Pest categorisation of *Colletotrichum aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola*

EFSA Panel on Plant Health (PLH),
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**Abstract**

The EFSA Plant Health Panel performed a pest categorisation of *Colletotrichum aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola*, five clearly defined fungi of the *C. gloeosporioides* complex causing anthracnose. The pathogens are widely distributed in at least three continents. *C. aenigma* and *C. siamense* are reported from Italy and *C. alienum* from Portugal, including the Madeira Islands, with a restricted distribution. *C. perseae* and *C. theobromicola* are not known to be present in the EU. However, there is uncertainty on the status of the pathogens worldwide and in the EU because of the taxonomic re-evaluation of the genus *Colletotrichum* and the lack of specific surveys. The pathogens are not included in Commission Implementing Regulation (EU) 2019/2072 and there are no reports of interceptions in the EU. With the exception of *C. perseae*, which has a very limited number of hosts, the other four *Colletotrichum* species have relatively wide host ranges. Therefore, this pest categorisation focused on those hosts for which there is robust evidence that the pathogens were formally identified by a combination of morphology, pathogenicity and multilocus sequence analysis. Host plants for planting and fresh fruits are the main entry pathways into the EU. Host availability and climate suitability factors occurring in some parts of the EU are favourable for the establishment of the pathogens. No yield losses have been reported so far in the EU but in non-EU areas of their current distribution, the pathogens have a direct impact on cultivated hosts that are also relevant for the EU. Phytosanitary measures are available to prevent the further introduction and spread of *C. aenigma*, *C. alienum* and *C. siamense* into the EU as well as the introduction and spread of *C. perseae* and *C. theobromicola*. *C. aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola* satisfy the criteria that are within the remit of EFSA to assess for these species to be regarded as potential Union quarantine pests.

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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 fulfill 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

*Colletotrichum aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola* are five of a number of pests listed in Annex 1C to the terms of reference (ToR) to be subject to pest categorisation to determine whether it fulfills the criteria of a potential Union quarantine pest for the area of the EU excluding Ceuta, Melilla and the outermost regions of Member States referred to in Article 355(1) of the Treaty on the Functioning of the European Union (TFEU), other than Madeira and the Azores, 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 fulfills the criteria to be potentially listed as a Union quarantine pest, risk reduction options will be identified.
1.3. Additional information

The pest categorisation was initiated following the commodity risk assessment of *Persea americana* from Israel.

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 *Colletotrichum aenigma*, *C. alienum* and *C. siamense*, EFSA has consulted the NPPOs of Italy, Portugal and Spain. The results of this consultation are presented in Section 3.2.2.

2.1.2. Literature search

A literature search on *Colletotrichum aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola* and their synonyms 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 SANTE) 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 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 *Colletotrichum aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola*, 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 *Colletotrichum aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola*, 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 quarantine pest (QP) are 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 quarantine pest status. Assessing social impact is outside the remit of the Panel.

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

| Criterion of pest categorisation | Criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest (article 3) |
|----------------------------------|----------------------------------------------------------------------------------|
| Identity of the pest (Section 3.1) | Is the identity of the pest clearly defined, or has it been shown to produce consistent symptoms and to be transmissible? |
| Absence/presence of the pest in the EU territory (Section 3.2) | Is the pest present in the EU territory? If present, is the pest in a limited part of the EU or is it scarce, irregular, isolated or present infrequently? If so, the pest is considered to be not widely distributed. |
| Pest potential for entry, establishment and spread in the EU territory (Section 3.4) | Is the pest able to enter into, become established in, and spread within, the EU territory? If yes, briefly list the pathways for entry and spread. |
| Potential for consequences in the EU territory (Section 3.5) | Would the pests’ introduction have an economic or environmental impact on the EU territory? |
| Available measures (Section 3.6) | Are there measures available to prevent pest entry, establishment, spread or impacts? |
| Conclusion of pest categorisation (Section 4) | A statement as to whether (1) all criteria assessed by EFSA above for consideration as a potential quarantine pest were met and (2) if not, which one(s) were not met. |

### 3. Pest categorisation

#### 3.1. Identity and biology of the pest

##### 3.1.1. Identity and taxonomy

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

Yes, the identities of *Colletotrichum aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola* are clearly defined.

The genus *Colletotrichum* constitutes a large monophyletic group of ascomycete fungi with more than 200 accepted species classified into at least 14 species complexes and singletons (Damm et al., 2019). The genus includes endophytes, saprobes and plant pathogens, with the latter being responsible for several diseases of many crops worldwide (Cannon et al., 2012; Udayanga et al., 2013). In the past, cultural and morphological characters (colour and growth rate of the colonies, size and shape of conidia and appressoria, presence or absence of setae, etc.) were used to
identify *Colletotrichum* at species level (Von Arx, 1957; Sutton, 1980, 1992). However, as these characters vary depending on the culture medium and the environmental conditions (light, temperature, etc.), the identification of *Colletotrichum* species based exclusively on these features is unreliable (Cai et al., 2009; Damm et al., 2012; Liu et al., 2016). Based on literature, identification of *Colletotrichum* at species level is performed using a polyphasic approach that combines cultural and morphological characteristics, pathogenicity tests and multilocus gene sequencing analysis (Cai et al., 2009; Cannon et al., 2012; Weir et al., 2012; Liu et al., 2016). The vast majority of *Colletotrichum* species are now classified into 15 complexes, i.e. *C. acutatum, C. agaves, C. boninense, C. caudatum, C. destructivum, C. dematium, C. dracaenophilum, C. gigasporum, C. gloeosporioides, C. graminicola, C. magnus, C. orbiculare, C. orchidearum, C. spaethianum and C. truncatum* (Marin-Felix and Zhang, 2017; Damm et al., 2019; Talhinhas and Baroncelli, 2021). *Colletotrichum aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola* are distinct fungal species belonging to the *C. gloeosporioides* species complex, which consists of 57 closely related species (Weir et al., 2012; Jayawardena et al., 2021; Talhinhas and Baroncelli, 2021).

*Colletotrichum aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola* are fungi of the family Glomerellaceae. The EPPO Global Database (online) provides the following taxonomic identification for each of the above-mentioned *Colletotrichum* species:

1) **Colletotrichum aenigma**
   
   Preferred scientific name: *Colletotrichum aenigma* B.S. Weir & P.R. Johnston.

   Order: Phyllachorales.
   Family: Glomerellaceae.
   Genus: *Colletotrichum*.
   Species: *Colletotrichum aenigma*.

   Common names: anthracnose.
   Synonyms: *Colletotrichum populi* C.M. Tian & Z. Li.

   The EPPO code\(^1\) (Griessinger and Roy, 2015; EPPO, 2019) for this species is COLLAE (EPPO, online).

2) **Colletotrichum alienum**
   
   Preferred scientific name: *Colletotrichum alienum* B.S. Weir & P.R. Johnston.

   Order: Phyllachorales.
   Family: Glomerellaceae.
   Genus: *Colletotrichum*.
   Species: *Colletotrichum alienum*.

   Common names: anthracnose.

   The EPPO code\(^1\) (Griessinger and Roy, 2015; EPPO, 2019) for this species is COLLAI (EPPO, online).

3) **Colletotrichum perseae**
   
   Preferred scientific name: *Colletotrichum perseae* G. Sharma & S. Freeman.

   Order: Phyllachorales.
   Family: Glomerellaceae.
   Genus: *Colletotrichum*.
   Species: *Colletotrichum perseae*.

   Common names: anthracnose.

   The EPPO code\(^1\) (Griessinger and Roy, 2015; EPPO, 2019) for this species is COLLPV (EPPO, online).

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\(^1\) 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).
4) **Colletotrichum siamense**

- **Preferred scientific name:** *Colletotrichum siamense* Prihastuti, L. Cai & K.D. Hyde.
  - Order: Phyllachorales.
  - Family: Glomerellaceae.
  - Genus: *Colletotrichum*.
  - Species: *Colletotrichum siamense*.

- **Common names:** anthracnose.

**Synonyms:** No synonyms for this species are provided by EPPO Global Database or CABI. However, the following synonyms of *C. siamense* are reported by Farr and Rossman (online; https://nt.ars-grin.gov/fungaldatabases/):

  - *Colletotrichum communis* G. Sharma, A.K. Pinnaka & B.D. Shenoy
  - *Colletotrichum dianesei* N.B. Lima, M.P.S. Camara & S.J. Michereff
  - *Colletotrichum endomangiferae* W.A.S. Vieira, M.P.S. Camara & S.J. Michereff
  - *Colletotrichum hymenocallidis* Y.L. Yang, Zuo Y. Liu, K.D. Hyde & L. Cai
  - *Colletotrichum jasmini-sambac* Wikee, K.D. Hyde, L. Cai & McKenzie
  - *Colletotrichum melanocaulon* V. Doyle, P.V. Oudem & S.A. Rehner

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

5) **Colletotrichum theobromicola**

- **Preferred scientific name:** *Colletotrichum theobromicola* Delacroix.
  - Order: Phyllachorales.
  - Family: Glomerellaceae.
  - Genus: *Colletotrichum*.
  - Species: *Colletotrichum theobromicola*.

- **Common names:** anthracnose.

**Synonyms:** No synonyms for this species are provided by EPPO Global Database or CABI. However, the following synonyms are reported by Farr and Rossman (online; https://nt.ars-grin.gov/fungaldatabases/):

  - *Colletotrichum fragariae* A.N. Brooks
  - *Colletotrichum gloeosporioides* f. *stylosanthis* Munaut
  - *Colletotrichum pseudotheobromicola* Chethana, J.Y.Yan, X.H. Li & K.D. Hyde

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

### 3.1.2. Biology of the pest

Species of the genus *Colletotrichum* show different lifestyles that vary between species complexes, with most species being able to sequentially switch between lifestyles (de Silva et al., 2017a). The lifestyle patterns found in *Colletotrichum* species can be broadly categorised as necrotrophic, hemibiotrophic, saprotrophic, latent or quiescent, and endophytic. Evidence suggests that the interaction between the host plant and the endophytic *Colletotrichum* species can sometimes switch from mutualistic to antagonistic or pathogenic depending on the physiological condition of the plant, host genotype and environmental conditions (de Silva et al., 2017a). Therefore, *Colletotrichum* species may have different interactions with their hosts and exhibit differences in their life cycles independently whether they belong to the same species complex or not (da Silva et al., 2020). Occurrence of cross-pathogenicity between *Colletotrichum* species from different hosts is also observed (Bragança et al., 2016; Eaton et al., 2021).

*Colletotrichum aenigma, C. alienum, C. perseae, C. siamense* and *C. theobromicola* have life cycles similar to those of other *Colletotrichum* species (Figure 1). Their life cycles include both asexual and sexual reproductive stages (Cannon et al., 2012; de Silva et al., 2017a). Infection occurs via an appressorium that develops from the germinating conidium on the plant surface, followed by turgor-driven penetration of the cuticle (Deising et al., 2000) and, in some cases, also of the epidermal cells by fungal hyphae (Bailey et al., 1992). Establishment within plant tissues is aided via production by the
fungus of host-induced virulence effectors (Kleemann et al., 2012; O’Connell et al., 2012). Subsequently, the pathogens enter a biotrophic phase during which they remain quiescent or latent within the host tissues until environmental conditions and host physiology become conducive for their reactivation and further development (Boufluer et al., 2020). The biotrophic life strategies adopted by Colletotrichum species may also contribute to their prominence as symptomless endophytes of living plant tissues (Lu et al., 2004; Joshee et al., 2009; Rojas et al., 2010; Yuan et al., 2011). Following the biotrophic phase, Colletotrichum spp. enter a necrotrophic phase that results in death of host plant cells and the appearance of disease symptoms. During their active growth in the plant tissues, the pathogens produce acervuli (asexual fruiting structures) with masses of mucilage-embedded conidia (Figure 1). The mucilaginous matrix is composed of glycoprotein and germination inhibitors that protect conidia against desiccation and toxins produced by the host defence mechanism (Leite and Nicholson, 1992). The conidia are dispersed over relatively short distances by water (rain, irrigation), wind-driven rain (de Silva et al., 2017a). Dispersal is also possible by insects (Gasparoto et al., 2017). They are produced on the infected host tissues throughout the season resulting in polycyclic disease cycles. The sexual stage of many Colletotrichum species, including C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola, has been observed in in vitro cultures on synthetic media but not under field conditions (Jayawardena et al., 2021).

No information for the potential of C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola to survive in soil (with or without plant debris) exists. Nevertheless, in general, Colletotrichum species do not survive for long periods in soil (Bergstrom and Nicholson, 1999; Ripoche et al., 2008), although there are notable exceptions (Eastburn and Gubler, 1990; Dillard and Cobb, 1998; Freeman et al., 2002; Feil et al., 2008; Ripoche et al., 2008) and survival structures, such as melanised microsclerotia, have been observed in several species (e.g. C. truncatum, C. sublineola and C. coccodes) (Dillard and Cobb, 1998; Boyette et al., 2007; Sukno et al., 2008). However, no information exists in the literature on the formation of microsclerotia by C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola.

Although it has not been documented, seeds of host plants are possibly one of the main sources of primary inoculum for the above-mentioned five Colletotrichum species, similarly to other Colletotrichum species (Cannon et al., 2012).

Figure 1: General life cycle of Colletotrichum species (from de Silva et al., 2017a)
Like other *Colletotrichum* species, host infection by *C. aenigma, C. alienum, C. perseae, C. siamense* or *C. theobromicola* depends on different factors including humidity, temperature, host physiology and inoculum level (Freeman et al., 1998). In general, warm, wet or humid environmental conditions favour host infection by *Colletotrichum* species. According to Zhang et al. (2020a,b), the optimum temperature for the *in vitro* mycelial growth of *C. aenigma* and *C. siamense* was 28°C. At 36°C, no mycelial growth of *C. aenigma* was observed, whereas *C. siamense* proved to be more tolerant to temperatures higher than 36°C suggesting the potential threat posed by this species to hosts grown in areas with hot and rainy weather.

### 3.1.3. Host range/Species affected

With the exception of *C. perseae*, which, so far, has been reported to affect a very limited number of hosts, the other four *Colletotrichum* species, i.e. *C. aenigma, C. alienum, C. siamense* and *C. theobromicola*, have relatively wide host ranges (see Appendix A). It should be noted that, in some cases, more than one of the above-mentioned five *Colletotrichum* species were identified to be associated with anthracnose on a single host, whereas in other cases, other species of the *C. gloeosporioides* complex or of other *Colletotrichum* species complexes were also involved (Schena et al., 2014; Liu et al., 2015; Sharma et al., 2017; Yokosawa et al., 2017; Fu et al., 2019; Chen et al., 2020; Zhang et al., 2020a,b). The host range of each of the five *Colletotrichum* species and particularly that of *C. perseae*, which has been identified recently (Sharma et al., 2017), might be wider than that currently reported as, in the past, when molecular tools were not available, *Colletotrichum* species identified as *C. gloeosporioides sensu lato* based on morphology and pathogenicity, might have belonged to one of the above-mentioned species.

Given that *Colletotrichum* species are commonly found on many plant species as pathogens, endophytes and occasionally as saprobes, and that their accurate identification and their discrimination from other closely-related *Colletotrichum* species is only possible by using molecular tools, this Pest categorisation will focus on those hosts for which there is robust evidence in the literature that (i) the pathogens were isolated and identified by both morphology and multilocus gene sequencing analysis, (ii) the Koch's postulates were fulfilled through pathogenicity tests performed on unwounded plant tissues, and (iii) their impacts on crop yield were documented. The reported hosts in the literature of *C. aenigma, C. alienum, C. perseae, C. siamense* and *C. theobromicola* that fulfil the above-mentioned criteria are considered by the Panel as main hosts and are listed in Table 2. Appendix B provides an overview on the main hosts which can be infected or co-infected by more than one of the five *Colletotrichum* species.

**Table 2:** Main hosts of *Colletotrichum aenigma, C. alienum, C. perseae, C. siamense* and *C. theobromicola*

| *Colletotrichum* species | Main hosts | References |
|---------------------------|------------|-----------|
| *C. aenigma*              | Actinidia arguta | Wang et al. (2019) |
|                           | Aquilaria sinensis | Li et al. (2021a,b) |
|                           | Camellia spp. (*C. japonica, C. oleifera, C. sinensis, C. sasanqua*) | Yang et al. (2019), Wang et al. (2020b), Chen et al. (2019) |
|                           | Capsicum annum | Sharma et al. (2022), Diao et al. (2017) |
|                           | Diospyros kaki | Andrioli et al. (2021) |
|                           | Fragaria × ananassa | Zhang et al. (2020a,b) |
|                           | Juglans regia | Wang et al. (2020a,b,c) |
|                           | Malus domestica | Lee et al. (2021), Yokosawa et al. (2017), Zhang et al. (2021a,b,c) |
|                           | Olea europaea | Schena et al. (2014) |
|                           | Persea americana | Sharma et al. (2017) |
|                           | Pyrus spp. (*P. pyrifolia, P. × bretschneideri, P. communis*) | Fu et al. (2019) |
|                           | Prunus avium | Chethana et al. (2019) |
|                           | Selenicereus undatus | Meetum et al. (2015) |
|                           | Synsepalum dulcificum | Truong et al. (2018) |
|                           | Vitis vinifera | Kim et al. (2021) |
| **Colletotrichum species** | **Main hosts** | **References** |
|-------------------------|---------------|---------------|
| *C. alienum*            | Camellia spp. | Liu et al. (2015) |
|                         | *Mangifera indica* | Ahmad et al. (2021), Tovar-Pedraza et al. (2020) |
|                         | *Olea europaea* | Moreira et al. (2021) |
|                         | *Persea americana* | Sharma et al. (2017) |
| *C. perseae*            | Capsicum annum | Sharma et al. (2022) |
|                         | *Olea europaea* | Moral et al. (2021) |
|                         | *Persea americana* | Sharma et al. (2017), Hofer et al. (2021) |
|                         | *Vitis vinifera* | Yokosawa et al. (2020) |
| *C. siamense*           | Allium cepa | Chowdappa et al. (2015) |
|                         | Annona muricata | Costa et al. (2019) |
|                         | Annona squamosa | Costa et al. (2019) |
|                         | Camellia spp. | Liu et al. (2015), Zhao et al. (2021), Peng et al. (2022), Jayawardena et al. (2016) |
|                         | Capsicum annum | de Silva et al. (2017b, 2019), de Oliveira et al. (2017), Diao et al. (2017), Sharma and Shenoy (2014), Mongkolporn and Taylor (2018), Suwannarat et al. (2017) |
|                         | Carica papaya | Zhang et al. (2021a,b,c) |
|                         | Carya illinoinensis | Oh et al. (2021) |
|                         | Citrus spp. | Wang et al. (2021) |
|                         | Citrus reticulata | Cheng et al. (2013) |
|                         | Citrus sinensis | Douanla-Meli and Unger (2017) |
|                         | Coffea arabica | Serrato-Diaz et al. (2020) |
|                         | Corchorus capsularis | Niu et al. (2016) |
|                         | Ctenanthe oppenheimiana | Xu et al. (2020) |
|                         | Dioscorea cayennensis | de Souza Junior and Assuncao (2021) |
|                         | Fragaria × ananassa | Zhang et al. (2020a,b), Wang et al. (2022) |
|                         | Gossypium hirsutum | Salunkhe et al. (2020) |
|                         | Juglans regia | Wang et al. (2017) |
|                         | Malus domestica | Yokosawa et al. (2017) |
|                         | Malus niedzwetzkyana | Han et al. (2022) |
|                         | Magnifera indica | Giblin et al. (2018), Pardo-De la Hoz et al. (2016) |
|                         | Magnolia grandiflora | Zhou et al. (2022) |
|                         | Manihot carthaginesis | Oliveira et al. (2018) |
|                         | Manihot esculenta | Liu et al. (2019) |
|                         | Manihot tomentosa | Oliveira et al. (2018) |
|                         | Musa acuminata | Uysal and Kurt (2020) |
|                         | Olea europaea | Schena et al. (2014) |
|                         | Persea americana | Fuentes-Aragon et al. (2020), Sharma et al. (2017), Hofer et al. (2021) |
|                         | Prunus persica | Tan et al. (2022) |
|                         | Punica granatum | Xavier et al. (2019) |
|                         | Pyrus spp. (P. pyrifolia, P. bretschneideri, P. communis) | Fu et al. (2019) |
|                         | Ricinus communis | Tang et al. (2021) |
|                         | Selenicereus undatus | Meetum et al. (2015) |
|                         | Synsepalum dulcificum | Truong et al. (2018) |
|                         | Vitis cariba | Santos et al. (2018) |
|                         | Vitis riparia | Santos et al. (2018) |
3.1.4   Intraspecific diversity

The sexual stage of *C. aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola* has been observed in *in vitro* cultures but not under field conditions. However, other species of the *C. gloeosporioides* complex form perithecia (sexual fruiting bodies) on their hosts (Dowling et al., 2020). The ability of *Colletotrichum* species to differentiate sexual reproductive stages enhances their genomic plasticity and adaptation to various and/or adverse environmental conditions, including the selection of fungicide-resistant populations. It is generally acknowledged that the risk of fungicide resistance development increases when sexual recombination occurs in the life cycle (FRAC, 2014). With this respect, many isolates of *C. siamense* from commercial peach orchards in South Carolina (USA) were found to be resistant to quinone outside inhibitors (QoI) fungicides and some even dual resistant to QoI and benzimidazole fungicides (Hu et al., 2015).

