techniques.<br><br>The symptoms caused by *N. dimidiatum* 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. | Entry/Establishment/ Spread |
| **Laboratory testing** | 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.<br><br>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 *N. dimidiatum* (see Section 3.1.5). | Entry/Establishment/ Spread |
| Sampling | 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.<br>For inspection, testing and/or surveillance purposes the sample may be taken according to a statistically based or a non-statistical sampling methodology.<br><br>Necessary as part of other risk reduction options. | Entry/Establishment/ Spread |
| Phytosanitary certificate and plant passport | 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)<br>a) export certificate (import)<br>b) plant passport (EU internal trade)<br>Recommended for plant species known to be hosts of *N. dimidiatum*, including plant parts (e.g. branches) and seeds for sowing. | Entry/Spread |
| **Certified and approved premises** | 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 | Entry/Spread |

| Supporting measure | Summary | Risk element targeted (entry/establishment/spread/impact) |
|---|---|---|
| | 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.<br><br>Certified and approved premises may reduce the likelihood of the plants and plant products originating in those premises to be infected by *N. dimidiatum*. | |
| Certification of reproductive material (voluntary/official) | 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.<br><br>The risk of entry and/or spread of *N. dimidiatum* is reduced if host plants for planting are produced under an approved certification scheme and tested free of the pathogen | Entry/Spread |
| **Delimitation of Buffer zones** | 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).<br><br>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. | Spread |
| Surveillance | Surveillance to guarantee that plants and produce originate from a Pest Free Area could be an option.<br><br>*Neoscytalidium dimidiatum* 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. | 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 *N. dimidiatum* 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)** | *Neoscytalidium dimidiatum* is known to be present in Cyprus, Greece (with uncertainty) and Italy, but with a restricted distribution. | The geographical distribution of *N. dimidiatum* 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)** | *Neoscytalidium dimidiatum* 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. *Neoscytalidium dimidiatum* 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. *Neoscytalidium dimidiatum* 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 *N. dimidiatum* 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 *N. dimidiatum*, 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)** | *Neoscytalidium dimidiatum* 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 *N. dimidiatum* within the EU territory. To reduce this uncertainty, systematic surveys would need to be carried out and isolates of *N. dimidiatum* 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 *N. dimidiatum* in the EU territory. | |

# References


Adesemoye AO, Mayorquin JS, Wang DH, Twizeyimana M, Lynch SC and Eskalen A, 2014. Identification of species of Botryosphaeriaceae causing bot gummosis in citrus in California. Plant Disease, 98, 55–61. https://doi.org/10.1094/pdis-05-13-0492-re

Ahmad S, Iqbal SH and Khalid AN, 1997. Fungi of Pakistan. Mycological Society of Pakistan. Department of Botany, University of the Punjab, Lahore Pakistan.

Akgül DS, Savas NG and Ozarslandan M, 2019. First report of wood canker caused by *Lasiodiplodia exigua* and *Neoscytalidium novaehollandiae* on grapevine in Turkey. Plant Disease, 103(5), 1037.

Alananbeh KM, Al-Qasim M, Gharaibeh A and Al-Hiary HA, 2020. First report of shoot blight caused by *Neoscytalidium dimidiatum* on citrus in Jordan. Plant Disease, 104(2), 571. https://doi.org/10.1094/PDIS-04-19-0860-PDN

Al-Bedak OA, Mohamed RA and Seddek NH, 2018. First detection of *Neoscytalidium dimidiatum* associated with canker disease in Egyptian ficus trees. Forest Pathology, 48(2), e12411. https://doi.org/10.1111/efp.12411

Alidadi A, Kowsari M, Javan-Nikkhah M, Jouzani GRS and Rastaghi ME, 2019. New pathogenic and endophytic fungal species associated with Persian oak in Iran. European Journal of Plant Pathology, 155(3), 1017–1032.

Alizadeh M, Safaie N, Shams-Bakhsh M and Mehrabadi M, 2022. *Neoscytalidium novaehollandiae* causes dieback on *Pinus eldarica* and its potential for infection of urban forest trees. Scientific Reports, 12, 9337. https://doi.org/10.1038/s41598-022-13414-8

Alkan M, Ozer G, Kosar I, Güney IG and Derviş S, 2022. First report of leaf blight of Turkish oregano (*Origanum onites*) caused by *Neoscytalidium dimidiatum* in Turkey. Journal of Plant Pathology, 104(1), 471.

Al Raish SM, Saeed EE, Sham A, Alblooshi K, El-Tarabily KA and AbuQamar SF, 2020. Molecular characterization and disease control of stem canker on Royal Poinciana (*Delonix regia*) caused by *Neoscytalidium dimidiatum* in the United Arab Emirates. International Journal of Molecular Sciences, 21(3), 1033. https://doi.org/10.3390/ijms21031033

Al-Saadoon AH, Ameen MK and Al-Badran AI, 2012. First report of grapevine dieback caused by *Lasiodiplodia theobromae* and *Neoscytalidium dimidiatum* in Basrah, Southern Iraq. African Journal of Biotechnology, 11(95), 16165–16171. https://doi.org/10.5897/AJB12.010

Al-Sadi AM, Al-Ghaithi AG, Al-Fahdi N and Al-Yahyai R, 2014. Characterization and pathogenicity of fungal pathogens associated with root diseases of citrus in Oman. International Journal of Agriculture and Biology, 16, 371–376.

Al-Zarari AJ, Attackchi AA, Tarabeib AM and Michail SH, 1979. New hosts of *Hendersonula toruloidea*. Pakistan Journal of Scientific and Industrial Research, 22(5), 251.

Arkam M, Alves A, Lopes A, Cechova J, Pokluda R, Eichmeier A, Zitouni A, Mahamedi AE and Berraf-Tebbal A, 2021. Diversity of Botryosphaeriaceae causing grapevine trunk diseases and their spatial distribution under different climatic conditions in Algeria. European Journal of Plant Pathology, 161(4), 933–952. https://doi.org/10.1007/s10658-021-02377-7

Arrieta-Guerra JJ, Díaz-Cabadiaz AT, Pérez-Pazos JV, Cadena-Torres J, Sánchez L and Diana B, 2021. Hongos asociados a la pudrición seca de tubérculos de ñame (*Dioscorea rotundata* Poir.) en Córdoba, Colombia. Agronomía Mesoamericana, 32(3), 790–807. https://doi.org/10.15517/am.v32i3.41697

Baban B, Choolaei A, Emami M, Shidfar M and Rezaei S, 1995. The first survey of *Hendersonula toruloidea* as a human pathogen in Iran. Journal of International Medical Research, 23(2), 123–125.