No information exists in the literature on differences in aggressiveness among isolates of each of the five *Colletotrichum* species, although such differences have been reported for other species of the *C. gloeosporioides* complex (Wang et al., 2021).

3.1.5   Detection and identification of the pest

**Are detection and identification methods available for the pest?**

Yes, methods for the detection and identification of *C. aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola* and their discrimination from other closely related *Colletotrichum* species are available.

Plants infected by *C. aenigma*, *C. alienum*, *C. perseae*, *C. siamense* or *C. theobromicola* show symptoms of anthracnose, which may include dark brown stem and fruit spots, stem cankers, pre- and post-harvest fruit rot, leaf spots and wilt, shoot-tip dieback and defoliation (Rodrigues et al., 2014;
Colletotrichum aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola: Pest categorisation

Liu et al., 2015; Diao et al., 2017; Sharma et al., 2017, 2022; de Silva et al., 2017b; Giblin et al., 2018; Chethana et al., 2019; Costa et al., 2019; Chaves et al., 2020; Chen et al., 2020; Chung et al., 2020; Mao et al., 2020; Yokosawa et al., 2020; Andrioli et al., 2021; Carbone et al., 2021; Huang et al., 2021; Luo et al., 2021; Moral et al., 2021; Oo et al., 2021; Han et al., 2022). However, these symptoms are similar to those caused by other Colletotrichum species belonging either to the C. gloeosporioides complex or to other Colletotrichum species complexes. If fruiting structures (acervuli with conidia and/or perithecia with ascospores) are detected on the symptomatic plant tissues using a magnifying lens, they are similar to those of other Colletotrichum species. It should be also noted that during the biotrophic phase, the pathogens remain quiescent or latent within the host tissues until environmental conditions and host physiology become conducive for their reactivation and the development of disease symptoms (see Section 3.1.2 Biology of the pest). Based on the above, it is unlikely that C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola could be detected based only on visual inspection of their host plants.

The pathogens can be readily isolated on culture media and description of their cultural and morphological characteristics is available in the literature (Prihastuti et al., 2009; Rojas et al., 2010; Weir et al., 2012; Sharma et al., 2017; Hassan et al., 2018; Fu et al., 2019; Ahmad et al., 2021). However, as some of these characteristics are similar to or overlap with those of other Colletotrichum species, and moreover, they vary under changing environmental conditions (Cai et al., 2009; Liu et al., 2016), the pathogens cannot be reliably identified based only on morphology. A polyphasic approach, combining the application of molecular methods, such as multilocus gene sequencing analysis with morphological and pathogenicity data, is currently recognised as being the most reliable method for the identification of C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola and their discrimination from other closely related Colletotrichum species (Cai et al., 2009; Cannon et al., 2012; Weir et al., 2012). More specifically, C. aenigma can be distinguished from other closely related Colletotrichum species based on sequence analysis of tub2 and gs genes (Weir et al., 2012); C. alienum using cal or gs genes (Weir et al., 2012); C. perseae can be well resolved with sequence analysis of ApMAT and gs genes (Sharma et al., 2017); C. siamense is distinguished by cal or tub2 gene sequence data and C. theobromicola by ITS sequences (Weir et al., 2012). Nucleotide sequences of C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola are available in GenBank (www.ncbi.nlm.nih.gov/genbank) and could be used as reference material for molecular diagnosis.

No EPPO Standards are available for the detection and identification of C. aenigma, C. alienum, C. perseae, C. siamense or C. theobromicola.

### 3.2. Pest distribution

#### 3.2.1. Pest distribution outside the EU

The current geographical distribution of C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola outside the EU is shown in Table 3 and Figures 2–6. The records are based on CABI Crop Protection Compendium (online; accessed on 15/2/2022), Farr and Rossman (online; https://nt.ars-grin.gov/fungaldatabases/; accessed on 15/2/2022) and other sources (published articles until May 2022) as well as on whether the species is included in the EPPO Global Database (online; last accessed on 15/2/2022). Details of the current geographical distribution of each of the above-mentioned pathogens outside the EU are presented in Appendix C.

There is uncertainty with respect to the actual geographical distribution of C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola outside the EU, as in the past, when molecular tools (i.e. multigene phylogenetic analysis) were not available, the pathogens might have been misidentified based on morphology and pathogenicity tests only, which cannot reliably identify them.

**Table 3:** Distribution of *Colletotrichum aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola* outside the EU based on CABI Crop Protection Compendium (online), EPPO Global Database (online), Farr and Rossman (online; https://nt.ars-grin.gov/fungaldatabases/) and other sources.

| Colletotrichum species | Distribution |
|------------------------|--------------|
| C. aenigma              | Brazil, China, Colombia, Iran, Israel, Japan, Malaysia, Republic of Korea, Thailand, UK, USA |
| C. alienum              | Australia, China, Hawaii, Israel, Mexico, New Zealand, South Africa, Uruguay, USA, Zimbabwe |
| **Colletotrichum species** | **Distribution** |
|--------------------------|------------------|
| *C. perseae*              | Australia, Chile, Israel, Japan, New Zealand |
| *C. siamense*            | Argentina, Australia, Bangladesh, Brazil, China, Colombia, Egypt, Ghana, India, Indonesia, Israel, Japan, Kenya, Laos, Malaysia, Malawi, Mexico, New Zealand, Nigeria, Pakistan, Philippines, Puerto Rico, Republic of Korea, South Africa, Sri Lanka, Taiwan, Thailand, Turkey, Uruguay, USA, Vietnam, Zimbabwe |
| *C. theobromicola*       | Argentina, Angola, Australia, Brazil, China, Colombia, Costa Rica, India, Israel, Japan, Mexico, New Zealand, Panama, Philippines, Puerto Rico, Republic of Korea, Thailand, Uruguay, USA |

**Figure 2:** Global distribution of *Colletotrichum aenigma* [Data Source: CABI CPC (online; last accessed on 5 May 2022), Farr and Rossman (online; last accessed on 5 May 2022) and other literature sources]

**Figure 3:** Global distribution of *Colletotrichum alienum* [Data Source: CABI CPC (online; last accessed on 5 May 2022), Farr and Rossman (online; last accessed on 5 May 2022) and other literature sources]
Colletotrichum aenigma, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola*: Pest categorisation

**Figure 4:** Global distribution of *Colletotrichum perseae* [Data Source: CABI CPC (online; last accessed on 5 May 2022), Farr and Rossman (online; last accessed on 5 May 2022) and other literature sources]

**Figure 5:** Global distribution of *Colletotrichum siamense* [Data Source: CABI CPC (online; last accessed on 5 May 2022), Farr and Rossman (online; last accessed on 5 May 2022) and other literature sources]
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.

*Colletotrichum aenigma*, *C. alienum* and *C. siamense* have been reported to be present in the EU, with a restricted distribution. More specifically, *C. aenigma* and *C. siamense* have been reported from Italy and *C. alienum* from Portugal, including Madeira Islands. There are no reports of *C. perseae* and *C. theobromicola* being present in the EU.

According to Schena et al. (2014), *C. aenigma* was isolated from *Citrus sinensis*, *Pyrus communis* and *Olea europaea* in Italy during the period 1992–2011 and was tested for its pathogenicity on detached olive fruits (cv. Coratina). Results showed that *C. aenigma* was a weak pathogen on green olives, but it induced noticeable rot on olives at the colour changing stage (ripening olives). In Mosca et al. (2014) studies, one isolate of *C. aenigma* from *P. communis* originated in Apulia (Italy) was used as reference material. According to the NPPO of Italy, the only report of *C. aenigma* in Italy is on *Olea europaea*; the NPPO further noted that the fungus is a weak pathogen with sporadic presence.

*C. alienum* has been reported from Portugal, including Madeira Islands. More specifically, in their studies, Liu et al. (2013) used three reference isolates of *C. alienum* obtained from the Culture Collection of the Westerdijk Fungal Biodiversity Institute (former CBS-KNAW Fungal Biodiversity Centre), the Netherlands. Two isolates were identified on *Leucadendron* spp. (cv. High Gold) in Portugal in 2000 and the third one on *Protea cynaroides* in Madeira Islands in 2001. No other report is available in the literature on the presence of *C. alienum* in Portugal, including Madeira Islands.

Far and Rossman (online; https://nt.ars-grin.gov/fungaldatabases/) reported *C. alienum* as being present from Portugal, including Madeira Islands. More specifically, in their studies, Liu et al. (2013) used three reference isolates of *C. alienum* obtained from the Culture Collection of the Westerdijk Fungal Biodiversity Institute (former CBS-KNAW Fungal Biodiversity Centre), the Netherlands. Two isolates were identified on *Leucadendron* spp. (cv. High Gold) in Portugal in 2000 and the third one on *Protea cynaroides* in Madeira Islands in 2001. No other report is available in the literature on the presence of *C. alienum* in Portugal, including Madeira Islands.

The NPPO of Spain stated that *C. alienum* is not known to be present in Spain.

In a study on the biodiversity of fungi on *Vitis vinifera* (grapevine), Jayawardena et al. (2018) isolated among other fungi, *C. siamense* from grapevines grown in the Forli-Cesena Province, Italy. However, the pathogenicity of the fungus on grapevine was not investigated. According to the NPPO of Italy, *C. siamense* has been isolated in 2021 from receptive stigmas of walnut fruit but compared to other *Colletotrichum* species (*C. fioriniae* and *C. nymphaeae*), to date it is not pathogenic on walnut in Italy.
C. perseae and C. theobromicola have not been reported from the EU territory. There is uncertainty with respect to the actual distribution of C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola in the EU, as in the past, when molecular tools (i.e. multigene phylogenetic analysis) were not available, the pathogens might have been misidentified based on morphology and pathogenicity tests, which cannot reliably identify them.

3.3. Regulatory status

3.3.1. Commission Implementing Regulation 2019/2072

Colletotrichum aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola are not listed in Annex II of Commission Implementing Regulation (EU) 2019/2072, an implementing act of Regulation (EU) 2016/2031.

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

A list of hosts included in Annex VI of Commission Implementing Regulation (EU) 2019/2072 is provided in Table 4. Some of the hosts which belong to the genera Acacia, Annona, Diospyros, Jasminum, Juglans, Persea, Prunus, Persea as well as Ficus carica, are included in the Commission Implementing Regulation (EU) 2018/2019 on high-risk plants.

Table 4: List of plants, plant products and other objects that are Colletotrichum aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola hosts whose introduction into the Union from certain third countries is prohibited (Source: Commission Implementing Regulation (EU) 2019/2072, Annex VI, Commission Implementing Regulation (EU) 2021/419, Annex II and Commission Implementing Regulation (EU) 2021/1936, Annex II, Part A)

| 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 |
|---|---|
| **8.** | Plants for planting of [...] *Malus* Mill., *Prunus* L., *Pyrus* L. [...] other than dormant plants free from leaves, flowers and fruits |
| | ex 0602 10 90 | 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 (Tsentralfederalny 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, Turkey, Ukraine and the United Kingdom |
| | ex 0602 20 20 | |
| | ex 0602 20 80 | |
| | ex 0602 40 00 | |
| | ex 0602 90 41 | |
| | ex 0602 90 45 | |
| | ex 0602 90 46 | |
| | ex 0602 90 47 | |
| | ex 0602 90 48 | |
| | ex 0602 90 50 | |
| | ex 0602 90 70 | |
| | ex 0602 90 91 | |
| | ex 0602 90 99 | |
| **9.** | Plants for planting of [...] *Malus* Mill., *Prunus* L. and *Pyrus* L. and their hybrids, and *Fragaria* L., other than seeds |
| | ex 0602 10 90 | 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 (Tsentralfederalny okrug), Northwestern Federal District (Severo-Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug)), San Marino, Serbia, Switzerland, Turkey, Ukraine and the United Kingdom |
| | ex 0602 20 20 | |
| | ex 0602 90 30 | |
| | ex 0602 90 41 | |
| | ex 0602 90 45 | |
| | ex 0602 90 46 | |
| | ex 0602 90 48 | |
| | ex 0602 90 49 | |
| | ex 0602 90 50 | |
| | ex 0602 90 70 | |
| | ex 0602 90 91 | |
| | ex 0602 90 99 | |

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| Annex II of Commission Implementing Regulation (EU) 2021/419 |
|----------------------------------------------------------|
| **List of plants, plant products and other objects, originating from third countries, and the corresponding measures for their introduction into the Union territory, as referred to in Article 2** |

| Jasminum polyanthum Franchet, unrooted cuttings of plants for planting | ex 0602 10 90 | Israel |
|---------------------------------------------------------------------|---------------|--------|
| **(a)** Official statement that: |
| (i) the plants are free from ...Colletotrichum siamense; ...; |
| (iv) the production site has been subject to official inspections for the presence of ...Colletotrichum siamense every three weeks and found free from those pests; |
| (v) immediately prior to export, consignments of the plants have been subjected to an official inspection for the presence of ...and to an official inspection for the presence of Colletotrichum siamense including testing of symptomatic plants |

| Ficus carica L., rooted, dormant, without leaves, 1-year-old plants | ex 0602 20 20 | Israel |
|---------------------------------------------------------------------|---------------|--------|
| **(a)** Official statement that: |
| (i) the plants are free from ...Colletotrichum siamense... |

North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug), San Marino, Serbia, Switzerland, Syria, Tunisia, Turkey, Ukraine, the United Kingdom (1) and United States other than Hawaii

10. Plants of *Vitis* L., other than fruits

|  |  |  |
|------------------|------------------|------------------|
| ex 0602 10 10    | ex 0602 20 10    | ex 0604 20 90    |
| ex 1404 90 00    | Third countries other than Switzerland |

11. Plants of *Citrus* L., [... .......], and their hybrids, other than fruits and seeds

|  |  |  |
|------------------|------------------|------------------|
| ex 0602 10 90    | ex 0602 20 20    | ex 0602 20 30    |
| ex 0602 20 80    | ex 0602 90 45    | ex 0602 90 46    |
| ex 0602 90 47    | ex 0602 90 50    | ex 0602 90 70    |
| ex 0602 90 71    | ex 0602 90 99    | ex 0604 20 90    |
| ex 1404 90 00    | All third countries |

19. Soil as such consisting in part of solid organic substances

|  |  |  |
|------------------|------------------|------------------|
| ex 2,530 90 00   | ex 3824 99 93    | Third countries other than Switzerland |

20. Growing medium as such, other than soil, consisting in whole or in part of solid organic substances, other than that composed entirely of peat or fibre of *Cocos nucifera* L., previously not used for growing of plants or for any agricultural purposes

|  |  |  |
|------------------|------------------|------------------|
| ex 2530 10 00    | ex 2530 90 00    | ex 2703 00 00    |
| ex 3101 00 00    | ex 3824 99 93    | Third countries other than Switzerland |
3.4. Entry, establishment and spread in the EU

3.4.1. Entry

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

Yes. *C. aenigma*, *C. alienum* and *C. siamense* have already entered the EU and they may further enter via the host plants for planting and the fresh fruit pathways. Similarly, *C. perseae* and *C. theobromicola* could potentially enter the EU territory via the host plants for planting and the fresh fruit pathways.

Comment on plants for planting as a pathway.

Host plants for planting is a main pathway for the entry of the pathogens into the EU territory.

The Panel identified the following main pathways for the entry of *C. aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola* into the EU territory:

1) host plants for planting, and
2) fresh fruit of host plants,

originating in infested third countries (Table 3).
The pathogens could potentially enter the EU territory on nuts, cut flowers and plant parts of their hosts for ornamental or medicinal purposes. However, these are considered minor pathways for the entry of C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola into the EU.

Although seeds are reported as one of the primary sources of inoculum for many Colletotrichum species, there is no evidence of C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola being transmitted by seeds of their host plants. Therefore, uncertainty exists on seeds of host plants as a pathway for the entry of the above-mentioned five Colletotrichum species into the EU.

No information specific for C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola exists in the available literature on their potential to survive in soil, but in general, Colletotrichum species appear to be poor competitors in soil (see Section 3.1.2 Biology of the pest). Therefore, uncertainty exists on the soil and other substrates associated or not with host and non-host plants for planting as a pathway of entry of the pathogens into the EU territory.

C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola are unlikely to enter the EU by natural means (rain, wind-driven rain, insects, etc.) because of the long distance between the infested third countries and the EU Member States. Although there are no quantitative data available, spores of the pathogens may be also 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 entry of the pathogens into the EU territory.

Table 5: Potential pathways for Colletotrichum aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola 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, acervuli with conidia, perithecia with ascospores | • Annex VI (8) prohibits the introduction of plants for planting of Malus Mill., Prunus L. and Pyrus L. with leaves, flowers and fruits from certain third countries (Table 4). Among the third countries from where the introduction of the above-mentioned plant material is not prohibited are Turkey and UK, which have been reported to be infested with C. siamense and C. aenigma, respectively (see Section 3.2.1).  
• Annex VI (9) prohibits the introduction of plants for planting of Malus Mill., Prunus L., Pyrus L. and Fragaria L., other than seeds, from certain third countries (Table 4). Among the third countries from where the introduction of the above-mentioned plant material is not prohibited are Australia, Egypt, Israel, New Zealand, Turkey, UK and USA, which have been reported to be infested with C. aenigma (Israel, UK, USA), C. alienum (Australia, Israel, USA), C. perseae (Australia, Israel, New Zealand), C. siamense (Australia, Egypt, Israel, New Zealand, Turkey, USA) and C. theobromicola (Australia, Israel, New Zealand, USA) (see Section 3.2.1).  
• Annex VII (10 & 11) requires official statement of special requirements for the introduction into the Union from certain third countries of trees and shrubs, intended for planting, other than seeds and plants in tissue culture. These requirements are not specifically targeted against Colletotrichum. However, among the third countries from which official statement of special requirements is not required, are (i) Israel, which has been reported to be infested with all the five species. |
| Pathways | Life stage | Relevant mitigations [e.g. prohibitions (Annex VI), special requirements (Annex VII) or phytosanitary certificates (Annex XI) within Implementing Regulation 2019/2072] |
|----------|-----------|--------------------------------------------------------------------------------------------------|
|          |           | * Colletotrichum species, and (ii) Egypt and Turkey which have been reported to be infested with *C. siamense* (see Section 3.2.1).  
  - Annex VII (5) requires official statement of special requirements for the introduction into the Union from third countries other than Switzerland of annual and biennial plants for planting, other than Poaceae and seeds. These requirements are not specifically targeted against *Colletotrichum*. |
| Host plants other than fruits and seeds | Mycelium, acervuli with conidia, perithecia with ascospores |  
  - Annex VI (10) prohibits the introduction into the Union from third countries other than Switzerland of *Vitis* L. plants, other than fruits.  
  - Annex VI (11) prohibits the introduction into the Union from all third countries of plants of *Citrus* L., and their hybrids, other than fruits and seeds |
| Fruits of host plants | Mycelium, acervuli with conidia |  
  - Annex VII (57) requires fruits of *Citrus* L. and their hybrids shall be free from peduncles and leaves and the packaging shall bear an appropriate origin mark.  
  - Annex XI, Part A (5) requires phytosanitary certificate for the introduction into the Union of fruits of *Citrus* L. and their hybrids from third countries other than Switzerland  
  - Annex XI, Part A (5) requires phytosanitary certificate for the introduction into the Union from certain third countries of *Actinidia* Lindl., *Annona* L., *Carica papaya* L., *Diospyros* L., *Fragaria* L., *Malus* L., *Mangifera* L., *Persea americana* Mill., *Prunus* L., *Pyrus* L. and *Vitis* L. (Table 4).  
  Among the third countries from which a phytosanitary certificate is not required, Turkey has been reported to be infested with *C. siamense* (see Section 3.2.1).  
  - Annex XI, Part A (5) requires phytosanitary certificate for the introduction into the Union from certain third countries of *Punica granatum* L. (Table 4).  
  Among the third countries from which a phytosanitary certificate is not required, are countries which have been reported to be infested with the pathogens (see Section 3.2.1). |
| Leaves of host plants | Mycelium, acervuli with conidia, perithecia with ascospores |  
  - Annex XI, Part A (3) requires phytosanitary certificate from third countries other than Switzerland |
| Parts of host plants, other than fruit and seeds | Mycelium, acervuli with conidia, perithecia with ascospores |  
  - Annex XI, Part A (3) requires phytosanitary certificate for the introduction into the Union from certain third countries of *Prunus* L. plant parts, other than fruit and seeds.  
  Among the third countries from which a phytosanitary certificate is not required, Turkey has been reported to be infested with *C. siamense*.  
  - Annex XI, Part A (3) requires phytosanitary certificate for the introduction into the Union from third countries other than Switzerland of *Camellia* spp. L. plant parts, other than fruits and seeds |
It should be noted that among the host plant genera included in Table 5, *Annona* L., *Diospyros* L., *Juglans* L., *Malus* Mill., *Persea* Mill. and *Prunus* L. are considered high-risk plants [Commission Implementing Regulation (EU) 2018/2019 of 18 December 2018] (see Section 3.3).