Bakhshizadeh M, Hashemian HR, Najafzadeh MJ, Dolatabadi S and Zarrinfar H, 2014. First report of rhinosinusitis caused by *Neoscytalidium dimidiatum* in Iran. Journal of Medical Microbiology, 63(7), 1017–1019.

Balendres MA, Taguiam JD and Evallo E, 2022. Estigoy J and Cortaga C, 2022. Fruit brown rot caused by *Neoscytalidium dimidiatum* on *Selenicereus monacanthus* in the Philippines, MycoAsia.

Boa E and Lenné JM, 1994. Diseases of nitrogen fixing trees in developing countries. Natural Resources Institute, Chatham, UK. 82 pp.

Brito ACQ, de Mello JF, Câmara MPS, Vieira JCB, Michereff S, de Souza-Motta CM and Machado AR, 2020. Diversity and pathogenicity of Botryosphaeriaceae species associated with black root rot and stem cutting dry rot in *Manihot esculenta* in Brazil. European Journal of Plant Pathology, 157(2), 583–598. https://doi.org/10.1007/s10658-020-02024-7

CABI Invasive Species Compendium, 2022. *Neoscytalidium dimidiatum*. Available online: https://doi.org/10.1079/cabicompendium.12906083 [Accessed: 1 Feb 2022].

Chandra S, 1974. Some new leaf-spot diseases from Allahabad (India). Nova Hedw Beih, 47, 35–102.

Chang C-W, Chen C-Y, Wang C-L and Chung W-H, 2020. First report of leaf blight on *Cattleya* × hybrid caused by *Neoscytalidium dimidiatum* in Taiwan. Journal of Plant Pathology, 102(3), 921. https://doi.org/10.1007/s42161-020-00499-1

Chen SF, Fichtner E, Morgan DP and Michailides TJ, 2013. First Report of *Lasiodiplodia citricola* and *Neoscytalidium dimidiatum* causing death of graft union of English walnut in California. Plant Disease, 97, 993. https://doi.org/10.1094/pdis-10-12-1000-pdn

Chuang MF, Ni HF, Yang HR, Hsu SL, Lai SY and Jiang YL, 2012. First report of stem canker disease of pitaya (*Hylocereus undatus, H. polyrhizus*) caused by *Neoscytalidium dimidiatum* in Taiwan. Plant Disease, 96, 906. https://doi.org/10.1094/pdis-08-11-0689-pdn

Corlett RT, 2017. Frugivory and seed dispersal by vertebrates in tropical and subtropical Asia: An update. Global Ecology and Conservation, 11, 1–22. https://doi.org/10.1016/j.gecco.2017.04.007

Correia KC, Silva MA, Netto MSB, Vieira WAS, Camara MPS and Michereff SJ, 2016. First report of grapevine dieback caused by *Neoscytalidium hyalinum* in Brazil. Plant Disease, 100(1), 213. https://doi.org/10.1094/PDIS-03-15-0366-PDN

Coutinho IBL, Cardoso JE, Lima CS, Lima JS, Goncalves FJT, Silva AMS and Freire CO, 2018. An emended description of *Neofusicoccum brasiliense* and characterization of *Neoscytalidium* and *Pseudofusicoccum* species associated with tropical fruit plants in northeastern Brazil. Phytotaxa, 358(3), 251–264. https://doi.org/10.11646/phytotaxa.358.3.3

Crous PW, Slippers B, Wingfield MJ, Rheeder J, Marasas WFO, Phillips AJL, Alves A, Burgess T, Barber P and Groenewald JZ, 2006. Phylogenetic lineages in the Botryosphaeriaceae. Studies in Mycology, 55, 235–253.

Crous PW, Hernández-Restrepo M, Schumacher RK, Cowan DA, Maggs-Kölling G, Marais E, Wingfield MJ, Yilmaz N, Adan OCG, Akulov A, Álvarez Duarte E, Berraf-Tebbal A, Bulgakov TS, Carnegie AJ, de Beer ZW, Decock C, Dijksterhuis J, Duong TA, Eichmeier A, Hien LT, Houbraken JAMP, Khanh TN, Liem NV, Lombard L, Lutzoni FM, Miadlikowska JM, Nel WJ, Pascoe IG, Roets F, Roux J, Samson RA, Shen M, Spetik M, Thangavel R, Thanh HM, Thao LD, van Nieuwenhuijzen EJ, Zhang JQ, Zhang Y, Zhao LL and Groenewald JZ, 2021. New and Interesting Fungi. 4. Fungal Systematics and Evolution, 7, 255–343. https://doi.org/10.3114/fuse.2021.07.13

Davison AD, 1972. Factors affecting development of madrone canker. Plant Disease Reports, 56, 50–52.

de Mello JF, Brito ACQ, Motta CMS, Vieira JCB, Michereff SJ and Machado AR, 2019. First report of *Neoscytalidium dimidiatum* causing root rot in sweet potato in Brazil. Plant Disease, 103(2), 373–374. https://doi.org/10.1094/PDIS-07-18-1242-PDN

de Mello JF, Brito ACQ, Vieira JCB, Camara MPS, Michereff SJ, de Souza-Motta CM and Machado AR, 2021. Identification and pathogenicity of Botryosphaeriaceae species associated with root and stem rot of sweet potato in Brazil. Plant Pathology, 70(7), 1601–1615. https://doi.org/10.1111/ppa.13395

Derviş S, Türkölmez S, Ciftci O, Ulubas Serce C and Dikilitas M, 2019a. First report of *Neoscytalidium dimidiatum* causing canker, shoot blight, and root rot of pistachio in Turkey. Plant Disease, 103(6), 1411. https://doi.org/10.1094/PDIS-01-19-0053-PDN

Derviş S, Türkölmez S, Ciftci O, Ulubas Serce C and Dikilitas M, 2019b. First report of *Neoscytalidium dimidiatum* causing black canker and root rot of walnut in Turkey. Plant Disease, 103(8), 2129. https://doi.org/10.1094/PDIS-02-19-0306-PDN

Derviş S, Ozer G and Türkölmez S, 2020a. First report of *Neoscytalidium dimidiatum* causing tuber rot of potato in Turkey. Journal of Plant Pathology, 102, 1295–1296. https://doi.org/10.1007/s42161-020-00575-6

Derviş S, Ozer G and Tüurkölmez S, 2020b. First report of *Neoscytalidium novaehollandiae* causing stem blight on tomato in Turkey. Journal of Plant Pathology, 102, 1339–1340. https://doi.org/10.1007/s42161-020-00627-x

Derviş S, Güney IG, Kosar I, Bozoglu T and Ozer G, 2021. First report of *Neoscytalidium novaehollandiae* on common sage (*Salvia officinalis*). Australasian Plant Disease Notes, 16, 19. https://doi.org/10.1007/s13314-021-00433-z

Dionne B, Neff L, Lee SA, Sutton DA, Wiederhold NP, Lindner J, Fan H and Jakeman B, 2015. Pulmonary fungal infection caused by *Neoscytalidium dimidiatum*. Journal of Clinical Microbiology, 53, 2381–2384.

Du BD, Ngoc DHB, Thang ND, Le Tuan NA, Thach BD and Hien HQ, 2019. Synthesis and *in vitro* antifungal efficiency of alginate-stabilized Cu2O-Cu nanoparticles against *Neoscytalidium dimidiatum* causing brown spot disease on dragon fruit plants (*Hylocereus undatus*). Vietnam Journal of Chemistry, 57(3), 318–323. https://doi.org/10.1002/vjch.201900022

Dy KS, Wonglom P, Pornsuriva C and Sunpapao A, 2022. Morphological, molecular Identification and pathogenicity of *Neoscytalidium dimidiatum* causing stem canker of *Hylocereus polyrhizus* in Southern Thailand. Plants, 2022 (11), 504. https://doi.org/10.3390/plants11040504

Ebbels DL and Allen DJ, 1979. A supplementary and annotated list of plant diseases, pathogens and associated fungi in Tanzania Phytopathological Paper No 22, 89 pp.

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

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard C, Dehnen-Schmutz K, Di Serio F, Jacques M-A, Jaques Miret JA, Justesen AF, MacLeod A, Magnusson CS, Milonas P, Navas-Cortes JA, Parnell S, Potting R, Reignault PL, Thulke H-H, van der Werf W, Civera AV, Yuen J, Zappalà L, Battisti A, Mas H, Rigling D, Mosbach-Schulz O and Gonthier P, 2021a. Scientific Opinion on the commodity risk assessment of *Ficus carica* plants from Israel. EFSA Journal 2021;19(1):6353, 248 pp https://doi.org/10.2903/j.efsa.2021.6353

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard C, Dehnen-Schmutz K, Di Serio F, Gonthier P, Jacques M-A, Jaques Miret JA, Justesen AF, MacLeod AF, Magnusson CS, Milonas P, Navas-Cortes JA, Parnell S, Potting R, Reignault PL, Thulke H-H, Van der Werf W, Civera AV, Zappalà L, Gomez P, Lucchi A, Urek G, Tramontini S, Mosbach-Schulz O, de la Pena E and Yuen J, 2021b. Scientific Opinion on the commodity risk assessment of *Persea americana* from Israel. EFSA Journal 2021;19(2):6354, 193 pp. https://doi.org/10.2903/j.efsa.2021.6354

EFSA PLH Panel (EFSA Panel on Plant Health), Bragard C, Baptista P, Chatzivassiliou E, Gonthier P, Jaques Miret JA, Justesen AF, MacLeod A, Magnusson CS, Milonas P, Navas-Cortes JA, Parnell S, Potting R, Reignault PL, Stefani E, Thulke H-H, Van der Werf W, Civera AV, Zappalà L, Lucchi A, Gomez P, Urek G, Bernardo U, Bubici G, Carluccio AV, Chiumenti M, Di Serio F, Fanelli E, Kaczmarek A, Marzachı C, Mosbach-Schulz O and Yuen J, 2023. Scientific Opinion on the commodity risk assessment of *Prunus persica* and *P. dulcis* plants from Turkiye. EFSA Journal 2023;21(1):7735, 212 pp. https://doi.org/10.2903/j.efsa.2023.7735

EFSA Scientific Committee, Hardy A, Benford D, Halldorsson T, Jeger MJ, Knutsen HK, More S, Naegeli H, Noteborn H, Ockleford C, Ricci A, Rychen G, Schlatter JR, Silano V, Solecki R, Turck D, Benfenati E, Chaudhry QM, Craig P, Frampton G, Greiner M, Hart A, Hogstrand C, Lambre C, Luttik R, Makowski D, Siani A, Wahlstroem H, Aguilera J, Dorne J-L, Fernandez Dumont A, Hempen M, Valtuena Martınez S, Martino L, Smeraldi C, Terron A, Georgiadis N and Younes M, 2017. Scientific Opinion on the guidance on the use of the weight of evidence approach in scientific assessments. EFSA Journal 2017;15(8):4971, 69 pp. https://doi.org/10.2903/j.efsa.2017.4971

Elshafie AE and Ali OMM, 2005. First report of *Ficus benghalensis* dieback by *Scytalidium dimidiatum* in Sudan. Phytopathologia Mediterranea, 44(1), 80–81.

Elshafie AE and Ba-Omar T, 2002. First report of *Albizia lebbeck* dieback caused by *Scytalidium dimidiatum* in Oman. Mycopathologia, 154, 37–40. https://doi.org/10.1023/a:1015200707971

EPPO (European and Mediterranean Plant Protection Organization), online. EPPO Global Database. Available online: https://gd.eppo.int [Accessed 2 January 2023].