The volume of fresh produce of *C. aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola* main hosts originated in infested third countries and imported into the EU territory during the period 2016–2020 is presented in Table 6. Appendix D provides import statistics for individual third countries.

### Relevant mitigations [e.g. prohibitions (Annex VI), special requirements (Annex VII) or phytosanitary certificates (Annex XI) within Implementing Regulation 2019/2072]

| Pathways | Life stage |  |
|----------|------------|---|
| Soil associated or not with host and non-host plants for planting | Microsclerotia | • Annex VI (19) bans the introduction into the Union from third countries other than Switzerland of soil as such consisting in part of solid organic substances |  |
| Growing medium associated or not with host and non-host plants | Microsclerotia | • Annex VI (20) bans the introduction into the Union from third countries other than Switzerland of 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. |  |
| Machinery and vehicles which have been operated for agricultural or forestry purposes | Microsclerotia, with high uncertainty because of lack of information | • Annex VII (2) requires official statement that machinery or vehicles are cleaned and free from soil and plant debris. | • Annex XI, Part A (1) requires phytosanitary certificate for the introduction into the Union territory of machinery and vehicles from third countries other than Switzerland. |
| Commodity                                                                 | HS code | 2016       | 2017       | 2018       | 2019       | 2020       |
|--------------------------------------------------------------------------|---------|------------|------------|------------|------------|------------|
| Fresh persimmons                                                        | 0810 70 00 | 3331.48    | 3844.34    | 2205.98    | 3346.16    | 6724.66    |
| Fresh strawberries                                                       | 0810 10 00 | 42,131.12  | 48,341.86  | 44,872.39  | 35,151.25  | 84,609.94  |
| Fresh tamarinds, cashew apples, lychees, jackfruit, sapodillo plums, passion fruit, carambola and pitahaya* | 0810 90 20 | 163,404.09 | 179,632.91 | 184,705.55 | 201,001.91 | 184,088.82 |
| Fresh or dried walnuts, in shell and shelled                            | 0802 31  | 811,100.06 | 804,843    | 778,627.4  | 866,407.4  | 901,531.72 |
| Fresh apples                                                             | 0808 10  | 1,571,609.85 | 1,811,900.59 | 2,401,452.66 | 1,513,510.15 | 1,688,051.46 |
| Fresh or chilled olives                                                  | 0709 92  | 1542.04    | 1023.52    | 836.70     | 2042.29    | 6381.46    |
| Fresh or dried avocados                                                  | 0804 40 00 | 2,063,188.12 | 2,256,280.11 | 2,726,949.69 | 3,008,254.47 | 3,136,713.56 |
| Fresh pears                                                             | 0808 30  | 1,630,892.91 | 1,358,291.97 | 1,378,444.99 | 1,140,281.00 | 1,320,026.96 |
| Fresh cherries (excl. Sour cherries)                                     | 0809 29 00 | 2556.84    | 6513.03    | 6182.85    | 3435.61    | 11,509.14  |
| Fresh grapes                                                            | 0806 10  | 349,475.09  | 419,133.7  | 400,203.5  | 273,610.8  | 286,902.3  |
| Fresh or dried guavas, mangoes and mangosteens                           | 0804 50 00 | 1,407,147.77 | 1,482,471.03 | 1,562,860.63 | 1,845,650.38 | 1,938,656.55 |
| Coffee, whether or not roasted or decaffeinated; coffee husks and skins; coffee substitutes containing coffee in any proportion | 0901    | 20,987,474.19 | 19,595,095.83 | 20,172,408.67 | 20,827,757.53 | 20,131,232.09 |
| Coconuts, Brazil nuts and cashew nuts, fresh or dried, whether or not shelled or peeled | 0801    | 125,274     | 109,479    | 121,257.1  | 119,455.8  | 111,733.7  |
| Citrus fruit, fresh or dried                                             | 0805    | 14,000,959.74 | 13,944,079.72 | 15,893,049.64 | 13,821,011.24 | 15,818,866.58 |
| Cocoa beans, whole or broken, raw or roasted                             | 1801 00 00 | 86,869.22  | 83,223.42  | 31,753.83  | 23,668.46  | 22,433.73  |
| Vegetable and strawberry plants                                          | 0602 90 30 | 52,806.04  | 51,745.84  | 56,746.49  | 63,535.72  | 24,547.54  |
Notifications of interceptions of harmful organisms began to be compiled in Europhyt in May 1994 and in TRACES in May 2020. No records of interceptions by EU Member States specific for *C. aenigma*, *C. alienum*, *C. perseae*, *C. siamense* or *C. fructicola* exist in Europhyt (accessed on 6 September 2022). Nevertheless, until May–June 2020, there have been 21 interceptions of unidentified at species level *Colletotrichum*. No records of any of the five *Colletotrichum* species exist in TRACES database since May 2020 (accessed on 15/5/2022). However, there is only one report of *C. acutatum*.

### 3.4.2. Establishment

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

Yes. *C. aenigma*, *C. alienum* and *C. siamense* are present in the EU, which indicates that both the biotic (host availability) and abiotic (climate suitability) factors occurring in parts of the EU are also favourable for the establishment of the other two species, i.e. *C. perseae* and *C. theobromicola*.

Given their biology, the five *Colletotrichum* species could potentially be transferred from the pathways of entry to the host plants grown in the EU via splash-dispersed spores, contaminated soil and other plant growth substrates associated with plants for planting, and 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 its proximity to the hosts grown in the EU territory, as well as on the management of plant residues and fruit waste.

Climatic mapping is the principal method for identifying areas that could provide suitable conditions for the establishment of a pest taking key abiotic factors into account (Baker et al., 2000). Availability of hosts is considered in Section 3.4.2.1. Climatic factors are considered in Section 3.4.2.2.

#### 3.4.2.1. EU distribution of main host plants

As noted above and shown in Appendix A, except for *C. perseae*, whose host range is limited so far to pepper, olive, avocado and grapevine, the other four *Colletotrichum* species, i.e. *C. aenigma*, *C. alienum*, *C. siamense* and *C. theobromicola* have relatively wide host ranges. In addition, most of the main hosts of the above-mentioned five *Colletotrichum* species (Table 2) 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 each of the above-mentioned *Colletotrichum* species cultivated in the EU 27 in recent years is shown in Table 7. Appendix E provides production statistics for individual Member States.

| Crop                  | 2016   | 2017   | 2018   | 2019   | 2020   |
|-----------------------|--------|--------|--------|--------|--------|
| Strawberries          | 103.78 | 103.76 | 106.42 | 101.16 | 83.84  |
| Apples                | 505.66 | 504.61 | 506.27 | 491.08 | 483.01 |
| Pears                 | 115.13 | 113.81 | 113.54 | 110.66 | 107.05 |

Table 7: Harvested area of some of the *Colletotrichum aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola* main hosts in EU 27, 2016–2020 (1,000 ha). Source EUROSTAT (accessed 18/03/2022) https://ec.europa.eu/eurostat/databrowser/view/apro_cpsh1/default/table?lang=en
3.4.2.2. Climatic conditions affecting establishment

Of the five Colletotrichum species, *C. aenigma* and *C. perseae* have been reported from three continents (i.e. *C. aenigma* from America, Asia and Europe and *C. perseae* from America, Asia and Oceania), *C. theobromicola* from four continents (i.e. Africa, America, Asia and Oceania) and *C. alienum* and *C. siamense* from all the five continents (i.e. Africa, America, Asia, Europe and Oceania).

The global Köppen–Geiger climate zones (Kottek et al., 2006) describe terrestrial climate in terms of average minimum winter temperatures and summer maxima, amount of precipitation and seasonality (rainfall pattern).

Based on the data available in the literature on the exact locations of the infested areas, *C. aenigma* has been reported from areas with BSh, BSk, Cfa, Cfb, Csa, Dfb and Dfc climate zones; *C. alienum* from areas with BSh, BSk, Cfa, Cfb, Cfc, Csa, Csb and Dfc climate zones; *C. perseae* from areas with BSh, Cfa, Cfb, Csa and Dfb climate zones; *C. siamense* from areas with BSh, BSk, Cfa, Cfb, Cfc, Csa, Csb, Csc, Dfb and Dfc climates and *C. theobromicola* from areas with BSh, BSk, Cfa, Cfb, Cfc, Csa, Dfb and Dfc climates. The above-mentioned climate zones, where each of those five Colletotrichum species is currently present, are comparable to those occurring in parts of the EU territory where hosts are also grown (Figures 7–11).

Therefore, it can be concluded that the climatic conditions occurring in some parts of the EU territory are favourable for the establishment of *C. aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola*. However, uncertainty exists on whether the pathogens could potentially establish in EU areas belonging to other than the climate zones shown in Figures 7–11, where hosts are also present.

![Figure 7: Distribution of seven Köppen–Geiger climate types, i.e. BSh, BSk, Cfa, Cfb, Csa, Dfb and Dfc that occur in the EU and in countries where Colletotrichum aenigma has been reported. The legend shows the list of Köppen–Geiger climates. Red dots indicate point locations where C. aenigma was reported (Appendix C.1)](image)
Figure 8: Distribution of eight Köppen–Geiger climate types, i.e. BSh, BSk, Cfa, Cfb, Cfc, Csa, Csb and Dfc that occur in the EU and in countries where Colletotrichum alienum has been reported. The legend shows the list of Köppen–Geiger climates. Red dots indicate point locations where C. alienum was reported (Appendix C.2)

Figure 9: Distribution of five Köppen–Geiger climate types, i.e. BSh, Cfa, Cfb, Csa and Dfb that occur in the EU and in countries where Colletotrichum perseae has been reported. The legend shows the list of Köppen–Geiger climates. Red dots indicate point locations where C. perseae was reported (Appendix C.3)
Figure 10: 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 countries where *Colletotrichum siamense* has been reported. The legend shows the list of Köppen-Geiger climates. Red dots indicate point locations where *C. siamense* was reported (Appendix C.4)

Figure 11: Distribution of eight Köppen-Geiger climate types, i.e. BSh, BSk, Cfa, Cfb, Cfc, Csa, Dfb and Dfc that occur in the EU and in countries where *Colletotrichum theobromicola* has been reported. The legend shows the list of Köppen-Geiger climates. Red dots indicate point locations where *C. theobromicola* was reported (Appendix C.5)
3.4.3. Spread

Describe how the pest would be able to spread within the EU territory following establishment?

Following establishment, Colletotrichum aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola could potentially spread within the EU territory by natural and human-assisted means.

Host plants for planting is one of the main means of spread of the pathogens within the EU territory.

Following their introduction into the EU territory, C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola, similarly to other Colletotrichum species, could potentially spread via natural and human-assisted means.

Spread by natural means. Colletotrichum species can spread locally mainly by water (rain, irrigation) (Madden et al., 1996; Freeman et al., 2002; Mouen Bedimo et al., 2007; Penet et al., 2014). Wind-driven rain and insects may also contribute to the dispersal of Colletotrichum spp. spores (Gasparoto et al., 2017). In some pathogens (e.g. C. acutatum sensu stricto and C. gloeosporioides sensu stricto affecting citrus), spread of the pathogens may also occur via wind-disseminated ascospores (Silva-Junior et al., 2014). However, there is uncertainty on the potential of C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola to spread via wind-borne ascospores, as the presence of their sexual stage has not been reported so far under field conditions (see Section 3.1.2 Biology of the pest).

Spread by human-assisted means. The pathogens 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 agricultural machinery, tools, irrigation, etc.

Uncertainty exists on the potential of the pathogens to spread via the seeds of their host plants and soil or other plant growth substrates, due to lack of evidence.

3.5. Impacts

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

Yes, the introduction of C. perseae, C. theobromicola and the further introduction of Colletotrichum aenigma, C. alienum and C. siamense in the EU is likely to have yield and quality impacts in some parts of the territory. Nevertheless, the magnitude of the impacts is not known, especially in cases where more than one of the above-mentioned Colletotrichum species would co-infest a single host.

Species of the genus Colletotrichum are known to infect several economically important cultivated tropical, subtropical and temperate fruit crops, vegetables and ornamentals, causing severe damage and, consequently, resulting in significant losses (Bailey and Jeger, 1992; Lima et al., 2011; Cannon et al., 2012; Anderson et al., 2013; Guarnaccia et al., 2016; de Silva et al., 2017b).

In the areas of their current distribution, C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola are reported to cause anthracnose and pre- and post-harvest fruit rots on their host plants (see Section 3.1.5).

Andrioli et al. (2021) reported that in Brazil, early infection of sweet persimmon fruit by anthracnose caused by C. aenigma, C. asianum, C. fructicola and C. nymphaeae caused premature fruit drop. Moreover, the disease developed further during fruit ripening and after harvest, leading to post-harvest losses of 50–90%. In China, anthracnose of strawberry caused by C. aenigma, C. siamense, C. fructicola and C. gloeosporioides sensu stricto was responsible for nearly 50% of seedlings necrosis and > 40% of production losses in nurseries as well as for up to 80% yield losses (Chen et al., 2020). Chung et al. (2020) reported that in Taiwan from 2010 to 2016, C. siamense together with C. karstii, C. fructicola and C. boninense was responsible for a 30–40% loss of strawberry seedlings and of approximately 20% loss of plants after transplanting. In Hubei province, China, an incidence of 45% of strawberry crown rot caused by C. siamense was reported by Luo et al. (2021).
**C. aenigma** was identified to be the causal agent of anthracnose outbreaks in different vineyards in Gimcheon, South Korea (Kim et al., 2021): the most severely affected vineyards showed a disease incidence on grape berries of up to 50% with the infected berries displaying sunken necrotic lesions covered by orange conidial masses. In 2020, a 5% fruit damage caused by *C. aenigma* and *C. perseae* was estimated on pepper crops in two different locations in Southern (Fatsail) and Central Israel (Sde Warburg), respectively (Sharma et al., 2022). At both locations, anthracnose symptoms were observed only on pepper fruits and not on leaves or stems. According to Wang et al. (2020c), *C. aenigma* was the causal agent of a serious anthracnose disease of walnut orchards in Xingtai Hebei, China. Disease symptoms included brown to black circular or irregular sunken lesions on walnut fruits, with an incidence of 31–41% and circular to irregular brown to grey lesions on leaves, with an incidence of 1–2%. Additionally, Wang et al. (2017) identified *C. siamense* as the causal agent of walnut anthracnose in Shandong Province, China, which resulted in 50% yield loss.

Ahmad et al. (2021) reported that in 2019, 30% of mango fruits at different markets of the Fengtai district, Beijing, China, exhibited severe typical symptoms of anthracnose caused by *C. alienum*. Li et al. (2019) identified *C. siamense* as the most dominant among 13 *Colletotrichum* species causing anthracnose on mango crops in the Provinces of Hainan, Yunnan, Sichuan, Guizhou, Guangdong and Fujian of Southern China. The same authors reported that the annual yield loss because of the disease was 30–60% reaching 100% under favourable climatic conditions.

Anthracnose is the most devastating disease of olive in Uruguay (Leoni et al., 2018), particularly in orchards located in areas characterised by frequent high relative humidity and rainfall (around 1,100 mm per year). During the last 10 years, those areas were massively planted with olives for oil production using an intensive rainfed plantation system, which favours anthracnose development. According to Moreira et al. (2021), since 2017, severe anthracnose outbreaks have been observed in those areas leading to high yield losses and decreased olive oil quality (increased acidity and decreased organoleptic properties). *C. alienum* and *C. theobromicola* were identified as the causal agents of those outbreaks together with *C. acutatum sensu stricto, C. nymphaeae* and *C. floriniae* of the *C. acutatum* complex (Moreira et al., 2021).

Avocado is a high value crop grown in tropical and subtropical areas worldwide. Under the subtropical Mediterranean conditions of Israel, avocado fruit that set during the winter are seriously affected by post-harvest anthracnose which causes significant reduction in their shelf-life and marketability (Freeman et al., 1998). Sharma et al.’s (2017) studies showed that nine *Colletotrichum* species among which *C. aenigma, C. alienum, C. perseae, C. siamense* and *C. theobromicola* were involved in anthracnose disease of avocado in Israel. In Chile, anthracnose has increased during the last decades along with the establishment of new avocado orchards in humid areas. A survey carried out by Bustamante et al. (2020) in four commercial orchards located in the regions of Valparaíso, Metropolitana and O’Higgins (Chile) revealed that *C. perseae* and nine more *Colletotrichum* species belonging to four different *Colletotrichum* species complexes were associated with avocado anthracnose.

Although no quantitative data are available, *C. alienum* has been identified as the most economically important pathogen of Proteaceae in Australia, Europe and South Africa (Crous et al., 2013; Liu et al., 2013).

In India, chilli anthracnose caused by both *C. siamense* and *C. fructicola* was reported to adversely affect the quality of chilli fruits caused by resultant significant yield losses and reduced marketability (Sharma and Shenoy, 2014). Similarly, Oo et al. (2021) reported that *C. siamense* caused typical anthracnose symptoms on approximately 15–20% of chilli fruits (cv. Manita) growing in Goesan County, Chungcheong province, South Korea. *C. siamense* and *C. truncatum* were identified as the causal agents of severe anthracnose outbreaks in onion crops in southwest India (Chowdappa et al., 2015). Pérez-Mora et al. (2020) showed that in northern Sinaloa, Mexico, *C. siamense* was the only *Colletotrichum* species causing anthracnose symptoms (petal necrosis, fruit lesions) on Mexican lime (*C. aurantifolia*) resulting in high crop losses and unmarketable fruits. *C. siamense* was reported to cause a 50–90% incidence of anthracnose on red-fleshed apples (*Malus niedzwetzkyana*) in commercial orchards in Shandong province, China (Han et al., 2022).

Nine *Colletotrichum* species among which *C. siamense* and *C. theobromicola* were found to be associated with anthracnose of *Annona* spp., the most important disease of annonaceous crops in Brazil, causing yield losses of up to 70% particularly in periods of extended rainfall during the flowering and fruit developmental stages (Costa et al., 2019). It should be noted that *A. squamosa* (sugar apple) and *A. muricata* (soursop) have been arousing great interest in the international market for their fresh and processed fruit as well as for the production of biocomposites of medicinal,
allelopathic or pesticide importance (Lemos, 2014). According to Veloso et al. (2018), C. siamense was the most dominant among seven Colletotrichum species causing anthracnose on cashew in Brazil with more than 40% yield losses.

Citrus anthracnose caused by Colletotrichum spp. is a serious disease limiting production globally. Preharvest anthracnose reduces yield, while post-harvest anthracnose affects fruit quality, negatively impacting fruit export and marketability (Phoulivong et al., 2012). During a survey conducted in citrus orchards severely affected by anthracnose in Australia (Victoria, New South Wales, Queensland), Wang et al. (2021) identified six Colletotrichum species as the causal agents among which C. siamense and C. theobromicola. C. siamense was also reported to cause anthracnose of papaya fruit in China with an average disease incidence of 30% and over 60% in some orchards (Zhang et al., 2021a,b,c). According to Pardo-De la Hoz et al. (2016), six Colletotrichum species of the C. gloeosporioides complex, among which C. siamense and C. theobromicola and three species of the C. boninense complex were associated with up to 60% of yield losses in mango plantations in the state of Tolima, Colombia.

It should be noted that, in cases where anthracnose disease on a single host was reported to be associated with more than one of the five Colletotrichum species (i.e. C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola) or in cases where other species of the C. gloeosporioides complex or of other Colletotrichum species complexes were also involved, the individual contribution of C. aenigma, C. alienum, C. perseae, C. siamense or C. theobromicola to the overall impact was not determined (Schena et al., 2014; Liu et al., 2015; Sharma et al., 2017; Yokosawa et al., 2017; Fu et al., 2019; Chen et al., 2020; Zhang et al., 2020a,b).

Based on the above, it is expected that the introduction of C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola into the EU territory would potentially cause yield and quality losses in parts of the risk assessment area where susceptible hosts are grown. However, neither the magnitude of this impact is known nor whether the agricultural practices and chemical control measures currently applied in the EU could potentially reduce the impact of the pathogens’ introduction. It is worth mentioning that, although C. aenigma and C. siamense are reported from Italy and C. alienum from Portugal, including Madeira Islands, no crop losses have been reported so far.

### 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 C. aenigma, C. alienum, C. perseae, C. siamense or C. theobromicola, existing phytosanitary measures (see Sections 3.3.2 and 3.4.1) mitigate the likelihood of the pathogens’ entry into the EU territory. Potential additional measures also exist to further mitigate the risk of entry and spread of the pathogens in the EU (see Section 3.6.1).

#### 3.6.1. Identification of potential additional measures

Phytosanitary measures (prohibitions) are currently applied to some hosts of C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola, (see Section 3.3.2). Potential additional control measures are listed in Table 8. 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 8.
Table 8: 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 | The use of transplants raised from pathogen-free propagation material, as well as growing transplants in weed-free areas and away from other crops that are known hosts of the pathogens may represent an effective control measure. | Entry/Spread |
| Managed growing conditions | Anthracnose disease is generally more severe in tropical and subtropical countries. Hot and humid environmental conditions support the spread of Colletotrichum spp. Therefore, proper field drainage, plant distancing, cutting of pruning debris into small pieces for faster decomposition and removal of severely infected plants in the field or in the greenhouse represent effective strategies to manage anthracnose. | Entry/Spread/Impact |
| Crop rotation, associations and density, weed/volunteer control | Crop rotation (wherever feasible) and control of volunteer plants may also represent effective means to reduce inoculum sources and potential survival of the pathogens on alternative hosts. | Establishment/Spread/Impact |
| Roguing and pruning | Infection of host plants by the pathogens usually occurs from conidia formed on infected plants or plant debris which can act as inoculum sources. These propagules are dispersed from the infected plant parts and debris to healthy plants by rain splash, free water or high humidity. To reduce the sources of inoculum, pruning of the infected by the pathogens plant parts is highly recommended. | Spread/Impact |
| Biological control and behavioural manipulation | Some antagonistic fungi and bacteria have been tested in vitro for the biological control of the pathogens, but none of them was effective under field conditions. | Impact |
| Chemical treatments on crops including reproductive material | Several effective fungicides are available to control anthracnose-causing species of Colletotrichum. Copper compounds, triazoles and strobilurins are effective in field treatment as well as when applied on reproductive material. The possibility of selection of fungicide-resistant populations to triazoles and strobilurins must be considered. | Establishment/Spread/Impact |
| Chemical treatments on consignments or during processing | Copper compounds, triazoles and strobilurins are effective as post-harvest treatments against Colletotrichum species causing anthracnose and post-harvest fruit rot. Calcium chloride is reported to improve the shelf-life and quality of fruits that are known hosts of anthracnose pathogens. The possibility of selection of fungicide-resistant populations should not be ruled out. | Entry/Spread |
| Control measure/Risk reduction option (Blue underline = Zenodo doc, Blue = WIP) | RRO summary                                                                                                                                                                                                 | Risk element targeted (entry/establishment/spread/impact) |
|---|---|---|
| **Physical treatments on consignments or during processing** | Irradiation, mechanical cleaning (brushing, washing), sorting and grading and removal of diseased plant parts could be adopted on consignment or during processing of susceptible host plants or fruit. In the packinghouse, proper sanitation practices (e.g., good drainage systems to channel out wastewater or sewage during on-farm fruit disinfection) should be built and regularly cleaned. | Entry/Spread |
| **Cleaning and disinfection of facilities, tools and machinery** | Cleaning, disinfection and disinfestation (sanitation) 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 contribute to mitigate likelihood of entry or spread of *Colletotrichum* species. | Entry/Spread |
| **Limits on soil** | Limits on soil are an efficient measure. | Entry/Spread |
| **Soil treatment** | Although no specific studies are available on *C. aenigma, C. alienum, C. perseae, C. siamense* and *C. theobromicola*, it is likely that the pathogens could potentially survive in infected plant debris in soil, similarly to other *Colletotrichum* species. Therefore, soil and substrate disinfection with chemical or physical (heat, soil solarisation) means represents a suitable option for control. | Entry/Establishment/Spread/Impact |
| **Use of non-contaminated water** | Although *Colletotrichum* species could potentially spread via contaminated irrigation water, physical or chemical treatment of irrigation water is likely not to be feasible. | Spread/Impact |
| **Waste management** | Treatment of the waste (deep burial, composting, incineration, chipping, production of bio-energy...) in authorised facilities and official restriction on the movement of waste. | Spread |
| **Heat and cold treatments** | Hot water treatment at temperatures of 50-60°C for 5-60 min, depending on the host tolerance, may be applied to reduce the likelihood of infestation of the pathogens in susceptible plants or plant organs. The combination of hot water and calcium chloride may increase the efficacy of the treatment. As *Colletotrichum* spp. are adapted to high temperatures, cold treatment could also mitigate infection of consignments by the pathogens. | Entry/Spread |
| **Conditions of transport** | Specific requirements for mode and timing of transport of commodities to prevent escape of the pest and/or contamination.  
  a) physical protection of consignment  
  b) timing of transport/trade  
  If plant material, potentially infected or contaminated with *Colletotrichum* spp. has to be transported (including proper disposal of infested waste material), specific transport conditions (type of packaging/protection, time of transport, transport means) should be defined to prevent the pathogens from escaping. These may include, albeit not exclusively: physical protection; removal of leaves and peduncles from fruit commodities; sorting prior to transport, sealed packaging, etc. | Entry/Spread |
### 3.6.1.2. Additional supporting measures

Potential additional supporting measures are listed in Table 9.

Table 9: Selected supporting measures (a full list is available in EFSA PLH Panel, 2018) in relation to currently unregulated hosts and pathways. Supporting measures are categorisation 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). The effectiveness of sampling and subsequent inspection to detect pests may be enhanced by including trapping and luring techniques. As the symptoms caused by *C. aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola* on their hosts are similar to those of other anthracnose causing *Colletotrichum* species on the same hosts, it is unlikely that the pathogens could be detected at species level 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. Laboratory testing based on morphological characters and multilocus gene sequencing analysis is required for the detection and reliable identification of the pathogens. | Entry/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. | Entry/Spread |
| Supporting measure                                      | Summary                                                                                                                                                                                                 | Risk element targeted (entry/establishment/spread/impact) |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| 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)  
  a) export certificate (import)  
  b) plant passport (EU internal trade)  
  Recommended for plant species known as hosts of *C. aenigma, C. alienum, C. perseae, C. siamense* and *C. theobromicola* | 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 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.  
  Certified and approved premises reduce the likelihood of the plants and plant products originating in those premises to be infected by the pathogens | Entry/Spread                                                                                                                                |
| 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  
  The risk of entry and/or spread of the above-mentioned Colletotrichum species is reduced if host plants for planting, including seeds for sowing, are produced under an approved certification scheme and tested free of these pathogens. | 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). | Spread                                                                                                                                     |
3.6.1.3. Biological or technical factors limiting the effectiveness of measures

- Latently infected plants and plant products are unlikely to be detected by visual inspection.
- The similarity of symptoms and signs caused by C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola makes impossible the detection of the pathogens based on symptoms and signs (e.g. fruiting bodies).
- The lack of rapid diagnostic methods based on serological or molecular approaches does not allow proper in planta identification of the pathogens at entry. Thorough post-entry laboratory analyses may not be feasible for certain commodities as isolation in pure culture is needed prior to proceed with DNA extraction and molecular identification based on multigene sequencing.
- The wide host range of some of those Colletotrichum species (i.e. C. siamense) limits the possibility to develop standard diagnostic protocols for all potential hosts.
- The genome plasticity and the possibility of sexual reproduction leading to genetic recombination in C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola may limit the efficacy of chemical control approaches by favouring the selection of fungicide-resistant populations.

3.7. Uncertainty

Uncertainty on the actual distribution of the five Colletotrichum species in the EU, particularly with respect to records where multilocus gene sequencing analysis was not used for the identification of the isolated Colletotrichum species.

4. Conclusions

Of the five Colletotrichum species, C. aenigma and C. siamense are reported to be present in Italy and C. alienum in Portugal, including Madeira Islands, with a restricted distribution. C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola satisfy the criteria that are within the remit of EFSA to assess for these species to be regarded as potential Union quarantine pests (Table 10).

### Table 10: 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 identities of C. aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola are clearly defined | None |
| **Absence/presence of the pest in the EU** (Section 3.2) | 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. | Uncertainty on the actual distribution of the five Colletotrichum species in the EU, particularly with respect to records where multilocus gene sequencing... |
| Criterion of pest categorisation | Panel’s conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest | Key uncertainties |
|----------------------------------|-------------------------------------------------------------------------------------------------|-------------------|
| **Pest potential for entry, establishment and spread in the EU (Section 3.4)** | *C. aenigma*, *C. alienum* and *C. siamense* have already entered the EU and they may further enter into, become established in, and spread within the EU. Similarly, *C. perseae* and *C. theobromicola* could potentially enter into, become established in, and spread within the EU territory. The main pathways for the entry/further entry of the pathogens into, and spread within, the EU territory are: (i) host plants for planting, and (ii) fresh fruit of host plants, originating in infested third countries. Spores of the pathogens may be also present as contaminants on other substrates (e.g. non-host plants, and other objects, etc.) imported into the EU, although these are considered minor pathways for the entry of the pathogens into the EU territory. *C. aenigma*, *C. alienum* and *C. siamense* are present in the EU, which indicates that both the biotic (host availability) and abiotic (climate suitability) factors occurring in parts of the EU are also favourable for the establishment of *C. perseae* and *C. theobromicola*, too. Following establishment, the five *Colletotrichum* species could spread within the EU territory by natural and human-assisted means. | None |
| **Potential for consequences in the EU (Section 3.5)** | The introduction and spread of the pathogens in the EU is likely to have yield and quality impacts in some parts of the territory. No associated crop losses have been reported so far from Italy and Portugal where *C. aenigma*, *C. siamense* (Italy) and *C. alienum* (Portugal) occur locally. | None |
| **Available measures (Section 3.6)** | Although not specifically targeted against *C. aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola*, existing phytosanitary measures mitigate the likelihood of the pathogens’ entry into the EU territory. Potential additional measures also exist to further mitigate the risk of entry into, establishment within, or spread of the pathogens within the EU. | None |
| **Conclusion (Section 4)** | *C. aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola* meet all the criteria assessed by EFSA for consideration as Union quarantine pests. | None |
The main knowledge gap concerns the need to ascertain the present distribution of *C. aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola* within the EU territory. Given that all the data available in the literature have been explored, the Panel considers that systematic surveys should be carried out and *Colletotrichum* isolates in culture collections should be re-evaluated using appropriate pest identification methods (e.g., multilocus gene sequencing analysis) to define the current geographical distribution of *C. aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola* in the EU territory.

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**Glossary**

**Containment (of a pest)** Application of phytosanitary measures in and around an infested area to prevent spread of a pest (FAO, 2018)

**Control (of a pest)** Suppression, containment or eradication of a pest population (FAO, 2018)

**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, 2018)

**Eradication (of a pest)** Application of phytosanitary measures to eliminate a pest from an area (FAO, 2018)

**Establishment (of a pest)** Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2018)

**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, 2018)

**Pathway** Any means that allows the entry or spread of a pest (FAO, 2018)

**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, 2018)

Abbreviations

| Abbreviation | Definition |
|--------------|------------|
| EPPO         | European and Mediterranean Plant Protection Organization |
| FAO          | Food and Agriculture Organization |
| IPPC         | International Plant Protection Convention |
| ISPM         | International Standards for Phytosanitary Measures |
| MS           | Member State |
| PLH          | EFSA Panel on Plant Health |
| PZ           | Protected Zone |
| TFEU         | Treaty on the Functioning of the European Union |
| ToR          | Terms of Reference |

Colletotrichum aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola: Pest categorisation
Appendix A – Host plants/species affected by each of the five *Colletotrichum* species

Source: CABI (online), Farr and Rossman (online; https://nt.ars-grin.gov/fungaldatabases/) and other sources.

### A.1. Host plants/species affected by *Colletotrichum aenigma*

| Host status | Host name           | Plant family | Common name                  | Reference                  |
|-------------|---------------------|--------------|------------------------------|----------------------------|
| Cultivated hosts | Actinidia arguta   | Actinidiaceae | Hardy kiwi                  | Wang et al. (2019)         |
|              | Aquilaria sinensis | Thymelaeaceae | Agarwood                   | Li et al. (2021a,b)        |
|              | Camellia japonica  | Theaceae     | Common camellia             | Yang et al. (2019)         |
|              | Camellia oleifera  | Theaceae     | Tea oil camellia            | Wang et al. (2020b)        |
|              | Camellia sinensis  | Theaceae     | Tea plant; tea tree         | Wang et al. (2020b)        |
|              | Camellia sasanqua  | Theaceae     | Sasanqua camellia           | Chen et al. (2019)         |
|              | Capsicum annuum    | Solanaceae   | Pepper                      | Sharma et al. (2022)       |
|              | Diospyros kaki     | Ebenaceae    | Persimmon                   | Andrioli et al. (2021)     |
|              | Fragaria × ananassa| Rosaceae     | Strawberry                  | Chen et al. (2020)         |
|              | Juglans regia      | Juglandaceae | Walnut                      | Wang et al. (2020c)        |
|              | Malus domestica    | Rosaceae     | Apple                       | Yokosawa et al. (2017)     |
|              | Olea europaea      | Oleaceae     | Olive                       | Schena et al. (2014)       |
|              | Persea americana   | Lauraceae    | Avocado                     | Sharma et al. (2017)       |
|              | Populus sp.        | Salicaceae   | Poplar                      | Jayawardena et al. (2016)  |
|              | Populus nigra var. italic* | Salicaceae | Black poplar               | Li et al. (2012)           |
|              | Pyrus pyrifolia    | Rosaceae     | Nashi pear                  | Fu et al. (2019)           |
|              | Pyrus × bretschneider | Rosaceae | Chinese white pear         | Fu et al. (2019)           |
|              | Pyrus communis     | Rosaceae     | European pear               | Fu et al. (2019)           |
|              | Prunus avium       | Rosaceae     | Sweet cherry                | Chethana et al. (2019)     |
|              | Sedum kamtschaticum| Crassulaceae | Stonecrop                   | Choi et al. (2017)         |
|              | Selenicereus undatus | Cactaceae | Dragon fruit; pitahaya      | Meetum et al. (2015)       |
|              | Synsepalum dulcificum | Sapotaceae | Miracle fruit               | Truong et al. (2018)       |
|              | Vigna unguiculata  | Fabaceae     | Cowpea                      | Alizadeh et al. (2015)     |
|              | Vitis vinifera     | Vitaceae     | Grapevine                   | Lopez-Zapata et al. (2019), Kim et al. (2021) |

* Wild weed hosts

* Artificial/experimental host

*: As *Colletotrichum populi*.

### A.2. Host plants/species affected by *Colletotrichum alienum*

| Host status | Host name           | Plant family | Common name                  | Reference                  |
|-------------|---------------------|--------------|------------------------------|----------------------------|
| Cultivated hosts | Aquilaria sinensis | Thymelaeaceae | Agarwood                   | Liu et al. (2020)         |
|              | Camellia spp.      | Theaceae     | Common camellia; tea oil camellia; tea tree | Liu et al. (2015) |
|              | Diospyros kaki     | Ebenaceae    | Persimmon                   | Weir et al. (2012)        |
|              | Fragaria × ananassa| Rosaceae     | Strawberry                  | Shivas et al. (2016)      |
| Host status | Host name | Plant family | Common name | Reference |
|-------------|-----------|--------------|-------------|-----------|
| Cultivated hosts | Capsicum annuum | Solanaceae | Pepper | Sharma et al. (2022) |
| | Olea europaea | Oleaceae | Olive | Moral et al. (2021) |
| | Persea americana | Lauraceae | Avocado | Sharma et al. (2017) |
| | Vitis vinifera | Vitaceae | Grapevine | Yokosawa et al. (2020) |
| Wild weed hosts | – | – | – | – |
| Artificial/experimental hosts | – | – | – | – |