EPPO (European and Mediterranean Plant Protection Organization), 2019. EPPO codes. Available online: https://www.eppo.int/RESOURCES/eppo_databases/eppo_codes

Espargham N, Mohammadi H and Gramaje D, 2020. A Survey of trunk disease pathogens within citrus trees in Iran. Plants, 9, 754. https://doi.org/10.3390/plants9060754

Ezra D, Liarzi O, Gat T, Hershcovich M and Dudai M, 2013. First report of internal black rot caused by *Neoscytalidium dimidiatum* on *Hylocereus undatus* (pitahaya) fruit in Israel. Plant Disease, 97(11), 1513. https://doi.org/10.1094/pdis-05-13-0535-pdn

FAO (Food and Agriculture Organization of the United Nations), 2013. ISPM (International Standards for Phytosanitary Measures) 11—Pest risk analysis for quarantine pests. FAO, Rome, 36 pp. Available online: https://www.ippc.int/sites/default/files/documents/20140512/ispm_11_2013_en_2014-04-30_201405121523-494.65%20KB.pdf

FAO (Food and Agriculture Organization of the United Nations), 2022. International Standards for Phytosanitary Measures. ISPM 5 Glossary of phytosanitary terms. FAO, Rome. Available online: https://www.fao.org/3/mc891e/mc891e.pdf

Farr DF, Elliott M, Rossman AY and Edmonds RL, 2005. *Fusicoccum arbuti* sp. nov. causing cankers on Pacific madrone in western North America with notes on *Fusicoccum dimidiatum*, the correct name for *Scytalidium dimidiatum* and *Nattrassia mangiferae*. Mycologia, 97(3), 730–741.

Farr DF and Rossman AY, online. Fungal Databases, U.S. National Fungus Collections, ARS, USDA. Available online: https://nt.ars-grin.gov/fungaldatabases/ [Accessed: 1 February, 2023].

Feijo FM, Silva MJS, Nascimento AD, Infante NB, Ramos R, Assuncão IP and De Lima GS, 2019. Botryosphaeriaceae species associated with the pickly pear cactus, *Nopalea cochenillifera*. Tropical plant pathology, 44, 452–459. https://doi.org/10.1007/s40858-019-00299-8

Fernández-Herrera E, Moreno-Salazar SF, Rentería-Martínez ME, Arratia-Castro AA and Villar-Luna E, 2017. *Neoscytalidium dimidiatum*: causal agent of dieback in *Ficus benjamina* L. in Mexico. Revista Chapingo. Serie horticultura, 23(3), 203–210. https://doi.org/10.5154/r.rchsh.2017.02.009

French AM, 1987. California plant disease host index. Part 1: fruit and nuts. California Department of Food Agriculture, Sacramento.

French AM, 1989. California plant disease host index. California Department of Food Agriculture, Sacramento.

Fullerton RA, Sutherland PA, Rebstock RS, Hieu NT, Thu NNA, Linh DT, Thanh NTK and Van Hoa N, 2018. The life cycle of dragon fruit canker caused by *Neoscytalidium dimidiatum* and implications for control. In Proceedings of Dragon Fruit Regional Network Initiation Workshop., 71–80. 23 Apr 2018, Available online: https://dfnet.fftc.org.tw/Page/ArticleDetail.aspx?ArticleID=9LeTiREiqsA%3D&PI=ZeDMUJUrfPk%3D&Co=ztBzV%2F10sco%3D&Ca=ztBzV%2F10sco%3D&Ws=ztBzV%2F10sco%3D&Keyword=ztBzV%2F10sco%3D

Georghiou GP and Papadopoulos C, 1957. A second list of Cyprus fungi. Government of Cyprus, Department of Agriculture, 38 pp.

Ginns JH, 1986. Compendium of Plant Disease and Decay Fungi in Canada 1960–1980. Biosystematics Research Centre Ottawa. Minister of Supply and Services, Canada. 416 pp. ISBN 0-660-12223-5.

Ghasemi-Sardareh R and Mohammadi H, 2020. Characterization and pathogenicity of fungal trunk pathogens associated with declining of neem (*Azadirachta indica* A. Juss) trees in Iran. Journal of Plant Pathology, 102, 1159–1171. https://doi.org/10.1007/s42161-020-00598-z

González Cortés LF, Prada L, Bonilla JD, Gómez Lopez MT, Rueda LJ and Ibañez E, 2021. Onychoscopy in a Colombian population with a diagnosis of toenail onychomycosis: an evaluation study for this diagnostic test. Clinical and Experimental Dermatology, 46(8), 1427–1433.

Goudarzi A and Moslehi M, 2020. Distribution of a devastating fungal pathogen in mangrove forests of southern Iran. Crop Protection, 128, 104987. https://doi.org/10.1016/j.cropro.2019.104987

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

Güney İG, Özer G, Turan İ and Derviş S, 2021. First report of *Neoscytalidium dimidiatum* causing foliar and stem blight of lavender in Turkey. Journal of Plant Pathology, 103, 1347–1348. https://doi.org/10.1007/s42161-021-00917-y

Güney IG, Bozoğlu T, Özer G, Türkölmez S and Derviş S, 2022a. First report of *Neoscytalidium dimidiatum* associated with dieback and canker of common fig (*Ficus carica* L.) in Turkey. Journal of Plant Diseases and Protection., 129, 701–705. https://doi.org/10.1007/s41348-022-00586-8

Güney IG, Özer G, Türkölmez S and Derviş S, 2022b. Canker and leaf scorch on olive (*Olea europaea* L.) caused by *Neoscytalidium dimidiatum* in Turkey. Crop Protection, 157, 105985. https://doi.org/10.1016/j.cropro.2022.105985

Gusella G, Morgan DP and Michailides TJ, 2021. Further investigation on limb dieback of fig (*Ficus carica*) caused by *Neoscytalidium dimidiatum* in California. Plant Disease, 105, 324–330. https://doi.org/10.1094/PDIS-06-20-1226-RE

Hajlaoui MR, Nouri MT, Hamrouni N, Trouillas FP, Ben Yahmed N, Eddouzi J and Mnari-Hattab M, 2018. First record of dieback and decline of plum caused by *Neoscytalidium dimidiatum* in Tunisia. New Disease Reports, 38, 20. https://doi.org/10.5197/j.2044-0588.2018.038.020

Haleem RA, Abdullah SK and Jubrael JMS, 2013. Occurrence and distribution of fungi associated with grapevine decline in Kurdistan region-Iraq. Agriculture and Biology Journal of North America, 4(3), 336–348. https://doi.org/10.5251/abjna.2013.4.3.336.348

Hashemi H and Mohammadi H, 2016. Identification and characterization of fungi associated with internal wood lesions and decline disease of willow and poplar trees in Iran. Forest Pathology, 46(4), 341–352. https://doi.org/10.1111/efp.12269

Hashemi H, Mohammadi H and Abdollahzadeh J, 2017. Symptoms and fungi associated with elm trees decline in Iran. European Journal of Forest Research, 136(5), 857–879.