### A.3. Host plants/species affected by *Colletotrichum perseae*

| Host status | Host name | Plant family | Common name | Reference |
|-------------|-----------|--------------|-------------|-----------|
| Cultivated hosts | Acacia confusa | Mimosaceae | False koa | Liu et al. (2022) |
| | Alchornea bilifolia | Euphorbiaceae | – | Liu et al. (2022) |
| | Allium cepa | Amaryllidaceae | Onion | Chowdappa et al. (2015) |
| | Alpinia pusilla | Zingiberaceae | – | Liu et al. (2022) |
| | Amaryllis vittata | Amaryllidaceae | Barbados lily | Liu et al. (2022) |
| | Amherstia nobilis | Fabaceae | Orchid tree | Liu et al. (2022) |
| | Annona muricata | Annonaceae | Soursop | Costa et al. (2019) |
| | Annona squamosa | Annonaceae | Sugar apple | Costa et al. (2019) |
| | Arenga caudata | Arecaceae | – | Liu et al. (2022) |
| | Artabotrys hexapetalus | Annonaceae | Climbing ylang-ylang | Liu et al. (2022) |
| | Anthurium sp. | Araceae | – | Liu et al. (2022) |
| | Aspidistra sp. | Asparagaceae | – | Liu et al. (2022) |
| | Bambusa vulgaris | Poaceae | Common bamboo | Liu et al. (2022) |
| | Bauhinia purpurea | Fabaceae | Australian orchid tree | Liu et al. (2022) |
| Host status         | Host name               | Plant family | Common name               | Reference                      |
|---------------------|-------------------------|--------------|---------------------------|--------------------------------|
| Calliandra haematocephala | Mimosaceae                | Red powder puff | Liu et al. (2022)         |
| Camellia chrysantha   | Theaceae                 | Camellia     | Zhao et al. (2021)        |
| Camellia japonica     | Theaceae                 | Common camellia | Peng et al. (2022)       |
| Camellia oleifera     | Theaceae                 | Tea oil camellia | Liu et al. (2015)       |
| Camellia sinensis     | Theaceae                 | Tea plant    | Jayawardena et al. (2016) |
| Capsicum annuum       | Solanaceae               | Pepper       | Sharma and Shenoy (2014)  |
| Capsicum frutescens   | Solanaceae               | Bird's eye chilli | Noor and Zakaria (2018)  |
| Carica papaya         | Caricaceae               | Papaya       | Zhang et al. (2021a,b,c)  |
| Carya illinoinensis   | Juglandaceae             | Pecan        | Oh et al. (2021)          |
| Castanea henyi        | Fagaceae                 | Henry's chestnut | Liu et al. (2022)       |
| Celtis sinensis       | Cannabaceae              | Japanese hackberry | Liu et al. (2022)       |
| Cenchrus purpureus    | Poaceae                 | Elephant grass | Hyde et al. (2018)       |
| Cenostigma tocanitum  | Leguminosae              | –            | Ferreira e Ferreira et al. (2020) |
| Cercis chinensis      | Fabaceae                 | Chinese redbud | Ji et al. (2019)          |
| Chamaerops humilis    | Arecales                | Mediterranean palm | Liu et al. (2022)       |
| Chrysalidocarpus lutescens | Palmae                | Madagascar palm | Liu et al. (2022)       |
| Cinnamomum burmannii | Lauraceae                | Batavia cinnamon | Liu et al. (2022)       |
| Cinnamomum camphora   | Lauraceae                | Camphor      | Liu et al. (2022)         |
| Cinnamomum kotoense   | Lauraceae                | –            | Zhou et al. (2016)        |
| Citrus spp.           | Rutaceae                | Citrus       | Wang et al. (2021)        |
| Citrus reticulata     | Rutaceae                | Mandarin     | Cheng et al. (2013)       |
| Citrus sinensis var. brasiliensis | Rutaceae | – | Liu et al. (2022) |
| Clerodendrum wallichii | Lamiaceae              | Swaddling flower | Liu et al. (2022)       |
| Clinacanthus nutans   | Acanthaceae             | Sabah snake grass | Liu et al. (2022)       |
| Coffea arabica        | Rubiaceae               | Coffee       | Prihastuti et al. (2009)  |
| Corchorus capsularis  | Malvaceae               | White jute   | Niu et al. (2016)         |
| Cornus hongkongensis  | Cornaceae               | Dogwood      | Wang et al. (2021)        |
| Crinum asiaticum      | Amaryllidaceae          | Crinum lily  | Liu et al. (2022)         |
| Cymbidium ensifolium  | Orchidaceae             | Oriental cymbidium | Liu et al. (2022)       |
| Cymbidium hybrid      | Orchidaceae             | –            | Liu et al. (2022)         |
| Cymbopogon citratus   | Poaceae                 | Lemon grass  | Hyde et al. (2018)        |
| Dichotomanthus tristaniaecarpa | Rosaceae | – | Liu et al. (2022) |
| Dionaea muscipula     | Droseraceae             | Venus flytrap | Shivas et al. (2016)      |
| Dioscorea cayennensis | Dioscoreaceae          | Yam          | De Souza Jr and Assuncão (2021) |
| Diospyros kaki        | Ebenaceae               | Persimmon    | Chang et al. (2018)       |
| Dracaena angustifolia | Asparagaceae            | –            | Liu et al. (2022)         |
| Dracaena cambodiana   | Asparagaceae            | –            | Liu et al. (2022)         |
| Host status | Host name                  | Plant family        | Common name                       | Reference                  |
|-------------|----------------------------|---------------------|-----------------------------------|----------------------------|
|             | Dracaena fragrans         | Asparagaceae        | Cornstalk dracaena                | Liu et al. (2022)          |
|             | Dypsis lutescens           | Arecaceae           | Areca palm                        | Chou et al. (2019)         |
|             | Elettaria cardamomum       | Zingiberaceae       | Cardamom                          | Chethana et al. (2016)     |
|             | Ensete superbum            | Musaceae            | Cliff banana                      | Kumar et al. (2017)        |
|             | Eriobotrya japonica        | Rosaceae            | Loquat                            | Shivas et al. (2016)       |
|             | Erythrina cristata-galli   | Fabaceae            | Cockspur coral tree               | Li et al. (2021)           |
|             | Erythrina variegata        | Fabaceae            | Indian coral tree                 | Guterres et al. (2020)     |
|             | Excentrodendron hsiennmu   | Malvaceae           | –                                 | Liu et al. (2022)          |
|             | Excoecaria cochinchinensis | Euphorbiaceae       | –                                 | Liu et al. (2022)          |
|             | Ficus carica               | Moraceae            | Fig                               | Shivas et al. (2016)       |
|             | Ficus elastica             | Moraceae            | Rubber tree                       | Jayawardena et al. (2016)  |
|             | Fragaria × ananassa        | Rosaceae            | Strawberry                        | Weir et al. (2012)         |
|             | Gossypium hirsutum         | Malvaceae           | Cotton                            | Salunkhe et al. (2020)     |
|             | Heliconia rostrata         | Musaceae            | False bird of paradise            | Chaves et al. (2020)       |
|             | Hevea sp.                  | Euphorbiaceae       | –                                 | Liu et al. (2022)          |
|             | Hibiscus tiliaceus         | Malvaceae           | Coastal hibiscus                  | Rocha et al. (2021)        |
|             | Homalomena occulta         | Arecaceae           | –                                 | Liu et al. (2022)          |
|             | Hymenocallis spp.          | Amaryllidaceae      | Spider lily                        | Weir et al. (2012)         |
|             | Ilex cornuta               | Aquifoliaceae       | Chinese holly                      | Liu et al. (2022)          |
|             | Iris tectorum              | Iridaceae           | Iris                               | Liu et al. (2017)          |
|             | Jasminum mesnyi            | Oleaceae            | Chinese jasmine                    | Liu et al. (2022)          |
|             | Jasminum sambac            | Oleaceae            | Arabian jasmine                    | Liu et al. (2022)          |
|             | Jatropha integerrima        | Euphorbiaceae       | Spicy jatropha                     | Liu et al. (2022)          |
|             | Juglans regia              | Juglandaceae        | walnut                            | Wang et al. (2017)         |
|             | Lagerstroemia speciosa     | Lythraceae          | Pride of India                     | Liu et al. (2022)          |
|             | Licania tomentosa          | Chrysobalanaceae    | –                                 | Lisboa et al. (2018)       |
|             | Liriodendron chinense × tulipifera | Magnoliaceae                  | Tulip poplar                      | Zhu et al. (2019)          |
|             | Litsea honghoensis         | Lauraceae           | –                                 | Liu et al. (2022)          |
|             | Litchi chinensis           | Sapindaceae         | litchi                            | Ling et al. (2019)         |
|             | Macadamia integrifolia     | Proteaceae          | Macadamia                         | Prassanath et al. (2020)   |
|             | Machilus ichangensis       | Lauraceae           | –                                 | Cheng et al. (2019)        |
|             | Machilus pauhoi            | Lauraceae           | –                                 | Liu et al. (2022)          |
|             | Maesa indica               | Primulaceae         | –                                 | Liu et al. (2022)          |
|             | Magnolia × alba            | Magnoliaceae        | White sandalwood                   | Liu et al. (2022)          |
|             | Magnolia grandiflora       | Magnoliaceae        | Magnolia                          | Zhou et al. (2022)         |
|             | Malus domestica            | Rosaceae            | Apple                             | Weir et al. (2012)         |
|             | Malus niedzwetzkyana       | Rosaceae            | Red-fleshed apple                 | Han et al. (2022)          |
|             | Mandevilla sp.             | Apocynaceae         | Rock trumpet                       | Watanabe et al. (2016)     |
|             | Mangifera indica           | Anacardiaceae       | Mango                             | Giblin et al. (2018)       |
| Host status | Host name         | Plant family | Common name            | Reference                   |
|-------------|-------------------|--------------|------------------------|-----------------------------|
|             | Manihot esculenta | Euphorbiaceae| Cassava                | Liu et al. (2019)           |
|             | Mentha sp.        | Lamiaceae    | Mint                   | James et al. (2014)         |
|             | Monstera deliciosa| Araceae      | Split-leaf philodendron| Liu et al. (2022)           |
|             | Muraya sp.        | Rutaceae     | –                      | Liu et al. (2015)           |
|             | Musa acuminata    | Musaceae     | Banana                 | Uysal and Kurt (2020)       |
|             | Musa paradisiaca  | Musaceae     | –                      | Liu et al. (2022)           |
|             | Nelumbo nucifera  | Nelumbonaceae| Lotus                  | Chen and Kirschner (2018)   |
|             | Ocimum basilicum  | Lamiaceae    | Basil                  | Ismail et al. (2021)        |
|             | Olea europaea     | Oleaceae     | Olive                  | Schena et al. (2014)        |
|             | Ophiopogon japonicus | Asparagaceae | Dwarf lilyturf         | Liu et al. (2022)           |
|             | Opuntia cochenillofara | Cactaceae | –                      | Liu et al. (2022)           |
|             | Orchid            | Orchidaceae  | –                      | Liu et al. (2022)           |
|             | Paramongaia weberbaueri | Amaryllidaceae | –                  | Liu et al. (2022)           |
|             | Parthenocissus tricuspidata | Vitaceae | Ivy                    | Schena et al. (2014)        |
|             | Peperomia sp.     | Piperaceae   | –                      | Liu et al. (2022)           |
|             | Persea americana  | Lauraceae    | Avocado                | Liu et al. (2022)           |
|             | Philodendron selloum | Araceae       | Lacy tree philodendron| Liu et al. (2022)           |
|             | Piper nigrum      | Piperaceae   | Black pepper           | James et al. (2014)         |
|             | Pistacia vera     | Anacardiaceae| Pistachio              | Weir et al. (2012)          |
|             | Platostoma palustre | Lamiaceae     | Chinese mesona         | Hsieh et al. (2020)         |
|             | Plukenetia volubilis | Euphorbiaceae | Mountain peanut        | Wang et al. (2020a)         |
|             | Plumeria alba     | Apocynaceae  | –                      | Ismail et al. (2021)        |
|             | Pongamia pinnata  | Leguminosae  | Indian beech           | Liu et al. (2022)           |
|             | Protea cynaroides | Proteaceae   | King protea            | Liu et al. (2013)           |
|             | Prunus persica    | Rosaceae     | Peach                  | Tan et al. (2022)           |
|             | Psidium guajava   | Myrtaceae    | Common guava           | Rodriguez-Palarosa et al. (2021), Liu et al. (2022) |
|             | Pterocarpus sp.   | Fabaceae     | –                      | Liu et al. (2022)           |
|             | Punica granatum   | Lythraceae   | Pomegranate            | Xavier et al. (2019)        |
|             | Pyrus communis    | Rosaceae     | Pear                   | Fu et al. (2019)            |
|             | Pyrus pyrifolia   | Rosaceae     | Nashi pear             | Fu et al. (2019)            |
|             | Renanthera coccinea | Orchidaceae | –                      | Liu et al. (2022)           |
|             | Rhaphiolepis indica | Rosaceae      | Indian hawthorn        | Liu et al. (2022)           |
|             | Ricinus communis  | Euphorbiaceae| Castor bean            | Tang et al. (2021)          |
|             | Rosa chinensis    | Rosaceae     | Rose                   | Feng et al. (2019)          |
|             | Rubus reflexus    | Rosaceae     | –                      | Liu et al. (2022)           |
|             | Saccharum spp.    | Poaceae      | –                      | Cavalcani et al. (2022)     |
|             | Salix matsudana   | Salicaceae   | Chinese willow         | Zhang et al. (2021)         |
|             | Salvia rosmarinus | Lamiaceae    | Rosemary               | James et al. (2014)         |
|             | Saraca indica     | Fabaceae     | Asoka tree             | Jayawardana et al. (2016)   |
|             | Sarcandra glabra  | Chloranthaceae| Herba sarcandrae       | Ye et al. (2016)            |
|             | Saururus chinensis | Saururaceae  | Lizard’s tail          | Liu et al. (2022)           |
|             | Schefflera heptaphylla  | Araliaceae  | –                      | Liu et al. (2022)           |
### A.5. Host plants/species affected by *Colletotrichum theobromicola*  

**Table 1**

| Host status | Host name                        | Plant family | Common name       | Reference                  |
|-------------|----------------------------------|--------------|-------------------|----------------------------|
| Cultivated hosts | Anacardium occidentale*          | Anacardiaceae | Cashew            | Veloso et al. (2018)       |
|             | Allium fistulosum                | Amaryllidaceae| Welsh onion       | Matos et al. (2017)        |
|             | Annona cherimola*                | Annonaceae   | Cherimoya         | Villanueva-Arce et al. (2008) |
|             | Annona diversifolia              | Annonaceae   | Soursop           | Weir et al. (2012)         |
|             | Annona muricata                  | Annonaceae   | Soursop           | Costa et al. (2019)        |
|             | Annona squamosa                  | Annonaceae   | Sugar apple       | Costa et al. (2019)        |
|             | Anthurium spp.                   | Araceae      | Anthurium         | Chaves et al. (2020)       |
|             | Butia odorata                    | Arecaceae    | Jelly palm        | Dorneles et al. (2018)     |
|             | Buxus spp.                       | Buxaceae     | Boxwood           | Hawk et al. (2018)         |
|             | Camponanesia phaeae              | Myrtaceae    | Cambuci           | Santos et al. (2017)       |
|             | Centrosema pubescens             | Fabaceae     | Butterfly pea     | Pakdeeniti et al. (2022)   |
|             | Citrus spp.                      | Rutaceae     | Citrus            | Wang et al. (2021)         |

*Wild weed hosts*  

| Host status | Host name                        | Plant family | Common name       | Reference                  |
|-------------|----------------------------------|--------------|-------------------|----------------------------|
|             | Commelina sp.                    | Commelinaceae| Dayflower         | Weir et al. (2012)         |
|             | Cycas debaoensis                 | Cycadaceae   |                  | Han et al. (2021)          |
|             | Dichotomanthus tristisaeacarpa   | Rosaceae     |                  | Liu et al. (2022)          |
|             | Kadsura coccinea                 | Schisandraceae|                  | Wang et al. (2017)         |
|             | Mallotus oppositifolius          | Euphorbiaceae| Partridge tea     | Liu et al. (2018)          |
|             | Solanum rostratum                | Solanaceae   | Beaked nightshade | Liu et al. (2022)          |
|             | Sterculia spp.                   | Malvaceae    |                  | Zhang et al. (2020a,b)     |
|             | Uraria picta                     | Fabaceae     |                  | Srivastava et al. (2017)   |
| Host status         | Host name                 | Plant family | Common name | Reference                     |
|---------------------|---------------------------|--------------|-------------|-------------------------------|
| Coffea arabica      | Rubiaceae                 | Coffee       | James et al. (2014) |
| Cerealiaeae          | Coffee                     | Carnaubeira palm | Araujo et al. (2018) |
| Cyclamen persicum   | Primulaceae               | Persian cyclamen | Liu et al. (2011) |
| Eucalyptus spp.     | Myrtaceae                 | Eucalyptus   | Rodrigues et al. (2014) |
| Feijoa sellowiana   | Myrtaceae                 | Feijoa       | Weir et al. (2012) |
| Fragaria × ananassa | Rosaceae                  | Strawberry   | Weir et al. (2012) |
| Gossypium arboretum cv. indicum** | Malvaceae | Cotton | Kang et al. (2022) |
| Limonium spp.       | Plumbaginaceae            | Sea lavender | Weir et al. (2012) |
| Malpighia emarginata | Malpighiaceae            | Acerola cherry | Braganca et al. (2014) |
| Malus domestica     | Rosaceae                  | Apple        | Munir et al. (2016) |
| Mangifera indica    | Anacardiaceae             | Mango        | Pardo-De la Hoz et al. (2016) |
| Manihot esculenta   | Euphorbiaceae             | Cassava      | Oliveira et al. (2018) |
| Manilkara zapota    | Sapotaceae                | Sapodilla    | Martins et al. (2018) |
| Olea europaea       | Oleaceae                  | Olive        | Lima et al. (2020) |
| Persea americana    | Lauraceae                 | Avocado      | Sharma et al. (2017) |
| Prunus avium**      | Rosaceae                  | Sweet cherry | Chethana et al. (2019) |
| Punica granatum     | Lythraceae                | Pomegranate  | Xavier et al. (2019) |
| Quercus spp.        | Fagaceae                  | Oak          | Weir et al. (2012) |
| Senna obtusifolia*  | Fabaceae                  | Chinese senna | Howard and Albregts (1973) |
| Stylosanthes spp.   | Fabaceae                  | Pencilflower | Weir et al. (2012) |
| Theobroma cacao     | Malvaceae                 | Cacao tree   | Rojas et al. (2010) |
| Wild weed hosts     | Aeschynomene falcata      | Fabaceae     | Shivas et al. (2016) |
|                     | Fragaria vesca            | Rosaceae     | Weir et al. (2012) |
|                     | Hopea odorata*            | Dipterocarpaceae | Rashid et al. (2021) |
|                     | Potentilla canadensis*    | Rosaceae     | Grand (1985) |

*: As Colletotrichum fragariae.
**: As Colletotrichum pseudotheobromicola.
Appendix B – Aggregate table of main hosts of the five *Colletotrichum* species

| HOST NAME                     | *C. aenigma* | *C. alienum* | *C. perseae* | *C. siamense* | *C. theobromicola* |
|-------------------------------|--------------|--------------|--------------|---------------|-------------------|
| Actinidia arguta              |              |              |              | *              |                   |
| Allium cepa                   |              | *           |              |              |                   |
| Allium fistulosum             |              |              |              | *              |                   |
| Anacardium occidentale        |              |              |              | *              |                   |
| Annona spp.                   |              |              |              | *              | *                 |
| Anthurium spp.                |              | *           |              | *              |                   |
| Aquilaria sinensis            | *            |              |              | *              |                   |
| Butia odorata                 |              |              | *           |              |                   |
| Buxus spp.                    |              |              | *           |              |                   |
| Camellia spp.                 |              |              | *           | *              | *                 |
| Capsicum annuum               |              |              |              | *              |                   |
| Campomanesia phaea            |              |              |              | *              |                   |
| Centrosema pubescens          |              |              | *           |              |                   |
| Carica papaya                 |              |              |              |               |                   |
| Caryya illinoiensis           |              |              |              | *              |                   |
| Citrus spp.                   |              |              | *           | *              |                   |
| Citrus sinensis               |              |              |              | *              |                   |
| Citrus reticulata             |              |              |              | *              |                   |
| Coffea arabica                |              |              |              |               |                   |
| Copernicia prunifera          |              |              |              | *              |                   |
| Corchorus capsularis          |              |              |              |               |                   |
| Ctenanthe oppenheimiana       |              |              |              | *              |                   |
| Dioscorea cayennensis         |              |              |              | *              |                   |
| Diospyros kaki                | *            |              |              |               |                   |
| Eucalyptus spp.               |              |              |              | *              |                   |
| Fragaria × ananassa           |              |              | *           | *              |                   |
| Gossypium arboreum cv. indicum|              |              |              |               |                   |
| Juglans regia                 |              |              |              | *              |                   |
| Malpighia emarginata          |              |              |              | *              |                   |
| Malus domestica               |              |              | *           | *              |                   |
| Malus niedzwetzkyana          |              |              |              | *              |                   |
| Mangifera indica              |              |              |              | *              | *                 |
| Manihot carthagineis          |              |              |              |               |                   |
| Manihot esculenta             |              |              |              |               |                   |
| Manihot tomentosa             |              |              |              |               |                   |
| Manikara zapota               |              |              |              |               |                   |
| Olea europaea                  |              |              | *           | *              | *                 |
| Persea americana              | *            |              | *           | *              | *                 |
| Protea spp.                   |              |              |              | *              |                   |
| Prunus avium                  | *            |              |              | *              |                   |
| Prunus persica                |              |              |              | *              |                   |
| Punica granatum               |              |              |              | *              | *                 |
| Pyrus × bretschneideri         | *            |              | *           | *              |                   |
| Pyrus pyrifolia               |              |              | *           | *              |                   |
| Pyrus communis                | *            |              |              | *              |                   |
| Selenicereus undatus          |              |              | *           | *              |                   |
| HOST NAME                                      | C. aenigma | C. alienum | C. perseae | C. siamense | C. theobromicola |
|------------------------------------------------|------------|------------|------------|-------------|-----------------|
| Synsepalum dulcificum                         | •          |            |            | •           |                 |
| Theobroma cacao                               |            |            |            |             | •               |
| Vitis caribaea × Riparia do Traviú             |            |            |            | •           |                 |
| Vitis riparia                                 |            |            |            |             |                 |
| Vitis vinifera                                | •          |            |            |             |                 |
| Zinnia elegans                                |            |            |            |             | •               |
| Ziziphus mauritiana                           |            |            |            |             | •               |
Appendix C – Distribution of the five *Colletotrichum* species

### C.1. Distribution of *Colletotrichum aenigma*

Distribution records based on CABI (online) and Farr and Rossman (online; [https://nt.ars-grin.gov/fungal databases/](https://nt.ars-grin.gov/fungal databases/)).

| Region        | Country | Subnational (e.g. State)        | Status    | Reference                                                                 |
|---------------|---------|---------------------------------|-----------|---------------------------------------------------------------------------|
| North America | USA*    | N/A                             | Present   | Jayawardena et al. (2016)                                                |
| South America | Brazil  | Rio Grande do Sul (Farroupilha) | Present   | Andrioli et al. (2021)                                                   |
|               | Colombia| La Union, Valle del Cauca       | Present   | López-Zapata et al. (2019), Guevara-Suarez et al. (2022)                  |
| EU (27)       | Italy   | Apulia                          | Present   | Schena et al. (2014)                                                      |
| Other Europe  | UK      | N/A                             | Present   | Baroncelli et al. (2015)                                                  |
| Asia          | China   |                                 | Present   | Chen et al. (2019), Chethana et al. (2019), Diao et al. (2017), Fu et al. (2019), Han et al. (2016); Li et al. (2021a,b), Wang et al. (2015, 2019); Yan et al. (2015), Yang et al. (2019); Zhang et al. (2020a,b) |
|               |         | Beijing (Shi Jingshan)**        |           |                                                                           |
|               |         | Changzhou                       |           |                                                                           |
|               |         | Dandong (Liaoning)              |           |                                                                           |
|               |         | Dangshan (Anhui)                |           |                                                                           |
|               |         | Fangshan (Beijing)              |           |                                                                           |
|               |         | Hainan province                 |           |                                                                           |
|               |         | Hangzhou (Zhejiang)             |           |                                                                           |
|               |         | Hongshan (Wuhan, Hubei)         |           |                                                                           |
|               |         | Huangpi (Hubei)                 |           |                                                                           |
|               |         | Hubei                           |           |                                                                           |
|               |         | Jiangsu                         |           |                                                                           |
|               |         | Jinhua (Zhejiang)               |           |                                                                           |
|               |         | Liaoning                         |           |                                                                           |
|               |         | Nanjing                         |           |                                                                           |
|               |         | Neiqiu (Xingtai, Hebei)         |           |                                                                           |
|               |         | Ningbo (Zhejiang)               |           |                                                                           |
|               |         | Ningde (Fujian)                 |           |                                                                           |
|               |         | Putian (Fujian)                 |           |                                                                           |
|               |         | Qingdao                         |           |                                                                           |
|               |         | Qinhuangdao (Hebei)             |           |                                                                           |
|               |         | Quanzhou (Fujian)               |           |                                                                           |
|               |         | Shanghai (Campus of East China Normal University) | |                                                                           |
|               |         | Shanxi                          |           |                                                                           |
|               |         | Shaoxing (Zhejiang)             |           |                                                                           |
|               |         | Tianjin                         |           |                                                                           |
|               |         | Wugong                          |           |                                                                           |
|               |         | Wuhan (Hubei)                   |           |                                                                           |
|               |         | Wuxi (Jiangsu)                  |           |                                                                           |
|               |         | Xiayi (Henan)                   |           |                                                                           |
|               |         | Yancheng (Jiangsu)              |           |                                                                           |
|               |         | Yangling                        |           |                                                                           |
|               |         | Yangluqing (Tianjin)            |           |                                                                           |
|               |         | Zhangzhou (Fujian)              |           |                                                                           |
|               |         | Zhongxiang (Hubei)              |           |                                                                           |
| Iran          |         | Langrood                        | Present   | Alizadeh et al. (2015)                                                   |
|               |         | Rasht                           |           |                                                                           |
|               |         | Guilan                          |           |                                                                           |
### Region | Country | Subnational (e.g. State) | Status | Reference |
|-------|--------|--------------------------|--------|-----------|
| **North America** | USA | California | Present | Crous et al. (2013) |
| | Hawaii | N/A | Present | Crous et al. (2013) |
| | Mexico | Chiapas, Oaxaca | Present | Tovar-Pedraza et al. (2020) |
| **South America** | Uruguay | Departments of Colonia, Canelones, Montevideo, Maldonado, Rocha and Treinta y Tres | Present | Moreira et al. (2021) |
| **EU (27)** | Portugal | Madeira Islands_Florialis Estate | Present | Liu et al. (2013) |
| **Africa** | South Africa | Western Cape Province, Caledon, Betty’s Bay | Present | Liu et al. (2013) |
| | Zimbabwe | N/A | Present | Crous et al. (2013) |

### C.2. Distribution of *Colletotrichum alienum*

Distribution records based on Farr and Rossman (online; [https://nt.ars-grin.gov/fungaldatabases/](https://nt.ars-grin.gov/fungaldatabases/)) and other sources.