Holland LA, Trouillas FP, Nouri MT, Lawrence DP, Palomo MC, Doll D, Duncan RA, Holtz BA, Culumber M, Yaghmour MA, Niederholzer FJA, Lightle DM, Jarvis_Shean KSP, Gordon P and Fichter EJ, 2020. Fungal pathogens associated with canker diseases of almond in California. Plant Disease, 105(2), 346–360. https://doi.org/10.1094/PDIS-10-19-2128-RE

Hong C-F, Gazis R, Crane JH and Zhang S, 2020. Prevalence and epidemics of Neoscytalidium stem and fruit canker on pitahaya (*Hylocereus* spp.) in South Florida. Plant Disease, 104(5), 1433–1438. https://doi.org/10.1094/PDIS-10-19-2158-RE

Hong C-F, Zhang S, Gazis R, Crane JH and Wasielewski J, 2022. Stem and fruit canker of dragon fruit in South Florida. PP355. UF/IFAS Extension, University of Florida. 4pp.

Ismail AM, Cirvilleri G, Lombard L, Crous PW, Groenewald JZ and Polizzi G, 2013. Characterisation of *Neofusicoccum* species causing mango dieback in Italy. Journal of Plant Pathology, 95(3), 549–557.

Ismail SI, Ahmad Dahlan K, Abdullah S and Zulperi D, 2021. First report of *Neoscytalidium dimidiatum* causing fruit rot on guava (*Psidium guajava*) in Malaysia. Plant Disease, 105(1), 220.

Jamali S and Banihashemi Z, 2010. The pathological and physiological study of *Nattrassia mangiferae* the cause of shade trees decline in Shiraz city. Iranian Journal of Plant Pathology, 46, 105–109.

Jayasinghe CK and Silva WPK, 1994. Foot canker and sudden wilt of *Hevea brasiliensis* associated with *Nattrassia mangiferae*. Plant Pathology, 43, 938–940.

Jayawardena RS, Purahong W, Zhang W, Wubet T, Li X, Liu M, Zhao WS, Hyde KD, Liu JH and Yan JY, 2018. Biodiversity of fungi on *Vitis vinifera* L. revealed by traditional and high-resolution culture-independent approaches. Fungal Diversity, 90, 1–84.

Jo SY, Lee S, Kim KH and Yi J, 2021. A case of brain abscess caused by the dematiaceous mold *Neoscytalidium dimidiatum* in a Korean Man. Annals of Laboratory Medicine, 41(2), 247–249.

Johnston A, 1960. A supplement to a host list of plant diseases in Malaya. Mycological Papers No. 77. The Commonwealth Mycological Institute, Kew, Surrey, England. 30 pp.

Kee YJ, Suhaimi NN, Zakaria L and Mohd MH, 2017. Characterisation of *Neoscytalidium dimidiatum* causing leaf blight on *Sansevieria trifasciata* in Malaysia. Australasian Plant Disease Notes, 12, 60.

Kranz J, 1963. Fungi collected in the Republic of Guinea. Collections from the rain forest. Sydowia, 17, 132–138.

Kuruppu M, Siddiqui Y, Ahmad K and Ali A, 2021. First report of postharvest stem end rot disease on MD2 pineapple fruits caused by *Neoscytalidium dimidiatum* in Malaysia. Plant Disease, 105(5), 1564. https://doi.org/10.1094/PDIS-10-20-2318-PDN

Lan G-B, He Z-F, Xi P-G and Jiang Z-D, 2012. First Report of brown spot disease caused by *Neoscytalidium dimidiatum* on *Hylocereus undatus* in Guangdong. Chinese Mainland. Plant Disease, 96(11), 1702. https://doi.org/10.1094/PDIS-07-12-0632-PDN

Lin C-H, Chen Y-X, Liu W-B, Wu W-Q, Miao W-G and Zheng F-C, 2017. First Report of *Dioscorea esculenta* dieback caused by *Neoscytalidium dimidiatum* in China. Plant Disease, 101(7), 1320. https://doi.org/10.1094/PDIS-02-17-0167-PDN

Machado AR, Pinho DB, Dutra DC and Pereira OL, 2012. First Report of collar and root rot of physic nut (Jatropha curcas) caused by *Neoscytalidium dimidiatum* in Brazil. Plant Disease, 96(11), 1697. https://doi.org/10.1094/PDIS-05-12-0504-PDN

Machado AR, Pinho DB, de Oliveira SAS and Pereira OL, 2014. New occurrences of Botryosphaeriaceae causing black root rot of cassava in Brazil. Tropical Plant Pathology, 39(6), 464–470.

Mangle BB and Patil KB, 2012. *Hendersonula toruloidea* Nattrass. fungus on new host from Nandurbar District (M.S.). Journal of Experimental Sciences, 3(9), 19–20. https://updatepublishing.com/journal/index.php/jes/article/view/1983

Mathur RS, 1979. The Coelomycetes of India. Bishen Singh Mahendra Pal Singh, Delhi. 460 pp.

Mayorquin JS, Wang DH, Twizeyimana M and Eskalen A, 2016. Identification, distribution, and pathogenicity of Diatrypaceae and Botryosphaeriaceae associated with citrus branch canker in the Southern California desert. Plant Disease, 100(12), 2402–2413. https://doi.org/10.1094/PDIS-03-16-0362-RE

Mendes MAS, Silva VL, Dianese JC, Ferreira MASV, Santos CEN, Urben AF, Castro C and Gomes Neto E, 1998. Fungosem Plantas no Brasil. EMBRAPA-SPI/EMBRAPA-CENARGEN, Brasilia. 555 p.

Meredith DS, 1963. Tip rot of banana fruits in Jamaica: I. *Hendersonula toruloidea* on dwarf Cavendish bananas. Transactions of the British Mycological Society, 46(4), 473–481. https://doi.org/10.1016/S0007-1536(63)80046-7

Mirtalebi M, Sabahi F and Banihashemi Z, 2019. Fruit rot caused by *Neoscytalidium hyalinum* on melon in Iran. Australasian Plant Disease Notes, 14, 8. https://doi.org/10.1007/s13314-019-0338-5Australasian

Moghadam JN, Khaledi E, Abdollahzadeh J and Amini J, 2022. *Seimatosporium marivanicum*, *Sporocadus kurdistanicus*, and *Xenoseimatosporium kurdistanicum*: three new pestalotioid species associated with grapevine trunk diseases from the Kurdistan province, Iran. Mycological Progress, 21, 427–446. https://doi.org/10.1007/s11557-021-01764-y

Mohd MH, Salleh B and Zakaria L, 2013. Identification and molecular characterizations of *Neoscytalidium dimidiatum* causing stem canker of red-fleshed dragon fruit (*Hylocereus polyrhizus*) in Malaysia. Journal of Phytopathology, 161, 841–849. https://doi.org/10.1111/jph.12146

Monteles RP, Sousa ES, Da Silva MK, De Brito VST, De Melo MP and Beserra JEA, 2020. *Neoscytalidium dimidiatum* causes leaf blight on *Sansevieria trifasciata* in Brazil. Australasian Plant Disease Notes, 15(1), 1–4.

Moral J, Morgan D, Trapero A and Michailides TJ, 2019. Ecology and epidemiology of diseases of nut crops and olives caused by Botryosphaeriacece fungi in California and Spain. Plant Disease, 103, 1809–1827. https://doi.org/10.1094/PDIS-03-19-0622-FE

Nattrass RM, 1933. A new species of *Hendersonula* (*H. toruloidea*) on deciduous trees in Egypt. Transactions of the British Mycological Society, 18, 189–198.

Nouri MT, Lawrence DP, Yaghmour MA, Michailides TJ and Trouillas FP, 2018. *Neoscytalidium dimidiatum* causing canker, shoot blight and fruit rot of almond in California. Plant Disease, 102(8), 1638–1647. https://doi.org/10.1094/PDIS-12-17-1967-RE

Nourian AN, Salehi M, Safaie N, Khelghatibana F and Abdollahzadeh J, 2021. Fungal canker agents in apple production hubs of Iran. Scientific Reports, 11, 22646. https://doi.org/10.1038/s41598-021-02245-8

Nurul Nadiah MA, Mohamed Nor NMI, Latiffah Z and Hava M, 2017. First report of leaf blight on white spider lily caused by *Neoscytalidium dimidiatum* in Malaysia. New Disease Reports, 35(1), 16. https://doi.org/10.5197/j.2044-0588.2017.035.016

Ogawa JM, 1954. The occurrence of *Hendersonula toruloidea* Nattrass on *Populus* species in California. Plant Disease Reporter, 38, 238.

Oksal E, 2022. Prevalence, molecular characterization, and variety reactions of *Neoscytalidium novaehollandiae* on mulberries in Turkey. Notulae Botanicae Horti Agrobotanici Cluj-Napoca, 50(2), 12716. https://doi.org/10.15835/nbha50212716

Oksal E and Özer G, 2021. First report of shoot blight and branch canker of *Pyrus communis* by *Neoscytalidium novaehollandiae* in Turkey. Journal of Plant Pathology, 103, 673–674.

Oksal E, Celik Y and Özer G, 2019. *Neoscytalidium dimidiatum* causes canker and dieback of grapevine in Turkey. Australasian Plant Disease Notes, 14, 33. https://doi.org/10.1007/s13314-019-0363-4

Oksal E, Yiğit T and Özer G, 2020. First report of *Neoscytalidium dimidiatum* causing shoot blight, dieback and canker of apricot in Turkey. Journal of Plant Pathology, 102, 579–580. https://doi.org/10.1007/s42161-019-00467-4

Ören E, Koca G and Bayraktar H, 2020a. First report of *Neoscytalidium novaehollandiae* associated with branch dieback on Japanese persimmon in Turkey. Journal of Plant Pathology, 102, 1311–1312. https://doi.org/10.1007/s42161-020-00595-2

Ören E, Koca G, Gencer R and Bayraktar H, 2020b. First report of *Neoscytalidium novaehollandiae* associated with stem canker and branch dieback of almond trees. Australasian Plant Disease Notes, 15(1), 1–3. https://doi.org/10.1007/s13314-020-00386-9

Ören E, Palacioğlu KG, Ozan GN and Bayraktar H, 2021. First report of *Neoscytalidium dimidiatum* causing branch dieback and canker on apple in Turkey. Journal of Plant Pathology, 104, 429. https://doi.org/10.1007/s42161-021-00990-3

Ören E, Palacioglu G, Koca G, Ozan GN and Bayraktar H, 2022a. First report of *Neoscytalidium dimidiatum* causing branch dieback and canker on apple in Turkey. Journal of Plant Pathology, 104(1), 429.

Ören E, Palacioglu G, Ozan GN, Celik K and Bayraktar H, 2022b. First report of *Neoscytalidium novaehollandiae* associated with canker and branch dieback on cherry trees in Turkey. Journal of Plant Pathology, 104, 391.

Özer G, Günen TU, Koşar I, Güney IG and Derviş S, 2022. First report of *Neoscytalidium dimidiatum* causing blight of *Melissa officinalis* in Turkey. Journal of Plant Diseases and Protection, 129(1), 197–199. https://doi.org/10.1007/s41348-021-00522-2

Panahandeh S, Mohammadi H and Gramaje D, 2019. Trunk disease fungi associated with *Syzygium cumini* in Iran. Plant Disease, 103(4), 711–720.

Pavlic D, Wingfield MJ, Barber P, Slippers B, Hardy GESJ and Burgess TI, 2008. Seven new species of the Botryosphaeriaceae from baobab and other native trees in Western Australia. Mycologia, 100(6), 851–866. https://doi.org/10.3852/08-020

Penzig O, 1883. Repertorium. Fungi Agrumicoli. (Schluss.). Hedwigia, 22, 73–78.

Peregrine WTH and Kassim BA, 1982. Brunei: A first annotated list of plant diseases and associated organisms. Phytopathological Papers, 27, 1–87.

Polizzi G, Aiello D, Vitale A, Giuffrida F, Groenewald JZ and Crous PW, 2009. First report of shoot blight, canker, and gummosis caused by *Neoscytalidium diimidiatum* on citrus in Italy. Plant Disease, 93, 1215. https://doi.org/10.1094/pdis-93-11-1215a

Polizzi G, Aiello D, Castello I, Vitale A, Groenewald JZ and Crous PW, 2011. Occurrence, molecular characterisation, and pathogenicity of *Neoscytalidium dimidiatum* on citrus in Italy. Acta Horticulturae, 892, 237–243. https://doi.org/10.17660/ActaHortic.2011.892.27

Punithalingam E and Waterston JM, 1970. *Hendersonula toruloidea*. Commonwealth Mycological Institute, Kew, Surrey, England. CMI Descriptions of Pathogenic Fungi and Bacteria, 274, 1–2.