*: Reported by Jayawardena et al. (2016) but no ref is cited.  
**: As *Colletotrichum populi*.
### Distribution of Colletotrichum perseae

Distribution records based on Farr and Rossman (online; [https://nt.ars-grin.gov/fungaldatabases/](https://nt.ars-grin.gov/fungaldatabases/)) and other sources.

| Region     | Country | Sub-national (e.g. State)                        | Status | References                        |
|------------|---------|--------------------------------------------------|--------|-----------------------------------|
| Asia       | China   | • Fengtai (Beijing)                              | Present| Ahmad et al. (2021)               |
|            |         | • Huangzhuiling Forest Farm (Hainan)             |        |                                   |
|            |         | • Jiangxi Province (Ganzhou National Forest Park) |        |                                   |
| Israel     |         | • Kfar Yuval Orchard (North Israel)              | Present| Sharma et al. (2017)              |
| Oceania    | Australia | • Bangalow                                      | Present| Costa et al. (2019), Crous et al. (2013), Mo et al. (2018), Schena et al. (2014), Shivas et al. (2016), Weir et al. (2012) |
|            |         | • Cudgen                                         |        |                                   |
|            |         | • Duranbah                                       |        |                                   |
|            |         | • Green Pigeon                                   |        |                                   |
|            |         | • Mt Tamborine                                   |        |                                   |
|            |         | • New South Wales                                |        |                                   |
|            |         | • Western Australia                              |        |                                   |
|            | New Zealand | • Auckland (Oratia, Kumeu research orchard)     | Present| Alaniz et al. (2019), Diao et al. (2017), Liu et al. (2015), Vieira et al. (2014), Weir et al. (2012) |
|            |         | • Bay of Plenty (Katikati, Te Puke, Te Puna)     |        |                                   |
|            |         | • Tauranga                                       |        |                                   |
|            |         | • Waikato (Hamilton)                             |        |                                   |
| South America | Chile   | • Valparaiso                                     | Present| Bustamante et al. (2020)          |
|            |         | • Metropolitana                                  |        |                                   |
|            |         | • Libertador Gral (Bernardo Ohiggins)            |        |                                   |
| Oceania    | Australia | N/A                                              | Present| Moral et al. (2021)               |
|            | New Zealand | Tauranga (Bay of Plenty)                        | Present| Hofer et al. (2021)               |

### Distribution of Colletotrichum siamense

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

| Region     | Country | Subnational (e.g. State)                      | Status | References                        |
|------------|---------|------------------------------------------------|--------|-----------------------------------|
| North America | Mexico  | • Chiapas                                       | Present| Pérez-Mora et al. (2020)          |
|            |         | • Cocula                                        |        |                                   |
|            |         | • Colima                                        |        |                                   |
|            |         | • Guerrero                                      |        |                                   |
|            |         | • Michoacan                                     |        |                                   |
|            |         | • Nayarit                                       |        |                                   |
|            |         | • Oaxaca                                        |        |                                   |
| Region | Country | Subnational (e.g. State) | Status | References |
|--------|---------|--------------------------|--------|------------|
| USA    | Adams (Pennsylvania) | Present | Weir et al. (2012) |
|        | Aiken (South Carolina) | Present |            |
|        | Alabama | Present |            |
|        | Berks (Pennsylvania) | Present |            |
|        | Bourbon (Kentucky) | Present |            |
|        | Brussels (Illinois) | Present |            |
|        | Chesnee (South Carolina) | Present |            |
|        | Clinton (Kentucky) | Present |            |
|        | Cumberland (Kentucky) | Present |            |
|        | Edwardsville (Illinois) | Present |            |
|        | Fairfax (South Carolina) | Present |            |
|        | Fayette (Kentucky) | Present |            |
|        | Florida | Present |            |
|        | Frederick (Maryland) | Present |            |
|        | Georgia | Present |            |
|        | Graves (Kentucky) | Present |            |
|        | Harlan (Kentucky) | Present |            |
|        | Johnston (North Carolina) | Present |            |
|        | Kent (Delaware) | Present |            |
|        | Lancaster (Pennsylvania) | Present |            |
|        | Licking (Ohio) | Present |            |
|        | Lyon (Kentucky) | Present |            |
|        | McBee (South Carolina) | Present |            |
|        | Marshall (Kentucky) | Present |            |
|        | Montgomery (Kentucky) | Present |            |
|        | Ridge Spring (South Carolina) | Present |            |
|        | Saluda (South Carolina) | Present |            |
|        | Urbana (Illinois) | Present |            |
|        | Virginia | Present |            |
|        | Wilkes (North Carolina) | Present |            |
|        | Woodford (Kentucky) | Present |            |
| South America | Argentina | La Plata (Buenos Aires) | Present | Larrañ et al. (2015), Fernandez et al. (2018) |
|        | Santa Fe | Present |            |
| Brazil | Alagoas | Present | Costa et al. (2019), Fantinel et al. (2017), Lima et al. (2013), Oliveira et al. (2018), Santos et al. (2018), Soares et al. (2020) |
|        | Aquai (Sao Paolo) | Present |            |
|        | Atalaia | Present |            |
|        | Bahia | Present |            |
|        | Bauru (Sao Paolo) | Present |            |
|        | Belem (Para) | Present |            |
|        | Boa Esperança (Minas Gerais) | Present |            |
|        | Boa Vista (Roraima) | Present |            |
|        | Bonito (Pernambuco) | Present |            |
|        | Campinas (Sao Paolo) | Present |            |
|        | Campo Grande (Mato Grosso) | Present |            |
|        | Ceara | Present |            |
|        | Concorde (Sao Paolo) | Present |            |
|        | Conselheiro Lafaiete (Minas Gerais) | Present |            |
|        | Curvelo (Minas Gerais) | Present |            |
| Region            | Country   | Subnational (e.g. State)                                                                                                                                                                                                 | Status | References                  |
|-------------------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------------------------|
| Brazil            |           | • Flores da Cunha (Rio Grande Do Sul)  
• Formiga (Minas Gerais)  
• Gama (Distrito Federal)  
• Goias  
• Gurupi (Tocantins)  
• Lavras (Minas Gerais)  
• Manaus (Amazonas)  
• Palmital do Cervo (Minas Gerais)  
• Paraiba  
• Patos de Minas (Minas Gerais)  
• Piracicaba (Sao Paolo)  
• Piraju (Sao Paolo)  
• Rio Fundo  
• Rio Largo  
• Sao Pedro do Sul (Rio Grande do Sul)  
• Santa Catarina  
• Sao Caetano do Sul (Sao Paolo)  
• Teresina (Pernambuco)  
• Perdoes (Minas Gerais)  
• UFPI-Teresina (Piaui)  
• Recanto de Emas (Distrito Federal)  
• Ribeirao Vermelho (Minas Gerais)  
• Samambaia (Distrito Federal)  
• Sao Joao del Rei (Minas Gerais)  
• Sao Joao do Miriti (Rio de Janeiro)  
• Sao Sebastiao de Paraíso (Minas Gerais)  
• Taguatinga (Distrito Federal)  
• Tres Coracoes (Minas Gerais)  
• Vicos (Minas Gerais)  | Present | Pardo-De la Hoz et al. (2016) |
|                  |           | Colombia  
• Caldas  
• Sucre  
• Tolima  
• La Union (Valle del Cauca)  | Present | Carbone et al. (2021) |
|                  |           | Uruguay  
• Rincon del Colorado (Canelones)  | Present |                                    |
| Central America   | Puerto Rico | • Adjuntas  
• Ciales  
• Utuado  
• Mayaguez  | Present | Serrato-Diaz et al. (2020) |
| EU (27)           | Italy*     | Forli-Cesena                                                                                                                                                | Present | Jayawardena et al. (2018)   |
| Africa            | Egypt      | N/A                                                                                                                                                    | Present | Douanla-Meli and Unger (2017) |
|                  | Ghana      | Akuse (Eastern Region)                                                                                                                                     | Present | Douanla-Meli and Unger (2017) |
| Region     | Country     | Subnational (e.g. State)                                                                 | Status   | References                        |
|------------|-------------|-----------------------------------------------------------------------------------------|----------|-----------------------------------|
|            | Kenya       | N/A                                                                                     | Present  | Silva et al. (2012)               |
|            | Nigeria     | N/A                                                                                     | Present  | Silva et al. (2012)               |
|            | Malawi      | • Ibadan                                                                                 | Present  | Weir et al. (2012)                |
|            | South Africa| N/A                                                                                     | Present  | Weir et al. (2012)                |
|            | Zimbabwe    | N/A                                                                                     | Present  | Liu et al. (2013)                 |
| Asia       | Bangladesh  | • Dhaka                                                                                  | Present  | Azad et al. (2020)                |
|            |             | • Rajshahi district                                                                      |          |                                   |
|            |             | • Tangail                                                                                |          |                                   |
|            | China       | • Anhui                                                                                  | Present  | Weir et al. (2012), Xu et al. (2015) |
|            |             | • Fujian                                                                                 |          |                                   |
|            |             | • Guangdong                                                                              |          |                                   |
|            |             | • Guangxi                                                                                |          |                                   |
|            |             | • Hainan                                                                                 |          |                                   |
|            |             | • Henan                                                                                  |          |                                   |
|            |             | • Hubei                                                                                  |          |                                   |
|            |             | • Hunan                                                                                  |          |                                   |
|            |             | • Jiangxi                                                                                |          |                                   |
|            |             | • Sichuan                                                                                |          |                                   |
|            |             | • Yunnan                                                                                 |          |                                   |
|            |             | • Zhejiang                                                                               |          |                                   |
|            |             | • Zhuang                                                                                 |          |                                   |
|            |             | • Wuhan                                                                                  |          |                                   |
|            | India       | • Andaman & Nicobar Islands                                                              | Present  | Sharma and Shenoy (2014)          |
|            |             | • Karnataka                                                                              |          |                                   |
|            |             | • Kerala                                                                                 |          |                                   |
|            |             | • Maharashtra                                                                            |          |                                   |
|            |             | • Punjab                                                                                 |          |                                   |
|            | Indonesia   | • Gowa                                                                                   | Present  | Radiastuti et al. (2019), Sukarno et al. (2021), Zhafarina et al. (2021) |
|            |             |                                                                                         |          |                                   |
|            |             | • Indonesian Medicinal and Aromatic Crops Research Institute_Bogor                       |          |                                   |
|            |             | • Jeneponto                                                                              |          |                                   |
|            |             | • Massakar                                                                               |          |                                   |
|            |             | • Sibolangit_Deli                                                                        |          |                                   |
|            |             | • Serdang_North Sumatra                                                                   |          |                                   |
|            |             | • Yogyakarta                                                                             |          |                                   |
|            | Israel      | • Bet Dagan                                                                              | Present  | Sharma et al. (2017)              |
|            |             | • Kfar Aza                                                                               |          |                                   |
|            | Japan       | • Chiba                                                                                  | Present  | Yokosawa et al. (2017)            |
|            |             | • Awa Prefecture                                                                         |          |                                   |
|            |             | • Nagano                                                                                 |          |                                   |
|            |             | • Nara                                                                                   |          |                                   |
|            |             | • Sagamihar                                                                              |          |                                   |
| Region | Country | Subnational (e.g. State) | Status | References |
|--------|---------|--------------------------|--------|------------|
| Laos   | • N/A   | Present                  |        | Phoulivong et al. (2012) |
| Malaysia | • Sungai Kapar (Pos Dipang) | Present | | de Silva et al. (2019) |
| Malaysia | • Agricultural Farm (Universiti Putra Malaysia, Selangor) | Present | | |
| Malaysia | • Bakti Permai (Universiti Sains Malaysia) | Present | | |
| Malaysia | • Jalan Asam Jaws (Universiti Putra Malaysia Serdang Selangor) | Present | | |
| Malaysia | • Organic Edible Garden Unit (Serdang, Selangor) | Present | | |
| Malaysia | • Penang Island | Present | | |
| Malaysia | • Peninsular Malaysia | Present | | |
| Pakistan | • Punjab | Present | | Abid et al. (2019) |
| Pakistan | • Bhalwal | Present | | |
| Pakistan | • Khurshab | Present | | |
| Pakistan | • Quetta | Present | | |
| Pakistan | • Sargodha | Present | | |
| Philippines | • Davao del Norte | Present | | Reyes et al. (2021) |
| Philippines | • Mayapayap Sur (Cabanatuan, Nueva Ecija) | Present | | |
| South Korea | • Andong (Gyeongsangbukdo) | Present | | Hassan et al. (2018), Oo et al. (2021) |
| South Korea | • Cheoando (Gun North Gyeongsang) | Present | | |
| South Korea | • Gimcheon | Present | | |
| South Korea | • Goesan (Chungcheong) | Present | | |
| South Korea | • Gyeongbuk | Present | | |
| South Korea | • Miryang | Present | | |
| South Korea | • Mungyeong | Present | | |
| South Korea | • Sangju (Gyeongbuk) | Present | | |
| South Korea | • Ulseong | Present | | |
| South Korea | • Yesan | Present | | |
| Sri Lanka | • Bulanawewa (Galewela, Matale) | Present | | de Silva et al. (2019) |
| Sri Lanka | • Kananwila (Horana) | Present | | |
| Sri Lanka | • Kandy | Present | | |
| Sri Lanka | • Peradeniya | Present | | |
| Sri Lanka | • Sigiriya (Matale District) | Present | | |
| Taiwan | • Dahu Township (Miaoli) | Present | | Wu et al. (2020) |
| Taiwan | • Fangshan (Pingtung) | Present | | |
| Taiwan | • Gongguan Township (Miaoli) | Present | | |
| Taiwan | • Guantian (Taian) | Present | | |
| Taiwan | • Miaoli | Present | | |
| Taiwan | • Shitan Township (Miaoli) | Present | | |
| Taiwan | • Taichung City (National Museum of Natural Science) | Present | | |
| Taiwan | • Taoyuan City (Guanyin) | Present | | |
| Taiwan | • Yunlin county | Present | | |
### Distribution of *Colletotrichum theobromicola*

Distribution records based on CABI (2022), Farr and Rossman (online; https://nt.ars-grin.gov/fungaldatabases/) and other sources.

| Region          | Country | Sub-national (e.g. State)                          | Status | References                           |
|-----------------|---------|---------------------------------------------------|--------|--------------------------------------|
| Thailand        |         | • Mae Taeng (Mae Lod Village, Chiang Mai)         | Present| Weir et al. (2012), de Silva et al. (2019) |
|                 |         | • Mae Taeng (Pha Daeng Village, Chiang Mai)       |        |                                      |
|                 |         | • Chainat (Nakhon Ratchasima)                     |        |                                      |
|                 |         | • Chiang Mai                                      |        |                                      |
|                 |         | • Kanchanaburi                                    |        |                                      |
|                 |         | • Loei                                            |        |                                      |
|                 |         | • Nakhon Pathom                                   |        |                                      |
|                 |         | • Pathum Thani                                    |        |                                      |
|                 |         | • Ratchaburi                                      |        |                                      |
|                 |         | • Roi Et                                          |        |                                      |
|                 |         | • Samut Sakhon                                    |        |                                      |
| Turkey          |         | • Hatay                                          | Present| Uysal and Kurt (2020)                |
| Vietnam*        |         | • Cu Chi District (Trung An Ward) *               | Present| Weir et al. (2012)                   |
|                 |         | • Ho Chi Minh City (Cu Chi, Binh My Ward)         |        |                                      |
| Oceania         | Australia| • Ayr                                             | Present| Weir et al. (2012), Wang et al. (2021) |
|                 |         | • Bangalow                                        |        |                                      |
|                 |         | • Bees Creek                                      |        |                                      |
|                 |         | • Bundaberg (Queensland)                          |        |                                      |
|                 |         | • Childers (Queensland)                           |        |                                      |
|                 |         | • Cudgen                                          |        |                                      |
|                 |         | • Duranbah                                        |        |                                      |
|                 |         | • Green Pigeon                                    |        |                                      |
|                 |         | • Middle Point                                    |        |                                      |
|                 |         | • Mt Tamborine                                    |        |                                      |
|                 |         | • Murwillumbah (New South Wales)                  |        |                                      |
|                 |         | • Muswellbrook (New South Wales)                  |        |                                      |
|                 |         | • Orchard (New South Wales)                       |        |                                      |
|                 |         | • Wales (New South Wales)                         |        |                                      |
| New Zealand     |         | • Tauranga                                        | Present| Hofer et al. (2021)                  |

* As *C. jasmine-sambac*.

**C.5. Distribution of *Colletotrichum theobromicola***

Distribution records based on CABI (2022), Farr and Rossman (online; https://nt.ars-grin.gov/fungaldatabases/) and other sources.
| Region         | Country     | Sub-national (e.g. State)                                                                 | Status  | References                                      |
|---------------|-------------|------------------------------------------------------------------------------------------|---------|------------------------------------------------|
|               |             | • New York                                                                                 |         |                                                 |
|               |             | • North Carolina                                                                           |         |                                                 |
|               |             | • Oklahoma                                                                                 |         |                                                 |
|               |             | • Perry (Kentucky)                                                                         |         |                                                 |
|               |             | • Puerto Rico                                                                              |         |                                                 |
|               |             | • South Carolina                                                                           |         |                                                 |
|               |             | • Tarrant (Texas)                                                                          |         |                                                 |
|               |             | • Virginia                                                                                 |         |                                                 |
| Mexico        |             | • Michoacán*                                                                               | Present | Cristobal-Martinez et al. (2016)                |
|               |             | • State of Mexico*                                                                         |         |                                                 |
|               |             | • Compostela (Nayarit)                                                                    |         |                                                 |
|               |             | • San Blas (Nayarit)                                                                       |         |                                                 |
|               |             | • Venustiano Carranza (Puebla)                                                            |         |                                                 |
| Central       | Panama      | • Chiriquí (San Vicente)                                                                   | Present | Weir et al. (2012), Solis et al. (2022)        |
| America       |             | • Chiriquí (Escobar)                                                                       |         |                                                 |
| Caribbean     | Puerto Rico | • Adjuntas                                                                                 | Present | Serrato-Diaz et al. (2020)                     |
|               |             | • Ciales                                                                                   |         |                                                 |
|               |             | • Utuado                                                                                   |         |                                                 |
| South         | Argentina   | • Capital (La Rioja)                                                                       | Present | Lima et al. (2020)                             |
| America       |             | • Atalaia (Alagoas)                                                                        |         |                                                 |
|               | Brazil      | • Nossa Senhora de Fatima (Iranduba, Amazonas)                                            |         |                                                 |
|               |             | • Parana do Supia (Manacapuru, Amazonas)                                                   |         |                                                 |
|               |             | • Bela Cruz (Ceara)                                                                        |         |                                                 |
|               |             | • Embrapa Agroindustria Tropical (Pacaju, Ceara)                                           |         |                                                 |
|               |             | • Brasilia (Federal District)                                                              |         |                                                 |
|               |             | • Cachoeira                                                                                |         |                                                 |
|               |             | • Cristalina (Goias)                                                                       |         |                                                 |
|               |             | • Campo Alegre (Goias)                                                                     |         |                                                 |
|               |             | • Lages (Santa Catarina)                                                                   |         |                                                 |
|               |             | • Sao Gotardo (Minas Gerais)                                                              |         |                                                 |
|               |             | • Sao Paolo                                                                                |         |                                                 |
|               |             | • Palm Agricultural Center of Federal University of Pelotas (Capao do Leao, Rio Grande Do |         |                                                 |
|               |             |   Sul)                                                                                    |         |                                                 |
|               |             | • Palmas (Parana)                                                                          |         |                                                 |
|               |             | • Para                                                                                     |         |                                                 |
|               |             | • Piracicaba (Sao Paolo)                                                                   |         |                                                 |
|               |             | • Nazare (Reconcavo Region in Bahia)                                                       |         |                                                 |
|               |             | • Sao Felix (Reconcavo Region in Bahia)                                                    |         |                                                 |
|               |             | • Sao Jose do Rio Pardo (Sao Paolo)                                                        |         |                                                 |
|               |             | • Sao Jose do Norte (Rio Grande Do Sul)                                                    |         |                                                 |
|               |             | • Sao Jorge                                                                               |         |                                                 |
|               |             | • Lages                                                                                    |         |                                                 |
|               |             | • Sao Joaquim (Santa Catarina)                                                             |         |                                                 |
|               |             | • Irece (Reconcavo Region in Bahia)                                                       |         |                                                 |
|               |             | • Palm Agricultural Center of Federal University of Pelotas_Capao do Leao                 |         |                                                 |
|               |             | • Sao Jorge                                                                               |         |                                                 |
|               |             | • Sao Jose do Norte                                                                       |         |                                                 |
|               |             | • Lages                                                                                    |         |                                                 |
|               |             | • Sao Joaquim                                                                             |         |                                                 |
|               |             | • Sao Jose do Rio Pardo                                                                    |         |                                                 |
|               |             | • Piracicaba                                                                               |         |                                                 |
|               |             | • Nazare                                                                                   |         |                                                 |
|               |             | • Cachoeira                                                                               |         |                                                 |
|               |             | • Sao Felix                                                                               |         |                                                 |
| Region      | Country       | Sub-national (e.g. State)                                                                 | Status  | References                                      |
|------------|---------------|-----------------------------------------------------------------------------------------|---------|------------------------------------------------|
| Colombia   | • Tolima      | • Valle del Cauca                                                                        | Present | Pardo-De la Hoz et al. (2016)                  |
|            | • Parrita     | • San Carlos                                                                            | Present | Ruiz-Campos et al. (2022)                     |
|            | • Guacimo     |                                                                                         | Present |                                                 |
|            | • Progreso (Canelones) | • Juanico (Canelones) • Melilla (Montevideo) • Salto • Canelones (las Brujias) • Departments of Colonia, Maldonado, Rocha and Treinta y Tres | Present | Alaniz et al. (2015), Moreira et al. (2021) |
| Africa     | Angola        | N/A                                                                                     | Present | Silva et al. (2012)                            |
| Asia       | China         | • Fangshang (Beijing)                                                                    | Present | Solis et al. (2022)                            |
|            | India         | • Rahuri (Maharashtra)                                                                   | Present | Sharma et al. (2017)                           |
|            | Israel        | • Hod Hasharon • Kfar Rut • Bet Dagan                                                   | Present | Sharma et al. (2017), Solis et al. (2022)      |
|            | Japan         | • Chichijima island                                                                      | Present | Morita et al. (2015)                           |
|            | Philippines   | • Depangal (Coron) • Nagbaril (Coron) • Bintuan (Coron)                                 | Present | Dela Cueva Fe et al. (2021)                    |
|            | Republic of Korea | • Hahoe Village (Andong, Gyeongbuk)                                                   | Present | Kang et al. (2022)                             |
|            | Thailand      | • Chiang Mai • Lamphum                                                                   | Present | Pakdeeniti et al. (2022)                       |
| Oceania    | Australia     | • Atherton Tablelands (Queensland) • Bees Creek • Melville Island • New South Wales • Samford | Present | Weir et al. (2012), Wang et al. (2021)         |
|            | New Zealand   | • Kerikeri                                                                              | Present | Weir et al. (2012)                             |

*: As C. fragariae.
Appendix D – EU 27 annual imports of fresh produce of hosts from countries where *Colletotrichum aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola* are present, 2016–2020 (in 100 kg)

Source: Eurostat accessed on 18/3/2022.

|                       | 2016     | 2017     | 2018     | 2019     | 2020     |
|-----------------------|----------|----------|----------|----------|----------|
| **Fresh persimmons**  |          |          |          |          |          |
| United Kingdom        | 875.83   | 297.06   | 703.77   | 2,188.73 | 3,067.48 |
| Thailand              |          |          |          |          |          |
| Japan                 | 0.27     | 0.76     | 0.27     | 0.02     |          |
| Brazil                | 33.63    | 315.72   | 337.60   | 974.78   | 428.63   |
| South Korea           |          |          | 0.05     | 0.80     |          |
| Israel                | 2,404.45 | 3,231.29 | 1,158.64 | 181.58   | 3,211.13 |
| China                 | 17.57    |          | 5.09     |          | 17.40    |
| Sum                   | 3,331.48 | 3,844.34 | 2,205.98 | 3,346.16 | 6,724.66 |
| **Fresh strawberries**|          |          |          |          |          |
| United Kingdom        | 10,860.25| 13,845.53| 6,788.52 | 16,708.13| 25,121.30|
| Japan                 | 0.97     | 1.38     | 0.36     | 0.33     | 0.09     |
| South Korea           | 0.12     |          |          |          |          |
| USA                   | 2,881.84 | 1,572.86 | 354.26   | 10.12    | 3.11     |
| Israel                | 4.28     | 5.10     |          |          |          |
| China                 | 1,500.00 | 1,250.00 |          |          |          |
| South Africa          | 20.46    | 64.44    | 176.31   | 25.35    | 124.80   |
| Argentina             |          |          |          | 19.20    |          |
| Colombia              |          |          |          | 0.57     |          |
| Mexico                | 49.87    | 34.38    | 41.34    | 80.00    | 6.66     |
| Kenya                 | 0.70     | 0.64     | 0.01     |          |          |
| Turkey                | 26,813.33| 31,567.47| 37,510.96| 18,307.54| 59,353.98|
| Sum                   | 42,131.12| 48,341.86| 44,872.39| 35,151.25| 84,609.94|
| **Fresh or dried walnuts, shelled and in shell**|          |          |          |          |          |
| United Kingdom        | 15,274.36| 13,547.81| 15,560.94| 18,851.19| 22,022.85|
| Thailand              |          |          |          |          |          |
| Japan                 | 0.01     |          | 0        |          |          |
| Brazil                | 154,768.58| 249,520.21| 242,632.64| 139,015.43| 92,900.91|
| South Korea           |          |          |          |          |          |
| USA                   | 2,500.06 | 17,044.27| 30,127.04| 18,655.46| 48,220.89|
| China                 | 811,100.06| 804,843   | 778,627.4 | 866,407.4 | 901,531.7 |
| Sum                   | 811,100.06| 804,843   | 778,627.4 | 866,407.4 | 901,531.7 |
| **Fresh apples**      |          |          |          |          |          |
| United Kingdom        | 208,071.14| 340,412.05| 555,318.23| 214,996.32| 310,964.24|
| Thailand              |          | 3.79     |          |          |          |
| Japan                 | 7.61     | 0.53     | 0.95     | 19.25    |          |
| Brazil                | 154,768.58| 249,520.21| 242,632.64| 139,015.43| 92,900.91|
| South Korea           |          |          |          | 4.17     |          |
| USA                   | 0.05     | 545.82   | 2,874.22 |          |          |
|             | 2016      | 2017      | 2018      | 2019      | 2020      |
|-------------|-----------|-----------|-----------|-----------|-----------|
| **Israel**  | 2,225.55  | 1,037.58  | 936.63    | 1,813.20  | 755.03    |
| **Iran**     |           |           |           |           |           |
| **China**    | 13,188.53 | 1,644.89  | 15,539.34 | 780.15    | 4,778.37  |
| **South Africa** | 298,162.64 | 252,068.96 | 334,615.90 | 258,077.03 | 329,086.35 |
| **Argentina**| 120,597.09| 148,910.00| 222,092.84| 144,581.51| 163,000.90|
| **Australia**| 1,048.66  | 4,926.09  | 9,159.46  | 8,311.03  | 3,638.72  |
| **Colombia** | 785.39    | 1,376.06  | 745.60    | 1,397.11  | 1,065.38  |
| **Taiwan**   |           |           |           |           |           |
| **Bangladesh**| 2.64      | 2.18      | 0.63      | 4.05      |           |
| **Nigeria**  |           | 0.76      |           |           |           |
| **Pakistan** |           |           |           |           |           |
| **India**    | 0.01      |           |           |           |           |
| **Turkey**   | 240.22    | 1,610.74  | 17,594.86 | 2,311.21  | 19,023.31 |
| **Viet Nam** |           | 0.20      |           |           |           |
| **Sri Lanka**|           |           |           |           |           |
| **New Zealand** | 751,627.60| 754,736.56| 966,920.91| 728,052.41| 759,371.40|
| **Panama**   |           |           |           |           |           |
| **Uruguay**  | 20,879.17 | 55,103.38 | 30,072.47 | 14,164.50 | 2,310.32  |
| **Sum**      | 1,571,602 | 1,811,900 | 2,401,452 | 1,513,510 | 1,688,032 |

| **Fresh or chilled olives** | **2016** | **2017** | **2018** | **2019** | **2020** |
|-----------------------------|---------|---------|---------|---------|---------|
| **United Kingdom**          | 1,375.44 | 1,004.14 | 769.35  | 1,339.85| 4,669.79 |
| **Thailand**                | 0.08    | 0.71    | 0.59    | 0.48    | 0.03    |
| **USA**                     | 0.95    | 0.61    | 0.00    |         | 0.19    |
| **Israel**                  | 3.44    | 0.14    |         | 0.22    | 0.00    |
| **Iran**                    |         |         |         | 2.01    |         |
| **China**                   |         | 0.08    |         |         |         |
| **Australia**               |         |         | 0.02    |         | 0.00    |
| **South Africa**            |         |         | 0.02    | 0.31    | 0.01    |
| **Argentina**               |         |         |         | 0.61    |         |
| **Australia**               |         |         | 0.02    |         | 0.00    |
| **Kenya**                   |         |         |         | 0.11    |         |
| **Bangladesh**              | 11.80   | 15.44   | 23.98   | 12.89   | 18.93   |
| **India**                   |         |         |         | 0.10    | 5.05    |
| **Turkey**                  | 150.33  | 2.30    | 42.74   | 685.71  | 1,687.46|
| **Sum**                     | 1,542.04| 1,023.42| 836.72  | 2,042.29| 6,381.46|

| **Fresh or dried avocados** | **2016** | **2017** | **2018** | **2019** | **2020** |
|----------------------------|---------|---------|---------|---------|---------|
| **United Kingdom**         | 89,364.19 | 100,238.31 | 104,652.29 | 117,434.53 | 125,600.43 |
| **Thailand**               | 3.68    | 9.76    | 9.66    | 9.06    | 3.39    |
| **Brazil**                 | 44,357.36| 71,040.50| 68,697.61| 78,673.73| 48,183.83|
| **USA**                    | 8,819.53| 1.19    | 2,546.86| 0.02    | 4.66    |
| **Israel**                 | 301,123.91| 424,267.97| 370,378.23| 437,318.01| 345,664.24|
| **China**                  | 193.97  | 35.28   |         | 1.23    | 0.04    |
| **South Africa**           | 419,768.89| 315,854.56| 652,817.98| 401,352.79| 416,290.22|
| **New Zealand**            | 0.85    | 0.61    |         |         | 0.03    |
| **Australia**              |         |         |         |         |         |
| **Mexico**                 | 503,687.52| 445,611.06| 463,741.28| 767,878.48| 716,092.02|
| **Israel**                 | 301,123.91| 424,267.97| 370,378.23| 437,318.01| 345,664.24|
### Colletotrichum aenigma, *C. alienum, C. perseae, C. siamense* and *C. theobromicola: Pest categorisation*

- **Fresh pears**:
  - **Latin names**: *C. aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola*
  - **Countries**: United Kingdom, Japan, Brazil, South Korea, USA, Israel, Iran, China, South Africa, Argentina, Australia, Nigeria, Turkey

| Country     | 2016       | 2017       | 2018       | 2019       | 2020       |
|-------------|------------|------------|------------|------------|------------|
| United Kingdom | 36,698.28 | 32,267.61  | 16,605.43  | 10,203.21  | 16,864.50  |
| Japan       | 2.50       | 0.02       | 0.45       | :          | :          |
| Brazil      | 208.68     | :          | 251.27     | 926.88     | :          |
| South Korea | 789.33     | 1,036.40   | 666.02     | 819.04     | 628.26     |
| USA         | 214.47     | 454.76     | 471.49     | 12.54      | :          |
| Israel      | :          | 664.59     | :          | 569.20     | 219.49     |
| Iran        | :          | :          | 32.40      | :          | 7.50       |
| China       | 102,076.61 | 98,191.53  | 116,993.12 | 82,741.84  | 99,293.92  |
| South Africa| 865,862.63 | 759,193.32 | 655,428.91 | 590,939.08 | 583,331.56 |
| Argentina   | 611,166.07 | 434,480.03 | 519,079.90 | 390,070.38 | 505,997.93 |
| Australia   | :          | 1,224.72   | :          | :          | :          |
| Nigeria     | :          | :          | 1.00       | :          | 0.36       |
| Turkey      | 13,874.34  | 32,003.71  | 67,690.28  | 63,998.83  | 113,683.44 |
| Sum         | 1,630,892.9| 1,358,292  | 1,378,445  | 1,140,281  | 1,320,027  |

| Country     | 2016       | 2017       | 2018       | 2019       | 2020       |
|-------------|------------|------------|------------|------------|------------|
| United Kingdom | 2,100.45  | 2,245.25   | 4,635.62   | 2,497.09   | 11,131.10  |
| Japan       | :          | :          | 0.02       | :          | :          |
| Brazil      | :          | :          | 15.45      | :          | :          |
| USA         | 453.30     | 4,267.78   | 1,541.48   | 923.05     | 216.04     |
| Israel      | 3.09       | :          | :          | :          | :          |
| Iran        | :          | 0.00       | 7.57       | :          | 162.00     |
| Sum         | 2,556.84   | 6,513.03   | 6,182.85   | 3,435.61   | 11,509.14  |

| Country     | 2016       | 2017       | 2018       | 2019       | 2020       |
|-------------|------------|------------|------------|------------|------------|
| United Kingdom | 140,433.00| 153,809.85 | 115,241.01 | 74,593.85  | 56,236.27  |
| Thailand    | 0.37       | 0.14       | 0.16       | :          | 0.87       |
| Japan       | 4.84       | 1.19       | 1.17       | 1.15       | 20.67      |
| Brazil      | 194,152.79 | 249,279.81 | 271,987.56 | 196,465.22 | 228,091.31 |
| South Korea | :          | 2.88       | 4.32       | 0.09       | :          |
| USA         | 1,714.93   | 8,868.74   | 4,413.37   | 1,866.20   | 1,072.48   |
| Israel      | 13,169.16  | 7,165.09   | 6,397.33   | 318.24     | 1,080.90   |
| Iran        | :          | :          | 2,158.50   | 366.00     | 399.80     |

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### Colletotrichum aenigma, C. alienum, C. persea, C. siamense and C. theobromicola: Pest categorisation

|                              | 2016   | 2017   | 2018   | 2019   | 2020   |
|------------------------------|--------|--------|--------|--------|--------|
| China                        | 0.00   | 6.00   | 0.03   | :      | :      |
| Australia                    | 2.95   | 0.50   | :      | :      | :      |
| **Sum**                      | 349,478.04 | 419,134.2 | 400,203.45 | 273,610.8 | 286,902.3 |

|                              | 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 |
| New Zealand                  | 0.01   | 0.08   | 0.09   | 0.07   | 0.10   |
| Australia                    | 25.72  | 94.18  | 62.92  | :      | :      |
| Mexico                       | 35,095.07 | 40,848.36 | 46,001.68 | 50,935.79 | 51,841.89 |
| Israel                       | 143,726.08 | 140,551.30 | 108,353.48 | 121,875.16 | 98,143.59 |
| China                        | 38.95  | 51.87  | 180.81 | 78.23  | 104.34 |
| USA                          | 78,874.11 | 45,478.21 | 54,660.34 | 82,580.54 | 82,852.21 |
| Argentina                    | 14.40  | :      | :      | :      | :      |
| Colombia                     | 2,321.38 | 2,553.75 | 3,139.67 | 6,833.02 | 4,131.75 |
| Kenya                        | 232.06 | 4.08   | 65.09  | 10.30  | 66.53  |
| Thailand                     | 6,460.81 | 7,401.80 | 6,911.89 | 6,743.92 | 5,260.84 |
| Taiwan                       | :      | :      | 3.48   | 17.34  | 0.92   |
| Bangladesh                   | 438.53 | 256.66 | 331.27 | 310.73 | 323.91 |
| Malawi                       | :      | :      | :      | :      | 648.00 |
| Nigeria                      | 0.78   | 0.10   | 1.13   | 1.95   | 0.03   |
| 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 |
| Turkey                       | 0.12   | 0.21   | 24.09  | 68.86  | 38.93  |
| Japan                        | 0.66   | :      | :      | :      | 0.01   |
| Viet Nam                     | 794.89 | 950.37 | 1,346.64 | 1,546.69 | 965.31 |
| Indonesia                    | 1,981.20 | 2,004.36 | 2,926.64 | 2,386.27 | 1,406.94 |
| Sri Lanka                    | 1,254.27 | 1,003.35 | 765.31 | 813.83 | 423.16 |
| Angola                       | :      | :      | 486.65 | 658.15 | 351.50 |
| Brazil                       | 1,025,325.4 | 1,158,717.1 | 1,241,860.6 | 1,437,569.2 | 1,577,043.9 |
| Panama                       | :      | 0.18   | 0.70   | :      | :      |
| **Sum**                      | 1,328,273.7 | 1,436,993 | 1,508,200.3 | 1,763,070 | 1,855,804 |

|                              | 2016   | 2017   | 2018   | 2019   | 2020   |
|------------------------------|--------|--------|--------|--------|--------|
| **Citrus fruit, fresh or dried** |        |        |        |        |        |
| South Korea                  | 12.70  | 0.01   | :      | 21.09  | 15.00  |
| South Africa                 | 5,278,830.95 | 5,802,017.61 | 6,381,124.73 | 6,196,837.96 | 7,830,147.60 |
| Argentina                    | 2,412,706.76 | 1,913,772.23 | 2,242,298.89 | 1,585,087.09 | 1,403,348.80 |
| Australia                    | 3,279.84 | 1,284.38 | 644.97 | 10,645.40 | 2,343.47 |
| Colombia                     | 44,825.37 | 79,400.99 | 123,887.46 | 136,914.85 | 172,197.70 |
| Mexico                       | 570,402.80 | 553,818.66 | 589,021.12 | 443,743.54 | 349,648.63 |
| Kenya                        | :      | :      | 8.80   | :      | 34.56  |
| Thailand                     | 426.42 | 1,283.13 | 659.74 | 624.93 | 194.87 |
| Taiwan                       | 157.49 | :      | :      | :      | 0.01   |
| Bangladesh                   | 227.61 | 229.58 | 159.67 | 322.42 | 1,183.66 |
| Nigeria                      | :      | :      | 0.03   | 0.10   | 200.00 |
| Pakistan                     | :      | :      | 2.45   | 0.59   | :      |
| India                        | 246.80 | 1.00   | 449.63 | 88.51  | 254.95 |
| Turkey                       | 2,569,671.58 | 2,026,980.05 | 3,149,386.85 | 2,102,077.48 | 2,574,009.13 |
| Japan                        | 352.58 | 417.44 | 270.73 | 319.24 | 162.50 |
| Brazil                       | 864,863.09 | 903,432.95 | 900,907.24 | 822,134.46 | 902,590.26 |
| USA                          | 301,229.06 | 231,210.47 | 185,706.99 | 177,755.45 | 148,608.92 |
| Israel                       | 799,118.49 | 969,403.62 | 824,601.66 | 812,738.57 | 878,713.18 |

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| Country        | 2016       | 2017       | 2018       | 2019       | 2020       |
|---------------|------------|------------|------------|------------|------------|
| Zimbabwe      | 297,550.62 | 328,595.48 | 397,906.49 | 348,303.06 | 391,868.70 |
| Viet Nam      | 28,649.46  | 46,738.17  | 70,934.07  | 73,964.35  | 63,730.02  |
| Indonesia     | 566.73     | 555.70     | 779.35     | 836.73     | 864.54     |
| China         | 827,840.57 | 1,084,857.27 | 1,024,163.15 | 1,108,595.22 | 1,098,689.98 |
| Sri Lanka     | 0.82       | 80.98      | 135.62     | 0.20       | 60.10      |
| Sum           | 14,000,959.7 | 13,944,079.7 | 15,893,049.6 | 13,821,011.2 | 15,818,866.6 |

| Country        | 2016       | 2017       | 2018       | 2019       | 2020       |
|---------------|------------|------------|------------|------------|------------|
| South Africa  | 39,656.26  | 45,282.45  | 30,643.15  | 27,215.68  | 19,903.15  |
| Colombia      | 69,743.63  | 72,656.37  | 83,639.84  | 89,847.31  | 90,741.20  |
| Mexico        | 543.90     | 212.78     | 1,295.08   | 669.87     | 2,331.91   |
| Kenya         | 714.44     | 221.45     | 603.11     | 481.00     | 697.14     |
| Thailand      | 9,774.93   | 10,279.68  | 12,461.38  | 14,900.21  | 10,138.75  |
| Taiwan        | 11.92      | 10.59      | 25.97      | 8.97       |            |
| Bangladesh    | 140.15     | 222.55     | 291.61     | 206.12     | 382.00     |
| Nigeria       | :          | :          | 1.91       | 3.09       |            |
| Pakistan      | 2.22       | 3.34       | 8.17       |            |            |
| India         | 324.19     | 621.75     | 1,095.12   | 1,168.69   | 754.33     |
| Turkey        | :          | :          | 8.61       | 18.92      | 23.40      |
| Japan         | :          | :          | 0.07       | 0.02       |            |
| Brazil        | 49.36      | 147.37     | 368.88     | 966.63     | 1,220.26   |
| USA           | 3.97       | 3.00       | 0.07       |            | 0.02       |
| Israel        | 2,943.37   | 2,919.30   | 1,061.09   | 1,125.92   | 594.86     |
| Zimbabwe      | 3,880.59   | 3,622.61   | 3,725.92   | 4,324.34   | 4,886.79   |
| Viet Nam      | 33,078.82  | 38,426.81  | 44,070.83  | 52,846.33  | 45,652.67  |
| Indonesia     | 103.20     | 333.37     | 297.72     | 246.67     | 441.64     |
| China         | 314.75     | 287.38     | 1,112.11   | 1,014.77   | 823.41     |
| Sri Lanka     | 347.84     | 392.81     | 104.84     | 104.62     | 85.24      |
| Angola        | 0.20       |            | 98.60      | 205.72     | 435.93     |
| Iran          | 6.25       |            | 1.75       | 0.50       | 3.88       |
| Sum           | 161,639.99 | 175,634.8  | 180,897.75 | 195,371.2  | 179,141.18 |

| Country        | 2016       | 2017       | 2018       | 2019       | 2020       |
|---------------|------------|------------|------------|------------|------------|
| South Korea   | 26.96      | 42.26      | 2,135.94   | 13.79      | 35.16      |
| South Africa  | 2,867.11   | 915.21     | 279.46     | 314.60     | 131.21     |
| Argentina     | 45.24      | 2.23       | 32.16      | 12.80      | 3.74       |
| Australia     | 444.13     | 437.59     | 494.10     | 543.81     | 228.46     |
| Colombia      | 1,758,248.35 | 1,684,213.76 | 1,569,515.05 | 1,656,882.11 | 1,541,733.58 |
| Mexico        | 235,341.78 | 217,362.60 | 272,525.32 | 329,751.67 | 363,292.19 |
| Kenya         | 240,945.59 | 215,953.40 | 206,693.36 | 241,045.70 | 221,434.83 |
| Thailand      | 3,072.97   | 1,049.26   | 13,173.87  | 6,502.86   | 2,591.27   |
| Taiwan        | 3.01       | 1.22       | 9.80       | 35.34      | 2.30       |
| Bangladesh    |            |            |            |            |            |
| Malawi        | 3,353.26   | 1,921.31   | 2,425.91   | 1,591.15   | 4,794.93   |
| Nigeria       | 687.64     | 878.40     | 749.61     | 6.27       | 175.92     |
| Pakistan      | 0.00       |            |            |            |            |
| India         | 1,386,868.49 | 1,456,990.52 | 1,548,969.71 | 1,367,326.79 | 1,083,355.51 |
| Turkey        | 3,826.13   | 3,473.77   | 3,986.39   | 4,187.14   | 6,527.21   |
| Japan         | 28.78      | 127.93     | 63.32      | 113.01     | 384.22     |
| Brazil        | 8,884,451.03 | 8,059,774.02 | 8,340,175.81 | 9,322,630.20 | 9,326,189.77 |