Raabe RD, Conners IL and Martinez AP, 1981. Checklist of plant diseases in Hawaii: including records of microorganisms, principally fungi, found in the state. Hawaii Institute of Tropical Agriculture and Human Resources (CTAHR), Information Text Series 022. 313 pp.

Raiesi O, Hashemi SJ, Yarahmadi M, Getso MI, Raissi V, Amiri S and Boroujeni ZB, 2022. Allergic fungal rhinosinusitis caused by *Neoscytalidium dimidiatum*: A case report: Allergic fungal rhinosinusitis due to *Neoscytalidium dimidiatum*. Journal of Medical Mycology, 32(1), 101212. https://doi.org/10.1016/j.mycmed.2021.101212

Ratanaprom S, Nakkanong K, Nualsri C, Jiwanit P, Rongsawat T and Woraathakorn N, 2021. Overcoming encouragement of dragon fruit plant (*Hylocereus undatus*) against stem brown spot disease caused by *Neoscytalidium dimidiatum* using *Bacillus subtilis* combined with sodium bicarbonate. Plant Pathology Journal, 37(3), 205–214. https://doi.org/10.5423/PPJ.OA.01.2021.0007pISSN

Ray JD, Burgess T and Lanoiselet VM, 2010. First record of *Neoscytalidium dimidiatum* and *N. novaehollandiae* on *Mangifera indica* and *N. dimidiatum* on *Ficus carica* in Australia. Australasian Plant Disease Notes, 5, 48–50. https://doi.org/10.1071/DN10018

Retana-Sánchez K, Blanco-Meneses M and Castro-Zúñiga O, 2019. Etiología del cáncer del tallo provocado por *Neoscytalidium dimidiatum* (Penz) en *Hylocereus costaricensis*, en Costa Rica. Agronomía Costarricense, 43(1), 21–33. https://doi.org/10.15517/rac.v43i1.35646

Rolshausen PE, Akgul DS, Perez R, Eskalen A and Gispert C, 2013. First report of wood canker caused by *Neoscytalidium dimidiatum* on grapevine in California. Plant Disease, 97, 1511. https://doi.org/10.1094/pdis-04-13-0451-pdn

Sabernasab M, Jamali S, Marefat A and Abbasi S, 2019. Morphological and molecular characterization of *Neoscytalidium novaehollandiae*, the cause of *Quercus brantii* dieback in Iran. Phytopathologia Mediterranea, 58(2), 347–357. https://doi.org/10.14601/Phytopathol_Mediter-10621

Sakalidis ML, Ray JD, Lanoiselet V, Hardy GEStJ and Burgess TI, 2011. Pathogenic Botryosphaeriaceae associated with *Mangifera indica* in the Kimberley Region of Western Australia. European Journal of Plant Pathology, 130 (3), 379–391. http://researchrepository.murdoch.edu.au/4196

Sanahuja G, Lopez P and Palmateer AJ, 2016. First report of *Neoscytalidium dimidiatum* causing stem and fruit canker of *Hylocereus undatus* in Florida. Plant Disease, 100(7), 1499. https://doi.org/10.1094/PDIS-11-15-1319-PDN

Sayers EW, Cavanaugh M, Clark K, Ostell J, Pruitt KD and Karsch-Mizrachi I, 2020. Genbank. Nucleic AcidsResearch, 48, 84–86.

Serrato-Diaz LM and Goenaga R, 2021. First Report of *Neoscytalidium dimidiatum* causing stem canker on dragon fruit (*Hylocereus* spp.) in Puerto Rico. Plant Disease, 105, 2728. https://doi.org/10.1094/PDIS-10-20-2265-PDN

Sha S, Wang Z, Hao H, Wang L and Feng H, 2022. First report of *Neoscytalidium dimidiatum* inducing canker disease on apple trees in China. Journal of Plant Pathology, 104, 1149–1150. https://doi.org/10.1007/s42161-022-01131-0

Slippers B and Wingfield MJ, 2007. Botryosphaeriaceae as endophytes and latent pathogens of woody plants: diversity, ecology and impact. Fungal Biology Reviews, 21, 90–106. https://doi.org/10.1016/j.fbr.2007.06.002

Slippers B, Boissin E, Phillips AJ, Groenewald JZ, Lombard L, Wingfield MJ, Postma A, Burgess T and Crous PW, 2013. Phylogenetic lineages in the Botryosphaeriales: a systematic and evolutionary framework. Studies in Mycology, 76(1), 31–49. 10.3114%2Fsim0020

Sommer NF, 1955. Infection of the Persian walnut tree by *Hendersonula toruloidea* Nattrass. PhD Dissertation. Department of Plant Pathology, University of California, Davis. 82 p

Sür AR and Oksal E, 2021. *In vitro* efficiency of some fungicides against *Neoscytalidium dimidiatum* (Penz.) Crous and Slippers causing sudden shoot dry on apricot trees. Turkish Journal of Agriculture–Food Science and Technology, 9(4), 797–802. https://doi.org/10.24925/turjaf.v9i4.797-802.4235

Sutton BC and Dyko BJ, 1989. Revision of *Hendersonula*. Mycological Research, 93(4), 466–488.

Suwannarach N, Kumla J and Lumyong S, 2018. Leaf spot on cattleya orchid caused by *Neoscytalidium orchidacearum* in Thailand. Canadian Journal of Plant Pathology, 40(1), 109–114.

Tsahouridou PC and Thanassoulopoulos CC, 2000. First report of *Hendersonula toruloidea* as a foliar pathogen of strawberry-tree (*Arbutus unedo*) in Europe. Plant Disease, 84, 487. https://doi.org/10.1094/pdis.2000.84.4.487c

Türkölmez S, Derviş S, Ciftci O and Dikilitas M, 2019a. First report of *Neoscytalidium dimidiatum* causing shoot and needle blight of pines (*Pinus* spp.) in Turkey. Plant Disease, 103(11), 2960–2961.

Türkölmez S, Derviş S, Ciftci O, Serce CU, Türkölmez CG and Dikilitas M, 2019b. First report of *Neoscytalidium dimidiatum* causing dieback, shoot blight, and branch canker of willow trees in Turkey. Plant Disease, 103(8), 2139.

Türkölmez S, Derviş S, Ciftci O, Serce CU and Dikilitas M, 2019c. New disease caused by *Neoscytalidium dimidiatum* devastates tomatoes (*Solanum lycopersicum*) in Turkey. Crop Protection, 118, 21–30. https://doi.org/10.1016/j.cropro.2018.12.004

Wangikar PD, Raur JG and Gopalkrishna N, 1969. Drying of grapevines caused by *Hendersonula toruloidea*. Indian Phytopathology, 22, 403.

Watson AJ, 1971. Foreign bacterial and fungus diseases of food, forage, and fiber crops. An annotated List. Agriculture Handbook No. 418, USDA Agricultural Research Service, Washington DC.

Williams TH and Liu PSW, 1976. A host list of plant diseases in Sabah, Malaysia. Phytopathology Paper No. 19. 67 pp.

Xie HH, Long LY, Huang SP, Mao LY, Huang QW, Wang LP and Li JX, 2021. First report of black spot caused by *Neoscytalidium dimidiatum* on sisal in Guangxi, China. Plant Disease, 105, 701. https://doi.org/10.1094/PDIS-08-20-1669-PDN

Xu C, Wang C, Ju L, Zhang R, Biggs AR, Tanaka E, Li B and Sun G, 2015. Multiple locus genealogies and phenotypic characters reappraise the causal agents of apple ring rot in China. Fungal Diversity, 71, 215–231. https://doi.org/10.1007/s13225-014-0306-5

Xu M, Peng Y, Qi Z, Yan Z, Yang L, He M-D, Li Q-X, Liu C-L, Ruan Y-Z, Wei S-S, Xie J, Xia Y-Q and Tang H, 2018. Identification of *Neoscytalidium dimidiatum* causing canker disease of pitaya in Hainan, China. Australasian Plant Pathology, 47(5), 547–553.

Yang SJ, Ng CY, Wu TS, Huang PY, Wu YM and Sun PL, 2019. Deep cutaneous *Neoscytalidium dimidiatum* infection: Successful outcome with amphotericin B therapy. Mycopathologia, 184(1), 169–176.

Yeganeh S and Mohammadi H, 2022. Sooty canker, a destructive disease of banyan (*Ficus benghalensis* L.) trees in landscapes of Kish Island (Iran). Urban Forestry and Urban Greening, 72, 127573.

Yi RH, Lin QL, Mo JJ, Wu FF and Chen J, 2015. Fruit internal brown rot caused by *Neoscytalidium dimidiatum* on pitahaya in Guangdong province, China. Australasian Plant Disease Notes, 10, 13.

Zhang W, Groenewald JZ, Lombard L, Schumacher RK, Phillips AJL and Crous PW, 2021. Evaluating species in Botryosphaeriales. Persoonia, 46, 63–115. https://doi.org/10.3767/persoonia.2021.46.03

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

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

| Host status | Host name | Plant family | Common name | Reference |
|---|---|---|---|---|
| | *Pistacia vera* | Anacardiaceae | Pistachio | Derviş et al. (2019a) |
| | *Populus alba* | Salicaceae | Silver poplar | Georghiou and Papadopoulos (1957) |
| | *P. fremontii* | Salicaceae | Frémont's cottonwood | Ogawa (1954) |
| | *P. nigra* | Salicaceae | Black poplar | Hashemi and Mohammadi (2016) |
| | *Prunus amygdalus* (syn *P. dulcis*) | Rosaceae | Almond | French (1987, 1989); Nouri et al. (2018); Ören et al. (2020b); Holland et al. (2020) |
| | *P. armeniaca* | Rosaceae | Apricot | French (1987, 1989); Georghiou and Papadopoulos (1957); Oksal et al. (2020) |
| | *P. avium* | Rosaceae | Cherry | Ören et al. (2022b) |
| | *P. domestica* | Rosaceae | Plum | Hajlaoui et al. (2018) |
| | *P. persica* | Rosaceae | Peach | French (1987, 1989) |
| | *Psidium guajava* | Myrtaceae | Guava | Watson (1971); Ismail et al. (2021) |
| | *Punica granatum* | Lythraceae | Pomegranate | Mirtalebi et al. (2019) |
| | *Pyrus communis* | Rosaceae | Pear | Oksal and Özer (2021) |
| | *Quercus brantii* | Fagaceae | Persian oak | Alidadi et al. (2019) |
| | *Robinia pseudoacacia* | Fabaceae | Black locust | Jamali and Banihashemi (2010) |
| | *Salix alba* | Salicaceae | White willow | Hashemi and Mohammadi (2016); Tűrkölmez et al. (2019b) |
| | *Salvia officinalis* | Lamiaceae | Sage | Derviş et al. (2021) |
| | *Sansevieria* spp. | Asparagaceae | Dracaena | Kranz (1963); Kee et al. (2017); Monteles et al. (2020) |
| | *Selenicereus* spp. (syn. *Hylocereus* 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) |
| | *Solanum lycopersicum* | Solanaceae | Tomato | Tűrkölmez et al. (2019c); Derviş et al. (2020b) |
| | *S. tuberosum* | Solanaceae | Potato | Derviş et al. (2020a) |
| | *Syzygium cumini* | Myrtaceae | Black plum | Panahandeh et al. (2019) |
| | *Thaumatophyllum bipinnatifidum* (syn. *Philodendron bipinnatifidum*) | Araceae | Split-leaf philodendron | Mathur (1979) |
| | *Ulmus* sp. | Ulmaceae | Elm | Hashemi et al. (2017) |
| | *Vitis vinifera* | 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 | *Adansonia* spp. | Malvaceae | Baobabs | Sakalidis et al. (2011) |
| | *Aloidendron dichotomum* | Asphodeloideae | Quiver tree | Crous et al. (2021) |
| | *Avicennia marina* | Acanthaceae | Mangrove | Goudarzi and Moslehi (2020) |
| | *Ficus religiosa* | Moraceae | Sacred fig | Mirtalebi et al. (2019) |
| | *Rhizophora mucronata* | 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 | Ginns (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 Thanassoulopoulos (2000) |
| | Cyprus | | | Georghiou 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 | Lin et al. (2017); Xie et al. (2021) |
| | 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) | | Ray et al. (2010); Sakalidis et al. (2011) |

# 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 '*Citrus aurantifolia, Citrus latifolia*'** | 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 '*Citrus limon, Citrus limonum*'** | 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 | 1072,076.38 | 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 |