Colletotrichum aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola: Pest categorisation
| Country          | 2016      | 2017      | 2018      | 2019      | 2020      |
|------------------|-----------|-----------|-----------|-----------|-----------|
| USA              | 19,453.40 | 36,377.42 | 32,323.21 | 44,134.86 | 82,825.73 |
| Israel           | 428.35    | 341.94    | 222.41    | 197.59    | 244.48    |
| Zimbabwe         | 3,826.96  | 316.30    | 567.38    | 1,817.41  | 675.95    |
| Viet Nam         | 7,061,355.60 | 6,350,171.59 | 7,155,297.73 | 6,730,345.99 | 6,420,701.22 |
| Indonesia        | 940,766.27 | 1,155,325.36 | 575,414.13  | 769,517.70 | 773,805.47 |
| China            | :         | 0.01      | :         | :         | :         |
| Sri Lanka        | 406,073.82 | 359,543.82 | 393,659.33 | 288,971.81 | 199,635.62 |
| New Zealand      | 0.24      | 5.33      | 6.48      | 6.56      | 13.83     |
| Angola           | 2,970.62  | 4,348.14  | 4,225.81  | 7,120.66  | 12,574.44 |
| Panama           | 9,404.34  | 7,648.87  | 3,451.12  | 3,463.82  | 4,206.02  |
| Uruguay          | 0.00      | :         | 0.55      | :         | 0.00      |
| Sum              | 20,964,490| 19,557,222| 20,126,398| 20,776,534| 20,045,563|

| Coconuts, Brazil nuts and cashew nuts, fresh or dried, whether or not shelled or peeled | 2016      | 2017      | 2018      | 2019      | 2020      |
|----------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|
| New Zealand                                                                            | 26.96     | 42.26     | 2,135.94  | 13.79     | 35.16     |
| Argentina                                                                              | 2,867.11  | 915.21    | 279.46    | 314.60    | 131.21    |
| Australia                                                                              | 45.24     | 2.23      | 32.16     | 12.80     | 3.74      |
| Colombia                                                                               | 444.13    | 437.59    | 494.10    | 543.81    | 228.46    |
| Thailand                                                                               | 1,758,248.35 | 1,684,213.76 | 1,569,515.05 | 1,656,882.11 | 1,541,733.58 |
| Brazil                                                                                 | 235,341.78 | 217,362.60 | 272,525.32 | 329,751.67 | 363,292.19 |
| USA                                                                                    | 240,945.59 | 215,953.40 | 206,693.36 | 241,045.70 | 221,434.83 |
| Israel                                                                                 | 3,072.97  | 1,049.26  | 13,173.87 | 6,502.86  | 2,591.27  |
| Panama                                                                                 | 3.01      | 1.22      | 9.80      | 35.34     | 2.30      |
| Mexico                                                                                 | :         | :         | 0.00      | 0.03      | :         |
| Sum                                                                                    | 125,274   | 109,479   | 121,257.1 | 119,455.8 | 111,733.7 |

| Cocoa beans, whole or broken, raw or roasted | 2016      | 2017      | 2018      | 2019      | 2020      |
|---------------------------------------------|-----------|-----------|-----------|-----------|-----------|
| New Zealand                                                                              | :         | 0.15      | 0.06      | 0.20      | :         |
| Australia                                                                                | 0.30      | 0.65      | 125.20    | :         | 0.05      |
| Colombia                                                                                 | 71,129.12 | 71,178.89 | 20,815.98 | 12,962.68 | 12,353.08 |
| Thailand                                                                                 | 4.80      | 0.32      | 5.00      | :         | 0.22      |
| Japan                                                                                    | 2,027.95  | 18.72     | 1.00      | 0.02      | 0.18      |
| Brazil                                                                                   | 1,966.17  | 2,492.11  | 2,330.62  | 3,166.30  | 2,690.30  |
| USA                                                                                     | 1,038.76  | 2,040.19  | 500.84    | 199.11    | 453.78    |
| Israel                                                                                   | :         | 0.06      | 3.29      | :         | 6.60      |
| Panama                                                                                   | 4,998.44  | 5,041.40  | 5,110.17  | 3,953.48  | 5,902.14  |
| Mexico                                                                                   | 5,703.68  | 2,450.99  | 2,864.90  | 3,383.38  | 1,027.38  |
| Sum                                                                                     | 86,869.22 | 83,223.42 | 31,753.83 | 23,668.46 | 22,433.73 |

| Vegetable and strawberry plants | 2016      | 2017      | 2018      | 2019      | 2020      |
|---------------------------------|-----------|-----------|-----------|-----------|-----------|
| Australia                       | :         | :         | 4.05      | :         | :         |
| Brazil                          | 0.16      | 1.01      | 393.78    | :         | 0.85      |
| China                           | 0.02      | :         | 180.00    | 0.92      | 2.28      |
| Israel                          | 213.07    | 9.27      | 34.04     | 17.44     | 17.61     |
| Iran                            | :         | :         | :         | :         | 7.15      |
| Japan                           | :         | :         | :         | 1.03      | 0.28      |
| Mexico                          | 0.20      | :         | :         | :         | 1.23      |
| New Zealand                     | 0.16      | 0.01      | :         | 1.35      | 0.31      |
| Thailand                        | :         | :         | 0.08      | :         | :         |
| South Africa                    | 5.89      | 58.73     | 2.00      | 17.88     | 5.94      |
| United Kingdom                  | 47,542.28 | 46,794.49 | 51,438.19 | 59,693.77 | 22,252.55 |
|                | 2016     | 2017     | 2018     | 2019     | 2020     |
|----------------|----------|----------|----------|----------|----------|
| **Indoor**     |          |          |          |          |          |
| **flowering**  |          |          |          |          |          |
| **plants with**|          |          |          |          |          |
| **buds or flowers** |          |          |          |          |          |
| (excl. cacti)   |          |          |          |          |          |
| Australia      | :        | :        | :        | 0.01     | 2.39     |
| China          | 2.38     | 0.22     | 7.10     | 835.87   | 91.43    |
| Israel         | 20.03    | 44.45    | 0.80     | :        |          |
| Japan          | :        | 0.12     | :        | :        | 4.06     |
| South Korea    | :        | :        | :        | 0.02     |          |
| Thailand       | 33.64    | 43.34    | 44.54    | 30.72    | 15.35    |
| South Africa   | :        | 0.01     | :        | :        |          |
| United Kingdom | 8,640.36 | 6,843.20 | 10,090.13| 9,548.07 | 5,541.82 |
| **USA**        | 4,848.40 | 4,711.58 | 4,447.01 | 3,506.85 | 1,794.38 |
| **Chile**      | 5.60     | 13.96    | 4.05     | 1.72     | 0.67     |
| **India**      | 0.03     | 2.40     | 0.03     | 2.05     | 2.08     |
| **Turkey**     | 189.82   | 154.19   | 243.06   | 292.47   | 462.21   |
| **Viet Nam**   | 0.41     | 0.20     | 0.20     | 0.24     | :        |
| **Sum**        | 52,806.04| 51,745.84| 56,746.49| 63,535.72| 24,547.54|
| **Indoor**     |          |          |          |          |          |
| **rooted**     |          |          |          |          |          |
| **cuttings and**|          |          |          |          |          |
| **young plants**|          |          |          |          |          |
| (excl. cacti)   |          |          |          |          |          |
| **Australia**  | 128.71   | 347.76   | 354.52   | 369.02   | 384.96   |
| **Brazil**     | 21.51    | 165.09   | 656.62   | 247.66   | 54.81    |
| **China**      | 2,752.64 | 9,997.46 | 13,466.13| 14,163.88| 19,018.51|
| **Colombia**   | 85.70    | 21.77    | 241.38   | 484.53   | 211.31   |
| **Israel**     | 5,296.44 | 4,669.39 | 4,532.24 | 4,572.86 | 4,385.72 |
| **Iran**       | :        | 1.44     | :        | :        |          |
| **Japan**      | 2.61     | 1.11     | 11.20    | 13.28    | 12.09    |
| **South Korea**| 0.33     | 2.64     | 18.06    | 0.32     | 6.81     |
| **Mexico**     | 1.28     | 0.30     | :        | :        |          |
| **Malaysia**   | 162.98   | 130.92   | 208.38   | 692.96   | 481.63   |
| **New Zealand**| 27.20    | 117.07   | 396.42   | 79.56    | 0.89     |
| **Thailand**   | 5,088.95 | 5,155.52 | 5,186.67 | 5,025.07 | 5,508.39 |
| **Uruguay**    | :        | :        | :        | 0.12     | :        |
| **South Africa**| 1,350.18 | 3,955.46 | 3,726.06 | 3,245.41 | 2,856.00 |
| **Zimbabwe**   | :        | 43.61    | 2.28     | 97.28    | :        |
| **United Kingdom**| 84.26   | 98.89    | 314.16   | 1,674.00 | 807.85   |
| **USA**        | 206.43   | 169.98   | 201.85   | 398.31   | 114.98   |
| **Chile**      | 2.90     | 224.23   | 447.94   | 499.94   | 273.69   |
| **Egypt**      | 18.06    | 35.42    | 84.34    | 51.13    | 33.11    |
| **Ghana**      | 28.14    | :        | 338.65   | 880.13   | 1,087.52 |

Colletotrichum aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola: Pest categorisation
| Country     | 2016   | 2017   | 2018   | 2019   | 2020   |
|------------|--------|--------|--------|--------|--------|
| Indonesia  | 59.17  | 353.38 | 901.69 | 985.39 | 888.74 |
| India      | 457.56 | 672.09 | 4,428.20 | 4,581.08 | 4,284.74 |
| Sri Lanka  | 401.65 | 1,033.74 | 1,445.74 | 1,403.22 | 1,119.29 |
| Malawi     | :      | :      | :      | :      | 0.64   |
| Nigeria    | :      | :      | 0.53   | 1.43   | 1.10   |
| Turkey     | 1,416.01 | 1,710.10 | 2,039.26 | 2,570.49 | 1,728.18 |
| Taiwan     | 808.70 | 878.53 | 815.69 | 842.29 | 480.22 |
| Philippines| 10.69  | 20.21  | 17.61  | 113.19 | 114.45 |
| Viet Nam   | 234.78 | 1,831.48 | 2,166.63 | 2,159.08 | 2,520.12 |
| Costa Rica | 15,064.16 | 18,278.77 | 16,637.21 | 16,598.09 | 15,477.29 |
| Sum        | 33,711.04 | 49,916.36 | 58,639.58 | 61,749.60 | 61,853.04 |

Colletotrichum aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola: Pest categorisation

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Appendix E – EU 27 and member state cultivation/harvested/production area of *Colletotrichum aenigma*, *C. alienum*, *C. perseae*, *C. siamense* and *C. theobromicola* hosts (in 1,000 ha)

| Strawberries | 2016   | 2017   | 2018   | 2019   | 2020   |
|--------------|--------|--------|--------|--------|--------|
| EU 27        | 103.78 | 103.76 | 106.42 | 101.16 | 83.84  |
| Belgium      | 1.90   | 1.98   | 1.97   | 1.97   | 1.60   |
| Bulgaria     | 0.68   | 0.66   | 0.73   | 0.71   | 0.74   |
| Czechia      | 0.71   | 0.69   | 0.71   | 0.68   | 0.46   |
| Denmark      | 1.17   | 1.16   | 1.15   | 1.11   | 1.07   |
| Germany      | 14.30  | 14.16  | 14.00  | 13.20  | 12.86  |
| Estonia      | 0.44   | 0.53   | 0.62   | 0.63   | 0.66   |
| Ireland      | 0.19   | 0.19   | 0.19   | 0.18   | 0.18   |
| Greece       | 1.49   | 1.47   | 1.47   | 1.61   | 1.72   |
| Spain        | 6.87   | 6.82   | 7.03   | 7.26   | 7.35   |
| France       | 3.34   | 3.37   | 3.35   | 3.35   | 3.33   |
| Croatia      | 0.37   | 0.37   | 0.25   | 0.25   | 0.30   |
| Italy        | 4.88   | 4.86   | 4.72   | 4.74   | 4.62   |
| Cyprus       | 0.04   | 0.06   | 0.05   | 0.05   | 0.05   |
| Latvia       | 0.50   | 0.50   | 0.50   | 0.49   | 0.50   |
| Lithuania    | 0.78   | 0.84   | 0.83   | 0.88   | 0.94   |
| Luxembourg   | 0.01   | 0.01   | 0.01   | 0.01   | 0.01   |
| Hungary      | 0.79   | 0.79   | 0.73   | 0.73   | 0.88   |
| Malta        | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   |
| Netherlands  | 1.72   | 1.69   | 1.62   | 1.64   | 1.52   |
| Austria      | 1.14   | 1.14   | 1.21   | 1.19   | 1.18   |
| Poland       | 50.78  | 49.84  | 49.18  | 49.90  | 32.90  |
| Portugal     | 0.39   | 0.31   | 0.32   | 0.55   | 0.81   |
| Romania      | 2.72   | 3.25   | 3.27   | 3.30   | 3.29   |
| Slovenia     | 0.11   | 0.11   | 0.12   | 0.11   | 0.14   |
| Slovakia     | 0.17   | 0.12   | 0.17   | 0.27   | 0.21   |
| Finland      | 6.30   | 6.89   | 10.16  | 4.40   | 4.44   |
| Sweden       | 2.01   | 1.97   | 2.07   | 1.96   | 2.08   |

| Pears        | 2016   | 2017   | 2018   | 2019   | 2020   |
|--------------|--------|--------|--------|--------|--------|
| EU 27        | 115.13 | 113.81 | 113.54 | 110.66 | 107.05 |
| 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   |
| Estonia      | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   |
| Ireland      | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   |
| 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   | 0.06   |
| 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   |
| Country   | 2016  | 2017  | 2018  | 2019  | 2020  |
|-----------|-------|-------|-------|-------|-------|
| Pears     |       |       |       |       |       |
| Hungary   | 2.87  | 2.90  | 2.84  | 2.81  | 2.62  |
| Malta     | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| 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  | 5.10  |
| 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  | 0.23  |
| 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  |
| Cherries  |       |       |       |       |       |
| EU 27     | 172.45| 173.37| 175.49| 176.30| 177.86|
| 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  |
| Ireland   | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| 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  |
| Luxembourg| 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| Hungary   | 15.49 | 15.65 | 15.88 | 15.93 | 16.62 |
| Malta     | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| 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 | 34.00 |
| 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  | 0.21  |
| Slovakia  | 0.17  | 0.19  | 0.21  | 0.20  | 0.16  |
| Finland   | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| Sweden    | 0.04  | 0.03  | 0.03  | 0.03  | 0.04  |
| Avocados  |       |       |       |       |       |
| EU 27     | 12.24 | 12.72 | 13.22 | 17.50 | 19.60 |
| Belgium   | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| Bulgaria  | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| Czechia   | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| Denmark   | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| Germany   | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| Estonia   | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
| Ireland   | 0.00  | 0.00  | 0.00  | 0.00  | 0.00  |
### Avocados

|                | 2016 | 2017 | 2018 | 2019 | 2020 |
|----------------|------|------|------|------|------|
| Greece         | 0.48 | 0.60 | 0.72 | 1.08 | 1.10 |
| Spain          | 11.44| 11.81| 12.16| 14.10| 15.85|
| France         | 0.23 | 0.23 | 0.24 | 0.24 | 0.24 |
| Croatia        | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Italy          | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cyprus         | 0.09 | 0.08 | 0.10 | 0.10 | 0.10 |
| Latvia         | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Lithuania      | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Luxembourg     | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hungary        | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Malta          | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Netherlands    | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Austria        | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Poland         | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Portugal       | 0.00 | 0.00 | 0.00 | 1.98 | 2.31 |
| Romania        | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Slovenia       | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Slovakia       | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Finland        | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Sweden         | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

### Walnuts

|                | 2016 | 2017 | 2018 | 2019 | 2020 |
|----------------|------|------|------|------|------|
| EU 27          | 72.61| 74.15| 80.60| 87.62| 96.69|
| 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 |
| Denmark        | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Germany        | 0.00 | 0.29 | 0.29 | 0.29 | 0.29 |
| Estonia        | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ireland        | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 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 | 0.21 |
| Latvia         | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Lithuania      | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Luxembourg     | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Hungary        | 4.85 | 5.08 | 5.40 | 6.00 | 6.40 |
| Malta          | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Netherlands    | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Austria        | 0.14 | 0.14 | 0.17 | 0.17 | 0.18 |
| Poland         | 2.47 | 2.38 | 2.31 | 2.27 | 2.70 |
| 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 | 0.47 |
| Slovakia       | 0.19 | 0.21 | 0.36 | 0.63 | 1.17 |
| Finland        | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Sweden         | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|            | 2016     | 2017     | 2018     | 2019     | 2020     |
|------------|----------|----------|----------|----------|----------|
| **Grapes** |          |          |          |          |          |
| EU 27      | 3,136.15 | 3,133.32 | 3,135.50 | 3,155.20 | 3,156.22 |
| 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    |
| Denmark    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| Germany    |          |          |          |          |          |
| Estonia    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| Ireland    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| 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     | 6.79     |
| Latvia     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| Lithuania  | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| 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     | 0.90     |
| Portugal   | 179.17   | 178.95   | 179.25   | 175.65   | 175.67   |
| Romania    | 174.17   | 175.32   | 172.80   | 176.34   | 175.59   |
| Slovenia   | 15.84    | 15.86    | 15.65    | 15.57    | 15.29    |
| Slovakia   | 8.71     | 8.47     | 8.01     | 7.92     | 7.73     |
| Finland    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| Sweden     | 0.05     | 0.04     | 0.05     | 0.05     | 0.08     |

|            | 2016     | 2017     | 2018     | 2019     | 2020     |
|------------|----------|----------|----------|----------|----------|
| **Olivies**|          |          |          |          |          |
| EU 27      | 5,043.87 | 5,056.93 | 5,098.62 | 5,070.49 | 5,105.13 |
| Belgium    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| Bulgaria   | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| Czechia    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| Denmark    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| Germany    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| Estonia    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| Ireland    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| 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    | 11.11    |
| Latvia     | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| Lithuania  | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| Luxembourg | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| Hungary    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| Malta      | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| Netherlands| 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |
| Austria    | 0.00     | 0.00     | 0.00     | 0.00     | 0.00     |

Colletotrichum aenigma, C. alienum, C. perseae, C. siamense and C. theobromicola: Pest categorisation
| Country     | 2016 | 2017 | 2018 | 2019 | 2020 |
|-------------|------|------|------|------|------|
| Poland      | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Portugal    | 360.81 | 363.97 | 366.23 | 377.28 | 379.44 |
| Romania     | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Slovenia    | 1.17 | 1.24 | 1.30 | 1.37 | 1.42 |
| Slovakia    | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Finland     | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Sweden      | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |