Pest categorisation of *Colletotrichum fructicola*

EFSA Panel on Plant Health (PLH),
Claude Bragard, Katharina Dehnen-Schmutz, Francesco Di Serio, Paolo Gonthier, Marie-Agnès Jacques, Josep Anton Jaques Miret, Annemarie Fejer Justesen, Alan MacLeod, Christer Sven Magnusson, Panagiotis Milonas, Juan A Navas-Cortes, Stephen Parnell, Roel Potting, Hans-Hermann Thulke, Wopke Van der Werf, Antonio Vicent Civera, Jonathan Yuen, Lucia Zappalà, Quirico Migheli, Irene Vloutoglou, Caterina Campese, Andrea Maiorano, Franz Streissl and Philippe Lucien Reignault

**Abstract**

The EFSA Plant Health Panel performed a pest categorisation of *Colletotrichum fructicola* Prihast., a well-defined polyphagous fungus of the *C. gloeosporioides* complex which has been reported from all the five continents to cause anthracnose, bitter rot and leaf spotting diseases on over 90 cultivated and non-cultivated woody or herbaceous plant species. The pathogen is not included in EU Commission Implementing Regulation 2019/2072. Because of the very wide host range, this pest categorisation focused on *Camellia sinensis*, *Citrus sinensis*, *C. reticulata*, *Fragaria x ananassa*, *Malus domestica*, *M. pumila*, *Persea americana*, *Prunus persica*, *Pyrus pyrifolia* and *P. bretschneideri* for which there was robust evidence that *C. fructicola* was formally identified by morphology and multilocus gene sequencing analysis. Host plants for planting and fresh fruits are the main pathways for the entry of the pathogen into the EU. There are no reports of interceptions of *C. fructicola* in the EU. The pathogen has been reported from Italy and France. The host availability and climate suitability factors occurring in some parts of the EU are favourable for the establishment of the pathogen. Economic impact on the production of the main hosts is expected if establishment occurs. Phytosanitary measures are available to prevent the re-introduction of the pathogen into the EU. Although the pathogen is present in the EU, there is a high uncertainty on its actual distribution in the territory because of the re-evaluation of *Colletotrichum* taxonomy and the lack of systematic surveys. Therefore, the Panel cannot conclude with certainty on whether *C. fructicola* satisfies the criterium of being present but not widely distributed in the EU to be regarded as a potential Union quarantine pest unless systematic surveys for *C. fructicola* are conducted and *Colletotrichum* isolates from the EU in culture collections are re-evaluated.

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**Correspondence:** alpha@efsaa.europa.eu
Panel members: Claude Bragard, Katharina Dehnen-Schmutz, Francesco Di Serio, Paolo Gonthier, Marie-Agnès Jacques, Josep Anton Jaques Miret, Annemarie Fejer Justesen, Alan MacLeod, Christer Sven Magnusson, Panagiotis Milonas, Juan A Navas-Cortes, Stephen Parnell, Roel Potting, Philippe L Reignault, Hans-Hermann Thulke, Wopke Van der Werf, Antonio Vicent, Jonathan Yuen and Lucia Zappala.

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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 fulfil the conditions for inclusion in the list of the Union quarantine pest are included. Furthermore, EFSA has been performing horizon scanning of media and literature.

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

1.1.2. Terms of Reference

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

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

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

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

1.2. Interpretation of the Terms of Reference

_Colletotrichum fructicola_ Prihast., L. Cai & K.D. Hyde is one of a number of pests listed in Annex 1 to the Terms of Reference (ToR) (Section 1.1.2) to be subject to pest categorisation to determine whether it fulfils the criteria of a regulated 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 European Commission decision-making as to its appropriateness for potential inclusion in the lists of pests of Commission Implementing Regulation (EU) 2019/2072. If a pest fulfils the criteria to be potentially listed as a regulated pest, specific import requirements for relevant host commodities will be identified; for pests already present in the EU additional risk reduction options to inhibit spread will be identified.
2. **Data and methodologies**

2.1. **Data**

2.1.1. **Literature search**

A literature search on *C. fructicola* 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.

2.1.2. **Database search**

Pest information, on host(s) and distribution, was retrieved from the European and Mediterranean Plant Protection Organization (EPPO) Global Database (EPPO, online), 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 was 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 interceptions to TRACES in May 2020.

2.2. **Methodologies**

The Panel performed the pest categorisation for *C. fructicola*, 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) and No. 21 (FAO, 2004).

The criteria to be considered when categorising a pest as an EU-regulated quarantine pest (QP) is given in Regulation (EU) 2016/2031 article 3. 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.
3. Pest categorisation

3.1. Identity and biology of the pest

3.1.1. Identity and taxonomy

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

| Criterion of pest categorisation | Criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest (article 3) |
|----------------------------------|----------------------------------------------------------------------------------|
| Identity of the pest (Section 3.1) | Is the identity of the pest established, or has it been shown to produce consistent symptoms and to be transmissible? |
| Absence/presence of the pest in the EU territory (Section 3.2) | Is the pest present in the EU territory? If present, is the pest widely distributed within the EU? Describe the pest distribution briefly. |
| Regulatory status (Section 3.3) | If the pest is present in the EU but not widely distributed in the risk assessment area, it should be under official control or expected to be under official control in the near future. |
| 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. |
| 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 (Specific import requirements) (Section 3.6) | Are there measures available to prevent the entry into the EU such that the likelihood of introduction becomes mitigated? |
| Conclusion of pest categorisation (Section 4) | A statement as to whether (1) all criteria assessed by EFSA above for consideration as a potential quarantine pest were met and (2) if not, which one(s) were not met. |

The genus *Colletotrichum* includes endophytes, saprobes as well as plant pathogens, 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 (size and shape of conidia and appressoria, presence or absence of setae, colour and growth rate of the colonies, etc.) were used to identify *Colletotrichum* species (Von Arx, 1957; Sutton, 1980, 1992). However, it has been demonstrated that these characters are not reliable for species level identification because of their variability under different environmental factors, including culture media, light and temperature (Cai et al., 2009; Damm et al., 2012; Liu et al., 2016). In the last few years, the use of multi-gene phylogenetic analysis has significantly changed the taxonomy of the genus *Colletotrichum* (Cannon et al., 2012; Weir et al., 2012). So far, 11 *Colletotrichum* species complexes have been identified within the genus *Colletotrichum*.

*Colletotrichum fructicola* is a distinct fungal species belonging to the *C. gloeosporioides* complex, which represents a large group of plant pathogens affecting many different crops (Weir et al., 2012). Based on multi-gene phylogenetics, 22 species and one subspecies have been identified within the *C. gloeosporioides* complex (Weir et al., 2012). *C. fructicola* was originally reported as the causal agent of coffee berry disease on Coffea arabica in northern Thailand (Prihastuti et al., 2009) and as a leaf endophyte in Central America (Rojas et al., 2010). Since then, *C. fructicola* has been reported to cause anthracnose, bitter rot and leaf spotting diseases on a wide range of woody or herbaceous plants growing in tropical, subtropical and temperate climates worldwide (Damm et al., 2010; Cannon et al., 2012; Weir et al., 2012; Fu et al., 2019). The pathogen is morphologically and physiologically identical...
to other species of the C. gloeosporioides complex. Nevertheless, it can be reliably identified based on multilocus gene sequencing analysis.

*C. fructicola* is a fungus of the family Glomerellaceae. CABI Crop Protection Compendium (CABI, 2021) provides the following taxonomic identification for *C. fructicola*:

**Preferred scientific name:** *Colletotrichum fructicola* Prihast., L. Cai & K.D. Hyde  
Phylum: Ascomycota  
Subphylum: Pezizomycotina  
Class: Sordariomycetes  
Order: Phyllachorales  
Family: Glomerellaceae  
Genus: *Colletotrichum*  
Species: *Colletotrichum fructicola*

Common names: anthracnose, bitter rot of apple, bitter rot of pear, Glomerella leaf spot

**Synonyms:** Colletotrichum ignotum Rojas, Rehner & Samuels; Glomerella cingulata var. minor Wollenw. (Prihastuti et al., 2009; Rojas et al., 2010; Weir et al., 2012).

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

### 3.1.2. Biology of the pest

*Colletotrichum fructicola* has a similar life cycle to that of other *Colletotrichum* species and may survive between crops during winter as mycelium and perithecia on plant debris, or on infected plants, while its survival on seeds remains questionable (Rajeendran et al., 2017; Hanin and Fitriasari, 2019). Humid, wet, rainy weather is necessary for infection to occur. These requirements in particular may limit the occurrence of the pathogen in driest areas whereas the pathogen may represent a serious problem under controlled environments where humidity is ensured (i.e. in the greenhouse) or during postharvest stages (CDFA, 2009).

During active growth in the plant tissues, the pathogen develops acervuli, which produce masses of mucilage-embedded conidia. These conidia are disseminated by rain splash, wind-driven rain, cultivation tools, equipment and fieldworkers onto healthy leaves, young fruit or blossoms (de Silva et al., 2017). Conidia germinate, penetrate host tissue by means of specialised hyphae (appressoria) and invade host tissue. Upon infection the pathogen continues to produce conidia throughout the season resulting in a polycyclic disease cycle.

The life cycle of *Colletotrichum* species includes both sexual/teleomorph and asexual/anamorph reproductive stages, which occur on the host plant or in plant debris (de Silva et al., 2017). Sexual fruiting structures (perithecia) are readily formed in *in vitro* culture. Environmental conditions favourable for the formation of perithecia induce the development and release and the aerial dispersal of ascospores, which infect plant tissues (Zhao et al., 2019). Senescence of the host tissue may induce the development of the sexual stage, from which the life cycle will restart (Figure 1; de Silva et al., 2017). Perithecia also represent survival structures, which help the pathogen to overwinter or survive periods in the absence of a susceptible host, especially since *C. fructicola* does not produce sclerotia (Prihastuti et al., 2009; Rojas et al., 2010; Weir et al., 2012).

No information specific for the potential of the pathogen to survive in soil (with or without plant debris) exists. Nevertheless, in general, *Colletotrichum* species seem not to survive for long periods in soil (Bergstrom and Nicholson, 1999; Ripoche et al., 2008), although there are notable exceptions (Dillard and Cobb, 1998; Freeman et al., 2002) and melanised microsclerotia have been observed in several species (e.g. *C. truncatum, C. sublineola, C. coccodes*) (Dillard and Cobb, 1998; Boyette et al., 2007; Sukno et al., 2008). Conidia of *C. acutatum* and *C. gloeosporioides* isolates from strawberry survive for up to 1 year in autoclaved soil, whereas their viability declined rapidly within a few days in untreated soils at 22% soil moisture (field capacity) (Freeman et al., 2002). The number of conidia of *C. gloeosporioides*, causal agent of water yam (*Dioscorea alata*) anthracnose in Guadeloupe, was higher in artificially inoculated residues on the soil surface than in residues buried at 0.1 m soil depth, which decomposed faster (Ripoche et al., 2008). Eastburn and Gubler (1990) reported that *C. acutatum* survived in buried strawberry tissue for 9 months, but soil population densities gradually

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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).
declined over an 11-month period. According to Feil et al. (2008), the number of *C. acutatum* conidia recovered from artificially inoculated strawberry stolons buried in soil was the highest at 5°C with a soil moisture level of 26.8%. Recovery of conidia decreased progressively over a 6-month period, with the decline being more pronounced at 10°C than at 5°C and at a higher soil moisture.

*Colletotrichum* species exhibit diverse host colonisation strategies ranging from very short up to long latent periods (Perfect et al., 1999). The penetration and colonisation process of *C. fructicola* has been thoroughly described by Shang et al. (2020) on apple (cv. Gala) leaves using both light and transmission electron microscopy. *C. fructicola* conidia form germ tubes 4 h post-inoculation (hpi) and melanised appressoria at 8 hpi. At 12 hpi, *C. fructicola* produces secondary conidia. After penetration, *C. fructicola* develops infection vesicles at 36 hpi. At 48 hpi, the primary hyphae of *C. fructicola* are produced from infection vesicles within host epidermal cells; the host epidermal cell plasma membrane remains intact, indicating a biotrophic association. Subsequently, secondary hyphae penetrate epidermal cells and destroy cell components, initiating the necrotrophic colonisation stage. *C. fructicola* also produces biotrophic subcuticular infection vesicles and hyphae. Together, these results demonstrate that *C. fructicola* colonises apple leaves in a haemibiotrophic manner, involving intracellular as well as subcuticular colonisation strategies (Shang et al., 2020).

On PDA culture medium, optimal radial colony growth of *C. fructicola* occurs between 25°C and 30°C. Colony growth is significantly reduced at 35°C, and growth is arrested at 40°C (Lu et al., 2018).

**Figure 1:** General life cycle of *Colletotrichum* species (from de Silva et al., 2017)
3.1.3. Host range

As other members of the C. gloeosporioides complex, C. fructicola is polyphagous. Reported hosts include: Camellia sinensis (CDFA, 2009; Weir et al., 2012; Fuentes-Aragón et al., 2018); Capsicum annuum (Shoji et al., 2014); Capsicum frutescens (CDFA, 2009); Carica papaya (Saini et al., 2016); Citrullus vulgaris (CDFA, 2009); Citrus x paradisi (CDFA, 2009); Citrus reticulata (Huang et al., 2013); Citrus sinensis (Arzanlou et al., 2015); Coffea arabica (Prihastuti et al., 2009); Cucumis melo (CABI, 2019), Dendrobium officinale (Silva-Cabral et al., 2019; Ma et al., 2020a); Dioscorea sp. (CDFA, 2009; Weir et al., 2012; Fuentes-Aragón et al., 2018); Diospyros kaki (Carraro et al., 2019); Ficus carica (CDFA, 2009; Weir et al., 2012; Fuentes-Aragón et al., 2018); Ficus edulis (CDFA, 2009; Weir et al., 2012; Fuentes-Aragón et al., 2018); Fortunella margarita (Huang et al., 2013); Fragaria × ananassa (CDFA, 2009; Weir et al., 2012; Fuentes-Aragón et al., 2018); Hylocerus undatus (CABI, 2019); Juglans regia (Wang et al., 2018), Limonium sinuatum (CDFA, 2009; Weir et al., 2012; Fuentes-Aragón et al., 2018); Lycopersicon esculentum (CDFA, 2009); Lycium chinense (Huang et al., 2013); Mangifera indica (CABI, 2019); Musa acuminata (CDFA, 2009); Nerium oleander (CDFA, 2009); Nicotiana tabacum (Wang et al., 2016); Passiflora edulis (CDFA, 2009); Persea americana (CDFA, 2009; Weir et al., 2012; Fuentes-Aragón et al., 2018); Phaseolus lunatus (Sousa et al., 2018); Prunus persica (Lee et al., 2020); Pyrus bretschneideri (Jiang et al., 2014); Pyrus pyrifolia (Zhang et al., 2015); Theobroma cacao (CDFA, 2009; Weir et al., 2012; Fuentes-Aragón et al., 2018); Vitis vinifera (Peng et al., 2013; Echeverrigaray et al., 2020).

Colletotrichum fructicola has also been reported on many other cultivated hosts (including ornamentals) worldwide (see Appendix A). Some weeds were reported as potential hosts of C. fructicola: the pathogen is able to form acervuli on the tissues of these plants once treated with an herbicide. Hence, infected weeds associated with strawberry cultivation were hypothesised to represent potential inoculum sources of fungicide-resistant populations. It is generally acknowledged that the risk of fungicide resistance adaptation of C. fructicola to various and/or adverse environmental conditions, including the selection of fungicide-resistant populations. The complete list of the host plants of C. fructicola reported to date in the literature is included in Appendix A (last updated: 9 June 2021). However, uncertainty exists with respect to the actual host range of the pathogen.

3.1.4. Intraspecific diversity

The ability to differentiate sexual reproductive stages enhances the genomic plasticity and adaptation of C. fructicola 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, isolates of *C. fructicola* from apple orchards in Japan were found to develop resistance to benomyl and QoI (quinone outside inhibitors) fungicides at a more rapid pace compared to other anamorphic species of the *Colletotrichum gloeosporioides* complex, such as *C. siamense* (Yokosawa et al., 2017). Out of 125 *Colletotrichum* isolates from strawberry and yam sampled from 2012 through 2016 in the Hubei Province (China), 56 were identified as *C. fructicola* and tested for resistance to carbendazim: the number of sensitive, moderately resistant and highly resistant isolates was 38, 3 and 15, respectively (Han et al., 2018).

### 3.1.5. Detection and identification of the pest

| Are detection and identification methods available for the pest? |
|-------------------|
| Yes, detection and identification methods are available. |

Plants infected by *C. fructicola* show symptoms of anthracose, which include dark brown stem and fruit spots, pre- and post-harvest fruit rot, spotting and wilting of leaves (Zhang et al., 2015; Guarnaccia et al., 2016; Carraro et al., 2019; Fu et al., 2019; Chung et al., 2020; Echeverri-garay et al., 2020; Fuentes-Aragón et al., 2020). However, these symptoms are similar to those caused by other *Colletotrichum* species. If fruiting structures (acervuli with conidia and/or perithecia with ascospores) are detected on the symptomatic plant tissues using a magnifying lens, they are also similar to those of other *Colletotrichum* species. Therefore, it is unlikely that the pathogen could be detected based on visual inspection only.

The pathogen can be readily isolated on culture media and description of its cultural and morphological characteristics is available in the literature (Prihastuti et al., 2009; Rojas et al., 2010; Weir et al., 2012). 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 pathogen cannot be reliably identified based on morphology (Damm et al., 2010, 2012; Cannon et al., 2012; Weir et al., 2012). Molecular methods, such as multilocus gene (e.g. ITS, *tub2*, *gs*, *gpdh*, *cmode*) sequencing analysis, are available in the literature (Zhu et al., 2015; Li et al., 2016a,b; Giblin et al., 2018; Grammen et al., 2019) and may be used in combination with morphology-based methods for the identification of *C. fructicola* (Guarnaccia et al., 2021). However, it is worth noting that ITS sequences do not separate *C. fructicola* from *C. aescynomenes* and some *C. siamense* isolates. These taxa are best distinguished using GS or SOD2 genes (Weir et al., 2012). Using a comparative genomics approach, Gan et al. (2017) have developed a marker that can differentiate *C. fructicola*, *C. aenigma* and *C. siamense* within the *C. gloeosporioides* species complex based on polymerase chain reaction (PCR) amplicon size differences.

No EPPO Standard is available for the detection and identification of *C. fructicola*.

### 3.2. Pest distribution

#### 3.2.1. Pest distribution outside the EU

*Colletotrichum fructicola* is reported from Asia, Africa, America and Oceania (EPPO, 2016).

In Asia, the pathogen is reported from China (Jiang et al., 2014; Zhang et al., 2015; de Silva et al., 2019; Guarnaccia et al., 2021), Iran (Arzanlou et al., 2015), Japan (Shoji et al., 2014; Gan et al., 2016), Korea Republic (Paul et al., 2014; Lim et al., 2020), India (Sharma and Shenoy, 2013; Saini et al., 2016; de Silva et al., 2019), Taiwan (de Silva et al., 2019; Wu et al., 2020), Thailand (Weir et al., 2012; de Silva et al., 2019; Guarnaccia et al., 2021), Israel (Sharma et al., 2017) and Indonesia (Weir et al., 2012).

In Africa, *C. fructicola* is reported from Nigeria (Weir et al., 2012) and South Africa (Weir et al., 2012).

In America, the pathogen is reported from USA (Weir et al., 2012), Canada (Weir et al., 2012), Brazil (Lima et al., 2013; Lopes et al., 2021), Mexico (Fuentes-Aragón et al., 2018; Tovar-Pedraza et al., 2020), Uruguay (Casanova et al., 2017; Alaniz et al., 2019) and Panama (Weir et al., 2012).

In Oceania, *C. fructicola* is reported from Australia (Shivas et al., 2016; Giblin et al., 2018; Wang et al., 2021) and New Zealand (Weir et al., 2012; Hofer et al., 2021).
Details of the current distribution of the pathogen outside the EU are presented in Appendix B. No map on the global distribution of *C. fructicola* is available in the EPPO Global Database.

There is uncertainty with respect to the actual distribution of the pathogen outside the EU, as in the past, when molecular tools (i.e. multigene phylogenetic analysis) were not available, the pathogen might have been identified as *C. gloeosporioides* based on morphology and pathogenicity tests, which cannot reliably identify *Colletotrichum fructicola*.

### 3.2.2. Pest distribution in the EU

*Colletotrichum fructicola* is known to be present in the EU. More specifically, it has been reported from the following EU Member States:

- France (Nodet et al., 2019).
- Germany (Weir et al., 2012).
- Italy (Guarnaccia et al., 2016, 2021; Wenneker et al., 2021).

In France, the pathogen was detected in 2017 in four apple (*Malus pumila*) orchards in the Occitanie region (communes of Marsillargues, Saint-Just and Lunel-Viel of the Hérault Department and commune Campagne of the Gard Department; Dr P. Nodet, personal communication) exhibiting bitter rot symptoms on fruits (Nodet et al., 2019). Since then, no other reports on the presence of the pathogen in France exist in the available literature. In Germany, *C. fructicola* was found in 1936 to cause leaf spotting on a *Ficus edulis* plant grown in Berlin-Dahlem Botanical Garden. The pathogen was initially identified as *Glomerella cingulata* var. *minor*. In 2012, Weir et al. using multilocus gene sequencing analysis identified the isolate of the pathogen deposited in CBS (CBS 238.49) as *C. fructicola*. No other reports exist on the presence of the pathogen in Germany. Therefore, the Panel considers the pest as transient in Germany. In Italy, the pathogen was detected for the first time in 2013 causing fruit rot on 5- to 10-year-old avocado (*Persea americana*; cv Hass) trees grown in four orchards in Catania province (eastern Sicily) (Guarnaccia et al., 2016). In 2019, *C. fructicola* was reported to cause anthracnose on aromatic and ornamental plants grown in nurseries located in northern Italy (near Biella) (Guarnaccia et al., 2021). In the same year, the pathogen was reported to cause a severe outbreak of fruit rot in commercial ‘Pink Lady’ apple orchards in the region Emilia-Romagna (northern Italy) (Wenneker et al., 2021).

Again, uncertainty exists with respect to the current distribution of *C. fructicola* in the EU, as in the past, when molecular tools (i.e. multigene phylogenetic analysis) were not available, the pathogen might have been identified in the past as *C. gloeosporioides* based on morphology and pathogenicity tests, which cannot reliably identify *Colletotrichum fructicola*.

### 3.3. Regulatory status

#### 3.3.1. Commission Implementing Regulation 2019/2072

*C. fructicola* is not listed in Annex II of Commission Implementing Regulation (EU) 2019/2072, an implementing act of Regulation (EU) 2016/2031.
3.3.2. Hosts of *Colletotrichum fructicola* that are prohibited from entering the Union from third countries

Table 2: List of plants, plant products and other objects that are *Colletotrichum fructicola* hosts whose introduction into the Union from certain third countries is prohibited Source Commission Implementing Regulation (EU) 2019/2072, Annex VI). Some of the hosts such as *Ficus carica*, *Malus*, *Nerium*, *Prunus*, *Juglans* and *Persea* are included in the Commission Implementing Regulation (EU) 2018/2019 on high risk plants.

| Description | CN Code | Third country, group of third countries or specific area of third country |
|-------------|---------|-------------------------------------------------------------|
| 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, ex 0602 20 20, ex 0602 20 80, ex 0602 40 00, ex 0602 90 41, ex 0602 90 45, ex 0602 90 46, ex 0602 90 47, ex 0602 90 48, ex 0602 90 50, ex 0602 90 70, ex 0602 90 91, ex 0602 90 99 | Third countries other than: Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canary Islands, Faeroe Islands, Georgia, Iceland, Liechtenstein, Moldova, Monaco, Montenegro, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralsy federalny okrug), Northwestern Federal District (Severo-Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Turkey and Ukraine |
| 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, ex 0602 20 20, ex 0602 90 30, ex 0602 90 45, ex 0602 90 46, ex 0602 90 48, ex 0602 90 50, ex 0602 90 70, ex 0602 90 91, ex 0602 90 99 | Third countries, other than: Albania, Algeria, Andorra, Armenia, Australia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canada, Canary Islands, Egypt, Faeroe Islands, Georgia, Iceland, Israel, Jordan, Lebanon, Libya, Liechtenstein, Moldova, Monaco, Montenegro, Morocco, New Zealand, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralsy federalny okrug), Northwestern Federal District (Severo-Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Syria, Tunis, Turkey, Ukraine, and United States other than Hawaii |
| 10. Plants of *Vitis* L., other than fruits | 0602 10 10, 0602 20 10, ex 0604 20 90, ex 1404 90 00 | Third countries other than Switzerland |
| 11. Plants of *Citrus* L., *Fortunella* Swingle, *Poncirus* Raf., 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 48, ex 0602 90 50, ex 0602 90 70, ex 0602 90 91, ex 0602 90 99, ex 0604 20 90, ex 1404 90 00 | All third countries |
3.4. Entry, establishment and spread in the EU

3.4.1. Entry

Host plants for planting is the main pathway for the entry of the pathogen into the EU territory. The PLH Panel identified the following main pathways for the entry of the pathogen into the EU territory:

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

originating in infested third countries (Table 4).

Albeit seeds are reported as one of the primary sources of inoculum for many Colletotrichum species, there is no evidence of C. fructicola being transmitted by seeds of its host plants.

No information specific for C. fructicola exists in the available literature on its survival in soil, but in general, Colletotrichum species appear to be poor competitors in soil (see Section 3.1.2). Therefore, uncertainty exists on the soil and other substrates associated or not with host plants for planting as a pathway of entry of the pathogen into the EU territory.

The pathogen is 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 pathogen may be also present as contaminants on other substrates (e.g. non-host plants, other objects, etc.) imported into the EU. Nevertheless, this is considered a minor pathway for the entry of C. fructicola into the EU territory.

Given its biology, C. fructicola could potentially be transferred from the fruit pathway to host plants grown in the EU territory. However, the frequency of this transfer will depend on the volume and frequency of imported fruits, their final destination (e.g. retailers, packinghouses) and its proximity to the hosts and the management of fruit waste.

Table 3: Potential pathways for Colletotrichum fructicola into the EU 27

| Pathways                                                                 | Life stage                                      | Relevant mitigations [e.g. prohibitions (Annex VI) or special requirements (Annex VII) within Implementing Regulation 2019/2072] |
|--------------------------------------------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Plants for planting of Malus Mill., Prunus L. and Pyrus L., other than dormant plants free from leaves, flowers and fruits | Mycelium, acervuli with conidia, perithecia with ascospores | Annex VI (8.) bans the introduction of plants for planting of Malus, Prunus and Pyrus with leaves, flowers and fruits from certain third countries. None of the third countries from where the introduction of Malus, Prunus and Pyrus plants for planting with leaves, flowers and fruits is permitted has been reported to be infested by C. fructicola (see Section 3.3.1). |
| Plants for planting of Malus Mill., Prunus L. and Pyrus L. and their hybrids, and Fragaria L., other than seeds | Mycelium, acervuli with conidia, perithecia with ascospores | Annex VI (9.) bans the introduction of plants for planting of Malus, Prunus, Pyrus and Fragaria L. other than seeds from certain third countries. Of the third countries from where the introduction of Malus, Prunus, Pyrus and Fragaria L. plants for planting other than seeds, is not prohibited, the United States have been reported to be infested by C. fructicola (see Section 3.3.1). |
| Plants for planting of Citrus L., Fortunella Swingle, Poncirus Raf., and their hybrids | Mycelium, acervuli with conidia, perithecia with ascospores | Annex VI (11.) bans the introduction of plants of Citrus L., Fortunella Swingle, Poncirus Raf., and their hybrids, other than fruits and seeds from all third countries (see Section 3.3.1). |
Notifications of EU 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 Members States specific for *C. fructicola* exist in Europhyt (assessed on 1 June 2021). Nevertheless, until May–June 2020, there have been 21 interceptions of unidentified at species level *Colletotrichum*. No records of *C. fructicola* exist in TRACES database since May 2020 (assessed on 1 June 2021).

The California Department of Food and Agriculture (CDFA) reported that, during the period 2015–2016, *C. fructicola* was intercepted several times mainly in shipments of mango (*Mangifera indica*) and black sapote (*Diospyros nigra*) fruits, and *Dracaena* massangeana and Chinese evergreen (*Aglaonema*-sp.) cuttings originated in Costa Rica, Puerto Rico and Florida and destined to private citizens or nurseries in the State of California (Chitambar, 2016).

### Table 4: EU 27 annual imports of fresh produce of main hosts from countries where *Colletotrichum fructicola* is present, 2016–2020 (in 1,000 kg) Source: Eurostat accessed on 11/06/2021

| Commodity                                | HS code   | 2016     | 2017     | 2018     | 2019     | 2020     |
|------------------------------------------|-----------|----------|----------|----------|----------|----------|
| Citrus fruit, fresh or dried             | 0805      | 902,859  | 991,945  | 1,028,410| 997,965  | 1,155,131|
| Fresh or dried avocados                  | 080440    | 127,796  | 125,683  | 155,820  | 168,571  | 152,635  |
| Fresh apples                             | 080810    | 124,193  | 131,959  | 160,570  | 115,022  | 119,398  |
| Fresh pears                              | 080830    | 97,405   | 87,818   | 78,146   | 68,626   | 68,712   |
| Fresh strawberries                       | 081010    | 446      | 293      | 57       | 12       | 13       |
| Fresh persimmons                         | 081070    | 328      | 528      | 258      | 1,041    | 908      |
| Fresh grapes                             | 080610    | 209,599  | 248,583  | 242,833  | 254,796  | 236,271  |
| Edible fruit or nut trees, shrubs and bushes | 060220 | 2,209    | 2,170    | 939      | 958      | 1,427    |
| Vegetable and strawberry plants          | 06029030  | 507      | 478      | 506      | 355      | 183      |
| Sum                                      |           | 1,465,342| 1,589,456| 1,667,539| 1,607,345| 1,734,678|

Notifications of EU 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 Members States specific for *C. fructicola* exist in Europhyt (assessed on 1 June 2021). Nevertheless, until May–June 2020, there have been 21 interceptions of unidentified at species level *Colletotrichum*. No records of *C. fructicola* exist in TRACES database since May 2020 (assessed on 1 June 2021).
3.4.2. Establishment

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

Yes. *Colletotrichum fructicola* has recently been reported to be present in Italy and France (Section 3.2), which indicates that the biotic (host availability) and abiotic (climate suitability) factors occurring in some parts of the EU territory are favourable for the establishment of the pathogen.

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, *C. fructicola* has a wide host range. Some of its main hosts are confined to the warmer southern Europe (e.g. citrus, avocado) whereas others (e.g. apples, pears, strawberries) are more widely distributed. Hosts are grown in commercial production (orchards, greenhouses) and in home gardens. Except for *Camellia sinensis* (tea), which is grown commercially in Europe only in the Azores Islands over a surface of 40 ha (Mazerolle et al., 2018), the harvested area of the main hosts of *C. fructicola* cultivated in the EU 27 in recent years is shown in Table 5. Appendix C provides production statistics for individual Member States.

Table 5: Harvested area of *Colletotrichum fructicola* main hosts in EU 27, 2016–2020 (1,000 ha). Source EUROSTAT (accessed 14/6/2021) https://ec.europa.eu/eurostat/databrowser/view/apro_cpsh1/default/table?lang=en

| Crop        | 2016    | 2017    | 2018    | 2019    | 2020    |
|-------------|---------|---------|---------|---------|---------|
| Apples      | 506.48  | 505.55  | 507.24  | 491.35  | 473.66  |
| Pears       | 115.76  | 114.84  | 114.84  | 111.84  | 108.83  |
| Stone fruits|         | 625.46  | 621.32  | 612.33  |         |
| Citrus      | 519.01  | 502.84  | 508.99  | 512.53  | 487.08  |
| Grapes      | 3,136.04| 3,134.93| 3,137.17| 3,160.68| 3,162.48|
| Avocado     | 12.24   | 12.72   | 13.22   | 15.52   | 17.27   |

*: data not available.

3.4.2.2. Climatic conditions affecting establishment

*C. fructicola* has been reported from all five continents. Limited data are available on the exact location of the areas of the current global distribution of *C. fructicola*. Nevertheless, based on the few data available, the climatic zones in parts of China, Iran, Brazil and Uruguay, where the pathogen is present, are comparable to climatic zones within the EU (Figure 2).
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). *C. fructicola* occurs in several climate zones, such as Cfa, Csa, Csb, Bsh and Bsk. These climate zones also occur in the EU territory, where many hosts of the pathogen are grown. For example, in Italy, the presence of the pathogen has been reported from Csa and Csb (Catania, Sicily) and Cfa (Biella, Region of Piemonte) climatic zones (Guarnaccia et al., 2016).

Based on the above, it may be assumed that the climatic conditions occurring in some parts of the EU territory (mainly in southern EU Member States) are favourable for the establishment of *C. fructicola*. Given the limited data available on the exact locations of the current distribution of *C. fructicola* outside the EU, uncertainty exists on whether the pathogen could potentially establish at higher latitudes in the EU, i.e. in areas belonging to other than the above-mentioned climate zones where hosts are also present. Nonetheless, the possibility of establishment of *C. fructicola* in protected crops (glasshouses) at higher latitudes in the EU, cannot be ruled out, given the conducive environmental conditions that occur in such environments and the extreme polyphagy of the pathogen.

### 3.4.3. Spread

Following its introduction into the EU territory, *C. fructicola*, 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) droplets (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 pathosystems (e.g. *C. acutatum* and *C. gloeosporioides* affecting citrus), spread of the pathogen may also occur via the wind-disseminated ascospores (Silva-Junior et al., 2014).

**Spread by human assistance.** The pathogen can spread over long distances via the movement of infected host plants for planting (rootstocks, grafted plants, scions, etc.), including dormant plants, fresh fruits, contaminated agricultural machinery and tools, etc.
Uncertainty exists on the potential of the pathogen to spread via the seeds of its host plants and soil or other substrates, due to lack of evidence.

### 3.5. Impacts

The genus *Colletotrichum* includes important plant fungal pathogens affecting more than 30 plant genera by causing anthracnose and pre- and post-harvest fruit rots on several tropical, subtropical and temperate fruit crops, vegetables and ornamentals (Bailey and Jeger, 1992; Lima et al., 2011; Anderson et al., 2013; Guarnaccia et al., 2016; de Silva et al., 2017). *C. fructicola* is among the most aggressive species in the *C. gloeosporioides* complex and affects a wide range of plant species, among which economically important fruit and vegetable crops (e.g. apples, pears, peaches, strawberries) inciting anthracnose symptoms on fruits, flowers, twigs and leaves. Disease symptoms include dark brown stem and fruit spots, fruit rots, spotting and wilting of leaves and premature defoliation which result in yield and quality losses (Jiang et al., 2014; Velho et al., 2015; Zhang et al., 2015; Wang et al., 2016). Nevertheless, there is limited quantitative data available in the literature on the yield and/or quality losses caused by the pathogen in the area of its current distribution. Li et al. (2013) reported 60–90% losses in the fresh market of pear fruit (*P. bretschneideri*) in China as a result of *C. fructicola* infection. In Fujian province (China), the leaf black spot disease caused by *C. fructicola* on sandy pear (*P. pyrifolia*) affects 15–30% of the pear-growing areas causing more than 30 million kg in fruit loss each year (Zhang et al., 2015). In Brazil, commercial persimmon (*Diospyros kaki*) orchards affected by *C. fructicola* may experience 80% of anthracnose incidence resulting in comparable yield losses (Carraro et al., 2019). In Korea, *C. fructicola* was identified as the causal agent of anthracnose on strawberry (*Fragaria × ananassa*) with more than 30% of nurseries being affected by the disease (Nam et al., 2013). Gan et al. (2016) reported that anthracnose is the major problem in the Japanese strawberry cultivation industry and demonstrated that *C. fructicola* is the predominant causal agent. According to Chung et al. (2019), during the period 2010–2016, anthracnose disease of strawberry in Taiwan incited mainly by *C. fructicola* and *C. siamense* resulted in 30–40% and 20% loss of seedlings and transplanted plants, respectively.

As noted above, *C. fructicola* has been reported from Italy and France causing avocado stem-end rot and apple bitter rot (pre- and post-harvest), respectively (Guarnaccia et al., 2016; Nodet et al., 2019). Nevertheless, no quantitative data are available on the yield and/or quality losses caused by the pathogen on the respective crops.

Potential environmental consequences of the further introduction of *C. fructicola* into the EU territory may be associated with the additional fungicide treatments required for disease control. In addition, increasing the frequency of fungicide applications may interfere with the current integrated pest management (IPM) programmes that aim to reduce the use of chemical pesticides.

Based on the above, it is expected that further introduction of the pathogen into the EU territory would potentially cause yield and quality losses in parts of the risk assessment area. Nevertheless, it is not known if the agricultural practices and chemical control measures currently applied in the EU could potentially reduce the impact of the pest’s introduction.

### 3.6. Available measures and/or potential specific import requirements and limits of mitigation measures

Yes. Although not specifically targeted against *C. fructicola*, existing phytosanitary measures (see Sections 3.3.1 and 3.3.2) mitigate the likelihood of the pathogen’s entry into the EU territory. Potential additional measures also exist to further mitigate the risk of entry (see Section 3.6.1).
3.6.1. Identification of potential additional measures

Phytosanitary measures (prohibitions) are currently applied to some hosts of *C. fructicola*, although measures in Annex VII of Commission Implementing Regulation 2019/2072 do not specifically refer to this pest (see Section 3.3).

Potential additional control measures are listed in Table 6.

**Table 6:** Selected control measures (a full list is available in EFSA PLH Panel et al., 2018) for pest entry in relation to currently unregulated hosts and pathways

| Special requirements summary (with hyperlink to information sheet if available) | Control measure summary in relation to *Colletotrichum fructicola* |
| --- | --- |
| Pest freedom | Used to mitigate likelihood of infestation by specified pest at origin, hence to mitigate entry Plant or plant products come from a country officially free from the pest, or from a pest-free area or from a pest-free place of production. |
| Managed growing conditions | Used to mitigate likelihood of infestation at origin Anthracnose diseases are generally most common among the tropical and subtropical countries. Hot and humid environmental conditions support the spread of these pathogens. Hence, the use of pathogen-free propagative material, proper field drainage, avoidance of unclean water for canopy irrigation, plant distancing, destroying infected parts of plants into small pieces for faster decomposition using limes, crop rotation and removal of any infected plant parts in the field represent effective strategies to manage *C. fructicola* at origin. |
| Growing plants in isolation | Used to mitigate likelihood of infestation by specified pest in vicinity of growing site The use of transplants raised from pathogen-free propagative material, as well as growing transplants in weed-free areas and away from other crops that are known host of *C. fructicola* may represent an effective control measure. |
| Certification of reproductive material (voluntary/official) | Plants should come from within an approved propagation scheme and be certified pest-free following laboratory testing. |
| Chemical treatments on crops including reproductive material | Used to mitigate likelihood of infestation of pests susceptible to chemical treatments Several effective fungicides are available to control *C. fructicola* and other 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 has to be considered. |
| Roguing and pruning | Used to mitigate likelihood of infestation by specified pest (usually a pathogen) at growing site where pest has limited dispersal On some susceptible hosts, the infection by *C. fructicola* may occur from conidia or ascospores formed on infected plants or plant residues which can act as sources of inoculum. These propagules are dispersed from the infected organs and plant residues to newly established plant by rain splash, free water or high humidity. To reduce the sources of inoculum, pruning of the infected or damaged by the pathogen plant organs is highly recommended. Weed control may also represent an effective means to reduce inoculum sources and potential survival of the pathogen on alternative hosts. |
| Soil treatment | Used to mitigate likelihood of infestation of soil at origin Although no specific studies are available on *C. fructicola*, it is likely that the pathogen could potentially survive in infected plant residues 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. |
| Inspections | Used to mitigate likelihood of infestation by specified pest at origin The symptoms caused by *C. fructicola* are similar to those caused by other *Colletotrichum* species. If signs (acervuli with conidia and/or perithecia with ascospores) are detected on the symptomatic plant tissues using a magnifying... |
### Special requirements summary (with hyperlink to information sheet if available)

| Control measure summary in relation to *Colletotrichum fructicola* |
|---------------------------------------------------------------|
| lens, they are also similar to those of other *Colletotrichum* species. Therefore, it is unlikely that the pathogen could be detected based on visual inspection only. |
| **Chemical treatments on consignments or during processing** |
| *Used to mitigate likelihood of infestation of pests susceptible to chemical treatments* |
| Copper compounds, triazoles and strobilurins are effective as postharvest treatments against *C. fructicola*. 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. |
| **Physical treatments on consignments or during processing** |
| *Used to mitigate likelihood of infestation of pests susceptible to physical treatments* |
| 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. |
| **Heat and cold treatments** |
| *Used to mitigate likelihood of infestation of pests susceptible to physical 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 *C. fructicola* in susceptible plants or plant organs. The combination of hot water and calcium chloride may increase the efficacy of the treatment. As a warmth-adapted microorganism, cold treatments could also mitigate infection of consignments by *C. fructicola*. |
| **Controlled atmosphere** |
| *Used to mitigate likelihood of infestation of pests susceptible to modified atmosphere (usually applied during transport) hence to mitigate entry* |
| Modified and controlled atmosphere (CA and MA) packages using polymeric films with different permeability for O\textsubscript{2}, CO\textsubscript{2}, other gases and H\textsubscript{2}O can be used to maintain relative humidity, reduce water loss and contamination in various fruit commodities. |
| **Timing of planting and harvesting and timing of export to EU** |
| *Used to mitigate likelihood of entry of pests associated with particular phenological stages of host* |
| Not relevant for *C. fructicola*. |
| **Cleaning and disinfection of facilities, tools and machinery** |
| *Used to mitigate likelihood of entry or spread of soil-borne pests* |
| Cleaning, disinfection and disinfestation (sanitization) 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 *C. fructicola*. |
| **Conditions of transport** |
| *Used to mitigate likelihood of entry of pests that could otherwise infest material post-production* |
| When potentially infected/contaminated material has to be transported (including proper disposal of infested waste material), specific transport conditions (kind of packaging/protection, time of transport, transport mean) should be defined to prevent the pest from escaping (see Annex C Information sheet 1.15). These may include, albeit not exclusively: cold treatment and controlled atmosphere; physical protection; removal of leaves and peduncules from fruit commodities; sealed packaging. |
| **Limits on soil** |
| *Used to mitigate likelihood of entry or spread via pests in soil* |
| No additional measures |
| **Phytosanitary certificate and plant passport** |
| *Used to attest which of the above requirements have been applied* |
| Recommended for plant species known as hosts of *C. fructicola*. |
3.6.1. Biological or technical factors limiting the effectiveness of measures to prevent the entry of the pest

- Latently infected plants and plant products are unlikely to be detected by visual inspection.
- The similarity of symptoms and signs caused by *C. fructicola* with those of other *Colletotrichum* species makes impossible the detection of the pathogen based on symptomatology and morphology.
- The lack of rapid diagnostic methods based on serological or molecular approaches does not allow proper identification of the pathogen 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 polyphagy of the pathogen limits the possibility to set standard diagnostic protocols for all potential hosts.
- The genome plasticity and the possibility of sexual recombination in *C. fructicola* may favour the selection of fungicide-resistant populations, thereby limiting the efficacy of chemical control approaches.

3.7. Uncertainty

- Host range of the pathogen, particularly after the recent developments in the taxonomy of *Colletotrichum* species and the availability of molecular tools for the identification of *C. fructicola* and its discrimination from other close-related *Colletotrichum* species.
- Global distribution of the pathogen, including its distribution within the EU territory, particularly with respect to records where multilocus gene sequencing analysis was not used for the identification of the isolated *Colletotrichum* species.
- Seeds of host plants as potential pathway of entry into and means of spread within EU territory of *C. fructicola*, due to lack of evidence.
- *C. fructicola* could potentially be transferred from fruits to host plants grown in the EU territory. However, the frequency of this transfer was not assessed.
- Soil and other substrates associated or not with host plants for planting as a pathway of entry into and means of spread within the EU territory of *C. fructicola*.
- Uncertainty on the potential areas of establishment of the pathogen in the EU. *Colletotrichum fructicola* has been reported from several climate zones worldwide, such as Cfa, Csa, Csb, Bsh and Bsk. These climate zones are also present in the EU territory, especially in the southern Member States. Nevertheless, so far, there are no reports of the pathogen being established at higher latitudes in the EU, where hosts are also present.
- Whether the agricultural practices and chemical control measures currently applied in the EU could reduce the impact of pest introduction.

Nevertheless, because the pathogen is established in different locations in the EU, none of the above-mentioned uncertainties affects the conclusions of this pest categorisation.

4. Conclusions

*Colletotrichum fructicola* has been reported from a few locations in Italy and France. However, there is a high uncertainty on its actual distribution in the EU territory and worldwide because of the ongoing re-evaluation of the taxonomy of the genus *Colletotrichum* and the lack of systematic surveys. Therefore, the Panel cannot conclude with certainty on whether *C. fructicola* satisfies the criterium of
being present but not widely distributed in the EU territory to be regarded as a potential Union quarantine pest unless systematic surveys are conducted and *Colletotrichum* isolates in culture collections are re-evaluated using multilocus gene sequencing analysis.

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

| Criterion of pest categorisation | Panel’s conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest | Key uncertainties |
|----------------------------------|---------------------------------------------------------------------------------------------------|--------------------|
| Identity of the pest (Section 3.1) | Yes, the identity of the pathogen is well established; the pathogen has been shown to produce consistent symptoms and to be transmissible. | None |
| Absence/presence of the pest in the EU (Section 3.2) | Yes, *C. fructicola* is reported to be present in the EU, namely in the following EU Member States: France, Germany and Italy. | Uncertainty exists with respect to the current distribution of *C. fructicola* in the EU, as in the past, when molecular tools were not available, the pathogen might have been identified as *C. gloeosporioides* based on morphology and pathogenicity tests, which cannot reliably identify the *Colletotrichum* species. |
| Regulatory status (Section 3.3) | *C. fructicola* is currently not regulated in the EU. | None |
| Pest potential for entry, establishment and spread in the EU (Section 3.4) | Yes, the pathogen is able to enter into, become established in, and spread within, the EU territory. The main pathways for the entry of the pathogen 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 pathogen may be also present as contaminants on other substrates (e.g. non-host plants, and other objects, etc.) imported into the EU, albeit this is considered a minor pathway for the entry of *C. fructicola* into the EU territory. Following establishment, *C. fructicola* could spread within the EU territory by natural and human-assisted means. Trading of host plants for planting is the main means of long-distance spread of the pathogen. | There is uncertainty about (i) the host range of the pathogen, particularly following the recent developments in the taxonomy of *Colletotrichum* species, (ii) seeds of host plants, and soil and other substrates associated or not with host plants for planting as potential pathways of entry into and spread within the EU territory of *C. fructicola*, (iii) the frequency of transfer of the pest from fruits to host plants grown in the EU territory and (IV) the ability of the pathogen to establish in EU areas belonging to other than Cfa, Csa, Csb, Bsh or Bsk climate zones where hosts are also present. |
| Potential consequences in the EU (Section 3.5) | Yes, the introduction of *C. fructicola* is likely to have yield and quality impacts as well as environmental consequences in some parts of the EU territory. | Uncertainty exists on whether the agricultural practices and chemical control measures currently applied in the EU could reduce the impact of pest introduction. |
| Available measures (Section 3.6) | Yes. Although not specifically targeted against *C. fructicola*, existing phytosanitary measures mitigate the likelihood of the pathogen’s entry into the EU territory. Potential additional measures also exist to further mitigate the risk of entry into, establishment within, or spread of the pathogen within the EU. | None |
| Conclusion (Section 4) | *C. fructicola* does not meet all criteria assessed by EFSA above for consideration as a Union quarantine pest since it is already present in the EU territory, albeit not widely distributed. *Colletotrichum fructicola* has recently been reported from a few locations in Italy and France. | High uncertainty exists about the actual distribution of *C. fructicola* in the EU territory. |
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### Table: Colletotrichum fructicola: Pest categorisation

| Criterion of pest categorisation | Panel’s conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest | Key uncertainties |
|----------------------------------|-------------------------------------------------|------------------|
| Nevertheless, the actual distribution of the pathogen in the EU and worldwide is likely to be wider than that currently reported because of the ongoing re-evaluation of *Colletotrichum* taxonomy and the lack of systematic surveys. Therefore, it cannot be concluded with certainty on whether *C. fructicola* satisfies the criterion of being present but not widely distributed in the EU territory to be regarded as a potential Union quarantine pest. | The main knowledge gap concerns the lack of species-specific molecular diagnostic tool to readily identify *C. fructicola* in the past. 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. fructicola* in the EU territory. |
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Abbreviations

EPPO European and Mediterranean Plant Protection Organization

FAO Food and Agriculture Organization

IPPC International Plant Protection Convention

ISPM International Standards for Phytosanitary Measures

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

Glossary

Containment (of a pest) Application of phytosanitary measures in and around an infested area to prevent spread of a pest (FAO, 2018).
| Term                                | Definition                                                                                                                                 |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| 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. |
| 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 (of a pest)                 | 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).                                                         |
### Appendix A – *Colletotrichum fructicola* host plants

Source: EPPO Global Database (EPPO online)

| Host status | Host name               | Plant family | Common name                        | Reference               |
|-------------|-------------------------|--------------|------------------------------------|-------------------------|
| **Cultivated hosts** |                         |              |                                    |                         |
|             | Aglaonema sp.           | Araceae      | Chinese evergreen                  | CDFA (2009)             |
|             | Aesculus chinensis      | Sapindaceae  | Chinese horse chestnut             | Sun et al. (2020)       |
|             | Amomum villosum         | Zingiberaceae| Chinese spice                      | Song et al. (2019)      |
|             | Anacardium humile       | Anacardiaceae| Monkey nut, dwarf cashew           | Veloso et al. (2018)    |
|             | Anacardium occidentale  | Anacardiaceae| Cashew                             | Veloso et al. (2018)    |
|             | Anacardium othonianum   | Anacardiaceae| 'Cerrado' cashew                    | Veloso et al. (2018)    |
|             | Annona spp.             | Annonaceae   | Cherimoya                          | Costa et al. (2017)     |
|             | Annona muricata         | Annonaceae   | Soursop, guanabana                 | Costa et al. (2019)     |
|             | Annona reticulata       | Annonaceae   | Custard apple                      | CDFA (2009)             |
|             | Annona squamosa         | Annonaceae   | Sugar apple                        | CDFA (2009)             |
|             | Anthurium andraeanum    | Araceae      | Anthurium, flamingo lily           | Adikaram and Yakandawala (2020) |
|             | Arachis hypogaea        | Fabaceae     | Peanut, groundnut                   | Rajeevandran et al. (2017) |
|             | Areca catechu           | Areaceae     | Areca palm, betel palm             | Cao et al. (2020)       |
|             | Artocarpus heterophyllus| Moraceae     | Jackfruit                          | CDFA (2009)             |
|             | Aucuba japonica         | Garryaceae   | Aucuba                             | Li et al. (2016a,b)     |
|             | Camellia oleifera       | Theaceae     | Tea oil camellia                   | Li et al. (2016a,b)     |
|             | Camellia sinensis       | Theaceae     | Tea                                 | Weir et al. (2012), Fuentes-Aragón et al. (2018), CDFA (2009) |
|             | Capsicum annuum         | Solanaceae   | Pepper                             | Shoji et al. (2014)     |
|             | Capsicum frutescens     | Solanaceae   | Chilli pepper                       | CDFA (2009)             |
|             | Carica papaya           | Caricaceae   | Papaya                             | Saini et al. (2016)     |
|             | Cattleya sp.            | Orchidaceae  | Orchid                             | Silva-Cabral et al. (2019) |
|             | Ceanothus thyrsiflorus  | Rhamnaceae   | Blue blossom ceanothus             | Guarnaccia et al. (2021) |
|             | Citrullus vulgaris      | Cucurbitaceae| Watermelon                         | CDFA (2009)             |
|             | Citrus bergamia         | Rutaceae     | Bergamot orange                    | Peng et al. (2012)      |
|             | Citrus reticulata       | Rutaceae     | Mandarin orange                    | Huang et al. (2013)     |
|             | Citrus sinensis         | Rutaceae     | Sweet orange                       | Arzanlou et al. (2015)  |
|             | Citrus x paradisi       | Rutaceae     | Grapefruit                         | CDFA (2009)             |
|             | Coffea arabica          | Rubiaceae    | Coffee                             | Prihastuti et al. (2009) |
|             | Corchorus capsularis    | Malvaceae    | White jute                         | Niu et al. (2016)       |
|             | Crinum asiaticum        | Amaryllidaceae| Poison bulb (giant crinum lily (spider lily) | Qing et al. (2020)    |
|             | Cucumis melo            | Cucurbitaceae| Melon                              | CABI (2019)             |
|             | Cyclamen persicum       | Primulaceae  | Cyclamen                           | Guarnaccia et al. (2021) |
|             | Cymbidium sp.           | Orchidaceae  | Orchid                             | CDFA (2009)             |
| Host status | Host name       | Plant family | Common name       | Reference                  |
|-------------|----------------|--------------|-------------------|----------------------------|
|             | Cymbopogon citratus | Poaceae      | Lemon grass       | Hyde et al. (2018)         |
|             | Dendrobium officinale | Orchidaceae  | Orchid            | Silva-Cabral et al. (2019), Ma et al. (2020a) |
|             | Dimocarpus longan  | Sapindaceae  | Longan            | Phoulivong et al. (2010)   |
|             | Dioscorea sp.      | Dioscoreaceae| Yam               | Weir et al. (2012), Fuentes-Aragon et al. (2018), CDFA (2009) |
|             | Diospyros kaki     | Ebenaceae    | Persimmon         | Carraro et al. (2019)      |
|             | Diospyros nigra    | Ebenaceae    | Black sapote      | CDFA (2009)                |
|             | Dracaena massangeana | Agavaceae    | Cornstalk Dracaena | CDFA (2009)                |
|             | Epidendrum sp.     | Orchidaceae  | Orchid            | CDFA (2009)                |
|             | Fatsia japonica    | Araliaceae   | Japanese aralia   | Shi et al. (2017)          |
|             | Ficus carica       | Moraceae     | Common fig        | CDFA (2009), Weir et al. (2012), Fuentes-Aragon et al. (2018) |
|             | Ficus edulis       | Moraceae     | Fig               | CDFA (2009), Weir et al. (2012), Fuentes-Aragon et al. (2018) |
|             | Ficus habrophylla  | Moraceae     | Giant leaf fig    | Farr and Rossman (2021)    |
|             | Ficus pumila       | Moraceae     | Creeping fig      | EPPO GD                    |
|             | Fortunella margarita | Rutaceae   | Kumquat           | Huang et al. (2013)        |
|             | Fragaria × ananassa | Rosaceae    | Strawberry        | CDFA (2009), Weir et al. (2012), Fuentes-Aragon et al. (2018) |
|             | Gleditsia caspica  | Fabaceae     | Caspian locust    | EPPO GD                    |
|             | Hevea brasiliensis | Euphorbiaceae| Rubber tree       | Liu et al. (2018)          |
|             | Hydrangea paniculata | Hydrangeaceae| Panicle hydrangea | Guarnaccia et al. (2021)   |
|             | Hylocerus undatus  | Cactaceae    | Dragon fruit, red pitaya | CABI (2019)            |
|             | Juglans regia     | Juglandaceae | Common walnut     | Wang et al. (2018)         |
|             | Licania tomentosa  | Chrysobalanaceae | Oitizeiro | Lisboa et al. (2018)      |
|             | Limonium sinuatum  | Plumbaginaceae| Wavyleaf sea lavender | CDFA (2009), Weir et al. (2012), Fuentes-Aragon et al. (2018) |
|             | Liquidambar styraciflua | Altingiaceae| Sweet gum         | Guarnaccia et al. (2021)   |
|             | Lobularia maritima | Brassicaceae | Alyssum           | CDFA (2009)                |
|             | Lupinus angustifolius | Fabaceae   | Blue lupine       | CDFA (2009)                |
|             | Lycium chinense   | Solanaceae  | Goji berry        | Paul et al. (2014)         |
|             | Lycopersicon esculentum | Solanaceae | Tomato            | CDFA (2009)                |
|             | Malus domestica   | Rosaceae    | Apple             | Huang et al. (2013)        |
|             | Malus pumila      | Rosaceae    | Paradise apple    | Park et al. (2018), Nodet et al. (2019) |
|             | Malus sylvestris  | Rosaceae    | Crab apple        | CDFA (2009)                |
|             | Mangifera indica  | Anacardiaceae| Mango             | CABI (2019)                |
|             | Manihot esculenta | Euphorbiaceae| Cassava manioc    | Bragança et al. (2016)     |
|             | Medicago polymorpha | Fabaceae    | Burclover         | CDFA (2009)                |
|             | Morus alba        | Moraceae    | White mulberry    | Xue et al. (2019)          |
| Host status | Host name | Plant family | Common name | Reference |
|-------------|-----------|--------------|-------------|-----------|
|             | *Musa acuminata* | Musaceae | Edible banana | CDFA (2009) |
|             | *Nephelium lappaceum* | Sapindaceae | Ranbutan | Serrato-Diaz et al. (2017) |
|             | *Nerium oleander* | Apocynaceae | Oleander | CDFA (2009) |
|             | *Nicotiana tabacum* | Solanaceae | Tobacco | Wang et al. (2016) |
|             | *Nopalea cochenillifera* | Cactaceae | Cochineal Nopal cactus | Conforto et al. (2017) |
|             | *Paris polyphylla* | Melanthiaceae | Herb Paris | Zhou et al. (2020) |
|             | *Passiflora edulis* | Passifloraceae | Passion fruit | CDFA (2009) |
|             | *Persea americana* | Lauraceae | Avocado | CDFA (2009), Weir et al. (2012), Fuentes-Aragón et al. (2018) |
|             | *Peucedanum praeruptorum* | Apiaceae | Qian Hu | Ma et al. (2020b) |
|             | *Phalaenopsis sp.* | Orchidaceae | Moth orchid | CDFA (2009) |
|             | *Phaseolus lunatus* | Fabaceae | Lima bean | Sousa et al. (2018) |
|             | *Prunus persica* | Rosaceae | Peach | Lee et al. (2020) |
|             | *Psydiun guajava* | Myrtaceae | Guava | CDFA (2009) |
|             | *Pyrus × bretschneideri* | Rosaceae | Chinese white pear | Jiang et al. (2014) |
|             | *Pyrus pyrifolia* | Rosaceae | Chinese pear, nashi | Zhang et al. (2015) |
|             | *Genipa americana* | Rubiaceae | Genip tree | Rojas et al. (2010) |
|             | *Saccolabium sp.* | Orchidaceae | Orchid | CDFA (2009) |
|             | *Salvia greggii* | Lamiaceae | Autumn sage | Guarnaccia et al. (2019) |
|             | *Syzygium cuminii* | Myrtaceae | Malabar plum, Java plum | Hanin and Fitriasari (2019) |
|             | *Theobroma cacao* | Malvaceae | Cacao | EPPO GD |
|             | *Vanda sp.* | Orchidaceae | Orchid | CDFA (2009) |
|             | *Vitis labrusca* | Vitaceae | Fox grape | Santos et al. (2018) |
|             | *Vitis vinifera* | Vitaceae | Grapevine | Peng et al. (2013), Echeverrigray et al. (2020) |

| Wild weed hosts |
|-----------------|
| **Amaranthus blitum** | Amaranthaceae | Guernsey pigweed | Hirayama et al. (2018) |
| **Capsella bursa-pastoris** | Brassicaceae | Shepherd’s pursue | Hirayama et al. (2018) |
| **Cerastium glomeratum** | Caryophyllaceae | Clammy chickweed | Hirayama et al. (2018) |
| **Cistus parvifolius** | Solanaceae | Green cistus | CDFA (2009) |
| **Cyperus microirius** | Cyperaceae | Asian flat sedge | Hirayama et al. (2018) |
| **Digitaria ciliaris** | Poaceae | Southern crabgrass | Hirayama et al. (2018) |
| **Echinochloa crusgalli** | Poaceae | Water hyacinth | Huang et al. (2021) |
| **Erigeron annuus** | Asteraceae | Annual fleabane | Hirayama et al. (2018) |
| **Galinsoga ciliata** | Asteraceae | Hairy galinsoga, quackweed | Hirayama et al. (2018) |
| **Matthiola incana** | Brassicaceae | Common stock | CDFA (2009) |
| **Phormium tenax** | Asphodelaceae | New Zealand flax | CDFA (2009) |
| **Platostoma palustre** | Lamiaceae | Chinese mesona | Hsieh et al. (2020) |
| **Potulaca oleracea** | Portulacaceae | Common purslane | CDFA (2009) |
| **Rubus glaucus** | Rosaceae | Andean raspberry | Jayawardena et al. (2016) |
| **Sambucus ebulus** | Adoxaceae | Dwarf elder | EPPO GD |
| **Solidago altissima** | Asteraceae | Canada goldenrod | Hirayama et al. (2018) |
| **Sonchus oleraceus** | Asteraceae | Common sowthistle | Hirayama et al. (2018) |
Appendix B – Distribution of Colletotrichum fructicola
Distribution records based on EPPO Global Database (EPPO, online) and other literature.

| Region         | Country     | Sub-national (e.g. State)                                                                 | Status                          |
|----------------|-------------|------------------------------------------------------------------------------------------|---------------------------------|
| North America  | Canada      | Ontario                                                                                  | Present, no details             |
|                | Mexico      | Oaxaca, Molango de Escamilla                                                             | Present, no details             |
|                | USA         | Florida, North Carolina, Georgia                                                          | Present, no details             |
| Central America| Panama      | Barro Colorado Monument                                                                  | Present, no details             |
| Caribbean      | Puerto Rico | N/A                                                                                      | Present, no details             |
| South America  | Uruguay     | San José                                                                                  | Present, no details             |
|                | Brazil      | Rio Grande do Sul, Santa Catarina, Alagoas state (Maragogi, Estrela de Alagoas), State of Pernambuco, Bahia, São Paulo, Paraná | Present, no details             |
| EU (27)        | Italy       | Catania, Sicily Biella, Piedmont                                                          | Present, no details             |
|                | France      | Occitanie                                                                                 | Present, no details             |
|                | Germany     | Berlin-Dahlem Botanical Garden                                                            | Present, no details             |
| Other Europe   |             | No records, presumed absent                                                               |                                 |
| Africa         | Nigeria     | Ibadan, Ilesha                                                                            | Present, no details             |
| South Africa   |             | Present, no details                                                                       |                                 |
| Asia           | China       | Fujian, Zhejiang, Jiangxi, Hunan, Anhui, Hubei, Jiangsu, Chongqing, Guangxi, Henan, Liaoning, Shanxi, Tianjin, Yunnan | Present, no details             |
|                | Iran        | Mazandaran, Behshahr, Guilan, Talesh, Jomakooh, Kishonben, Astara                         | Present, no details             |
|                | Japan       | Kyushu island, Chiba prefecture                                                           | Present, no details             |
|                | South Korea | Andong, Sangju, Gimcheon, Yechon                                                           | Present, no details             |
| Region | Country | Sub-national (e.g. State) | Status |
|--------|---------|--------------------------|--------|
|        | India   | Yeongcheon, Cheongdo     |        |
|        | India   | Southern India           | Present, no details |
|        | Taiwan  |                          | Present, no details |
|        | Thailand| Chiang Mai                | Present, no details |
|        | Indonesia| Java, Bandung, Pangheotan| Present, no details |
|        | Oceania | Australia, Queensland, New South Wales, Tamworth | Present, no details |
|        | New Zealand| Mid-North New Zealand, Tauranga, Auckland, Sandringham, Northland | Present, no details |
Appendix C – EU 27 annual imports of fresh produce of hosts from countries where *Colletotrichum fructicola* is present, 2016–2020 (in 100 kg)

Source: Eurostat accessed on 11/6/2021

| Citrus fruit, fresh or dried | 2016   | 2017       | 2018       | 2019       | 2020       |
|-----------------------------|--------|------------|------------|------------|------------|
| Australia                   | 3,279.84| 1,284.38   | 644.97     | 10645.40   | 2,733.47   |
| Brazil                      | 864,863.09| 903,432.95| 900,907.24 | 822134.46 | 902,354.08 |
| Canada                      | 0.00    | 2.35       |            |            |            |
| China                       | 827,840.57| 1,084,857.27| 1,024,163.15| 1108595.22| 1,098,689.87|
| Indonesia                   | 566.73  | 555.70     | 779.35     | 836.73     | 864.54     |
| Israel                      | 799,118.49| 969,403.62| 824,601.66 | 812738.57 | 878,865.26 |
| India                       | 246.80  | 1.00       | 449.63     | 88.51      | 254.95     |
| Iran                        | 1,533.22| 1218.52    | 1,208.01   | 2174.22    | 1,882.74   |
| Japan                       | 352.58  | 417.44     | 270.73     | 319.24     | 162.50     |
| Mexico                      | 570,402.80| 553,818.66| 58,9021.12 | 443743.54 | 349,626.22 |
| New Zealand                 | 0.04    | 13.49      | 204.97     | 355.44     | 0.08       |
| Nigeria                     | 0.00    | 0.03       | 0.10       | 200.00     |            |
| Panama                      | 0.00    |            |            | 650.40     |            |
| South Africa                | 5,278,830.95| 5,802,017.61| 6,381,124.73| 6196837.96| 7,831,349.65|
| South Korea                 | 12.70   | 0.01       | 21.09      | 15.00      |            |
| Taiwan                      | 157.49  | 0.00       |            | 0.01       |            |
| Thailand                    | 426.42  | 1,283.13   | 659.74     | 624.93     | 194.87     |
| Uruguay                     | 379,726.08| 369,933.66| 374,356.50 | 402778.68 | 334,616.70 |
| United States               | 301,229.06| 231,210.47| 185,706.99 | 177755.45 | 148,845.72 |
| Sum                         | 9,028,586.86| 9,919,450.26| 10,284,098.82| 9,979,649.54| 11,551,306.06|

| Fresh or dried avocados     | 2016    | 2017       | 2018       | 2019       | 2020       |
|-----------------------------|--------|------------|------------|------------|------------|
| Australia                   | 0.00   | 0.06       |            |            |            |
| Brazil                      | 44,357.36| 71,040.50  | 68,697.61  | 78,673.73  | 48,183.82  |
| Canada                      | 0.00   |            |            |            |            |
| China                       | 193.97 | 35.28      | 1.23       | 0.04       |            |
| Indonesia                   | 0.00   |            |            |            |            |
| Israel                      | 301,123.91| 424,267.97| 370,378.23 | 437,318.01| 345,663.40 |
| India                       | 0.04   | 2.06       | 0.52       | 0.06       |            |
| Iran                        | 0.00   |            |            |            |            |
| Japan                       | 0.00   |            |            |            |            |
| Mexico                      | 503,687.52| 445,611.06| 463,741.28 | 767,878.48| 716,200.13 |
| New Zealand                 | 0.85   | 0.61       |            | 0.03       |            |
| Nigeria                     | 1.06   | 3.15       | 3.18       | 0.51       |            |
| Panama                      | 0.00   |            |            | 474.24     |            |
| South Africa                | 419,768.89| 315,854.56| 652,817.98 | 401,352.79| 416,290.11 |
| South Korea                 | 0.00   |            |            |            |            |
| Taiwan                      | 0.00   |            |            |            |            |
| Thailand                    | 3.68   | 9.76       | 9.66       | 9.06       | 3.39       |
| Uruguay                     | 0.00   |            |            |            |            |
| United States               | 8,819.53| 1.19       | 2,546.86   | 0.02       | 4.66       |
| Sum                         | 1,277,956.81| 1,256,826.14| 1,558,195.32| 1,685,708.19| 1,526,345.58|
### Fresh apples

| Country   | 2016    | 2017    | 2018    | 2019    | 2020    |
|-----------|---------|---------|---------|---------|---------|
| Australia | 1,048.66| 4,926.09| 9,159.46| 8,311.03| 3,638.72|
| Brazil    | 154,768.58| 249,520.21| 242,632.64| 139,015.43| 92,900.91|
| Canada    | 23.38   | 0.16    |         |         |         |
| China     | 13,188.53| 1,644.89| 15,539.34| 780.15  | 4,778.37|
| Indonesia | 0.00    |         |         |         |         |
| Israel    | 2,225.55| 1,037.58| 936.63  | 1,813.20| 755.03  |
| India     | 0.01    | 0.00    |         | 0.45    |         |
| Iran      | 0.00    | 2,945.28| 0.38    | 676.65  |         |
| Japan     | 7.61    | 0.53    | 0.95    | 19.25   |         |
| Mexico    | 0.00    |         |         |         |         |
| New Zealand | 751,627.60| 754,736.56| 966,920.91| 728,052.41| 759,371.49|
| Nigeria   | 0.76    |         |         |         |         |
| Panama    | 0.00    |         |         | 436.80  |         |
| South Africa | 298,162.64| 252,068.96| 334,615.90| 258,077.03| 329,087.60|
| South Korea| 0.00    |         |         | 4.17    |         |
| Taiwan    | 0.00    |         |         | 2.97    |         |
| Thailand  | 3.79    |         |         |         |         |
| Uruguay   | 20,879.17| 55,103.38| 30,072.47| 14,164.50| 2,310.32|
| United States | 0.05    | 545.82  | 2,874.22|         |         |
| **Sum**   | 1,241,931.78| 1,319,588.73| 1,605,697.80| 1,150,221.27| 1,193,975.59|

### Fresh pears

| Country   | 2016    | 2017    | 2018    | 2019    | 2020    |
|-----------|---------|---------|---------|---------|---------|
| Australia | 0.00    |         | 1,224.72|         |         |
| Brazil    | 208.68  | 0.00    | 251.27  | 926.88  |         |
| Canada    | 0.00    |         |         |         |         |
| China     | 102,076.61| 98,191.53| 116,993.12| 82,741.84| 99,293.92|
| Indonesia | 0.00    |         |         |         |         |
| Israel    | 664.59  |         | 569.20  | 219.49  |         |
| India     | 0.00    |         |         |         |         |
| Iran      | 0.00    |         | 32.40   | 7.50    |         |
| Japan     | 2.50    | 0.02    | 0.45    |         |         |
| Mexico    | 0.00    |         |         |         |         |
| New Zealand | 2,460.49| 1,847.30| 2,519.51| 754.67  | 1,377.03|
| Nigeria   | 0.00    |         | 1.00    | 0.36    |         |
| Panama    | 41.60   | 0.00    |         |         |         |
| South Africa | 865,862.63| 759,193.32| 655,428.91| 590,939.08| 583,340.54|
| South Korea| 789.33  | 1,036.40| 666.02  | 819.04  | 628.26  |
| Taiwan    | 0.00    |         |         |         |         |
| Thailand  | 0.00    |         |         |         |         |
| Uruguay   | 2,392.20| 16,789.90| 3,873.25| 9,494.10| 2,250.90|
| United States | 214.47  | 454.76  | 471.49  | 12.54   |         |
| **Sum**   | 974,048.51| 878,177.82| 781,462.14| 686,257.35| 687,118.00|

### Fresh strawberries

| Country   | 2016    | 2017    | 2018    | 2019    | 2020    |
|-----------|---------|---------|---------|---------|---------|
| Australia | 0.00    |         |         |         |         |
| Brazil    | 0.00    |         |         |         |         |
| Canada    | 0.00    |         |         |         |         |
| China     | 1,500.00| 1,250.00|         |         |         |
| Country        | 2016  | 2017  | 2018  | 2019  | 2020  |
|---------------|-------|-------|-------|-------|-------|
| Indonesia     | 0.00  |       |       |       |       |
| Israel        | 4.28  | 5.10  |       |       |       |
| India         | 0.00  |       |       |       |       |
| Iran          | 0.00  |       |       |       |       |
| Japan         | 0.97  | 1.38  | 0.36  | 0.33  | 0.09  |
| Mexico        | 49.87 | 34.38 | 41.34 | 80.00 | 6.66  |
| New Zealand   | 0.00  |       |       |       |       |
| Nigeria       | 0.00  |       |       |       |       |
| Panama        | 0.00  |       |       |       |       |
| South Africa  | 20.46 | 64.44 | 176.31| 25.35 | 124.80|
| South Korea   | 0.12  | 0.00  |       |       |       |
| Taiwan        | 0.00  |       |       |       |       |
| Thailand      | 0.00  |       |       |       |       |
| Uruguay       | 0.00  |       |       |       |       |
| United States | 2,881.84 | 1,572.86 | 354.26 | 10.12 | 3.11  |
| Sum           | 4,457.54 | 2,928.16 | 572.27 | 115.80 | 134.66|
| **Fresh persimmons** |       |       |       |       |       |
| Australia     |       |       |       |       |       |
| Brazil        | 33.63 | 315.72| 337.60| 974.78| 428.63|
| Canada        |       |       |       |       |       |
| China         | 17.57 | 5.09  |       |       | 17.40 |
| Indonesia     |       |       |       |       |       |
| Israel        | 2,404.45 | 3,231.29 | 1,158.64 | 181.58 | 3,211.13|
| India         |       |       |       |       |       |
| Iran          |       |       |       |       |       |
| Japan         | 0.27  | 0.76  | 0.27  | 0.02  |       |
| Mexico        |       |       |       |       |       |
| New Zealand   |       |       |       |       |       |
| Nigeria       |       |       |       |       |       |
| Panama        |       |       |       |       |       |
| South Africa  | 823.16| 817.79| 206.08| 7,857.42| 4,974.49|
| South Korea   |       | 0.05  | 0.80  |       |       |
| Taiwan        |       | 0.07  |       |       |       |
| Thailand      |       |       |       |       |       |
| Uruguay       | 913.19| 872.76| 1,392.90| 448.50|       |
| United States |       |       |       |       |       |
| Sum           | 3,278.81| 5,278.26| 2,581.05| 10,407.75| 9,080.17|
| **Fresh grapes** |       |       |       |       |       |
| Australia     | 2.95  | 0.50  |       |       |       |
| Brazil        | 194,152.79 | 249,279.81 | 271,987.56 | 196,465.22 | 228,092.92|
| Canada        |       | 164.64| 164.64|       |       |
| China         | 0.00  | 6.00  | 0.03  |       |       |
| Indonesia     |       | 0.00  |       |       |       |
| Israel        | 13,169.16| 7,165.09| 6,397.33| 318.24| 1,080.90|
| India         | 640,933.67| 827,467.67| 722,802.04| 950,910.96| 733,881.71|
| Iran          |       | 0.00  | 2,158.50| 366.00| 399.80 |
| Japan         | 4.84  | 1.19  | 1.17  | 1.15  | 20.67 |
| Mexico        | 358.96| 186.71| 184.62|       |       |
| New Zealand   |       | 0.00  |       |       |       |
| Nigeria       |       | 0.00  |       |       |       |
| Panama        | 0.00  | 0.00  |       |       |       |
|                      | 2016        | 2017        | 2018        | 2019        | 2020        |
|----------------------|-------------|-------------|-------------|-------------|-------------|
| South Africa         | 1,246,017.02| 1,392,515.89| 1,420,569.43| 1,397,681.57| 1,397,982.74|
| South Korea          | 2.88        | 4.32        | 0.09        |              |              |
| Taiwan               | 0.00        |             |             | 0.87        |              |
| Thailand             | 0.37        | 0.14        | 0.16        |              |              |
| Uruguay              | 0.00        |             |             |              |              |
| United States        | 1,714.93    | 8,868.74    | 4,413.37    | 1,866.20    | 1,072.48    |
| Sum                  | 2,095,995.73| 2,485,831.51| 2,428,333.91| 2,547,960.78| 2,362,716.71|

|                      | Edible fruit or nut trees, shrubs and bushes | 2016 | 2017 | 2018 | 2019 | 2020 |
|----------------------|----------------------------------------------|------|------|------|------|------|
| Australia            | 165.50                                      | 6.50 | 0.44 | 2.99 |
| Brazil               | 0.00                                        |     |     |     | 0.78 |
| Canada               | 470.24                                      | 8.41 | 0.01 |     |
| China                | 152.70                                      | 552.35| 404.63| 642.61| 305.32|
| Indonesia            | 0.00                                        |     | 0.01 | 1.34 |
| Israel               | 634.17                                      | 1,755.41| 1,350.76| 1,758.56| 55.42 |
| India                | 4.00                                        |     | 0.22 |     |
| Iran                 | 0.00                                        |     | 8.17 |     |
| Japan                | 66.57                                       | 133.75| 0.95 | 41.26| 0.55 |
| Mexico               | 2.44                                        | 0.42 | 5.52 | 0.63 |
| New Zealand          | 114.37                                      | 12.75| 17.57| 25.21|
| Nigeria              | 0.19                                        |     |     |     |
| Panama               | 0.00                                        |     |     |     |
| South Africa         | 0.35                                        | 0.13| 112.01| 30.48| 456.51|
| South Korea          | 0.00                                        |     | 163.76|     |     |
| Taiwan               | 0.10                                        |     |     | 0.36 |
| Thailand             | 148.80                                      |     | 0.22 |     |
| Uruguay              | 0.00                                        |     |     |     |
| United States        | 20,957.83                                   | 18,612.69| 7,497.05| 6,904.85| 13,445.54|
| Sum                  | 22,091.49                                   | 21,699.35| 9,392.24| 9,580.88| 14,269.44|

|                      | Vegetable and strawberry plants | 2016 | 2017 | 2018 | 2019 | 2020 |
|----------------------|---------------------------------|------|------|------|------|------|
| Australia            | 4.05                            |     |     |     |     |
| Brazil               | 0.16                            | 1.01| 393.78| 0.85 |
| Canada               | 0.10                            |     |     | 0.19 |
| China                | 0.02                            | 180.00| 0.92 | 2.28 |
| Indonesia            | 213.07                          | 9.27 | 34.04| 17.44| 17.61|
| Israel               | 0.03                            | 2.40 | 0.03 | 2.05 | 2.08 |
| Iran                 |                                 |     |     | 7.15 |
| Japan                | 1.03                            |     |     | 0.28 |
| Mexico               | 0.20                            |     |     | 1.23 |
| New Zealand          | 0.16                            | 0.01| 1.35 | 0.31 |
| Nigeria              |                                 |     |     |     |
| Panama               |                                 |     |     |     |
| South Africa         | 5.89                            | 58.73| 2.00 | 17.88| 5.94 |
| South Korea          |                                 |     |     | 0.30 |
| Taiwan               |                                 |     |     |     |
| Thailand             |                                 |     |     |     |
| Uruguay              |                                 |     |     |     |
| United States        | 4,848.40                        | 4,711.58| 4,447.01| 3,506.85| 1,794.38|
| Sum                  | 5,067.93                        | 4,783.10| 5,060.99| 3,548.01| 1,832.11|

Colletotrichum fructicola: Pest categorisation
### Appendix D – EU 27 and member state cultivation/harvested/production area of Colletotrichum fructicola hosts (in 1,000 ha)

Source EUROSTAT (accessed 14/6/2021)

|   | Apples | 2016  | 2017  | 2018  | 2019  | 2020  |
|---|---|---|---|---|---|---|
| EU 27 | 506.48 | 505.55 | 507.24 | 491.35 | 473.66 |
| Belgium | 6.49 | 6.16 | 5.99 | 5.79 | 5.48 |
| Bulgaria | 4.11 | 3.97 | 3.98 | 4.14 | 3.56 |
| Czechia | 7.49 | 7.35 | 7.25 | 7.32 | 7.19 |
| Denmark | 1.35 | 1.28 | 1.42 | 1.39 | 1.38 |
| Germany | 31.74 | 33.98 | 33.98 | 33.98 | 33.98 |
| Estonia | 0.51 | 0.48 | 0.60 | 0.57 | 0.62 |
| Ireland | 0.70 | 0.70 | 0.71 | 0.71 | 0.71 |
| Greece | 10.04 | 9.60 | 10.35 | 9.82 | 9.82 |
| Spain | 30.87 | 30.55 | 29.93 | 29.64 | 29.49 |
| France | 49.65 | 50.31 | 50.54 | 50.37 | 50.15 |
| Croatia | 5.89 | 4.84 | 4.73 | 4.95 | 4.37 |
| Italy | 56.16 | 57.26 | 57.44 | 55.00 | 36.14 |
| Cyprus | 0.53 | 0.37 | 0.37 | 0.37 | 0.38 |
| Latvia | 2.40 | 3.30 | 3.20 | 3.44 | 3.50 |
| Lithuania | 9.70 | 9.82 | 10.13 | 10.18 | 10.74 |
| Luxembourg | 0.26 | 0.27 | 0.27 | 0.27 | 0.27 |
| Hungary | 32.49 | 32.17 | 31.84 | 30.97 | 25.90 |
| Malta | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Netherlands | 7.30 | 7.00 | 6.60 | 6.42 | 6.20 |
| Austria | 6.67 | 6.67 | 6.74 | 6.59 | 6.43 |
| Poland | 164.76 | 162.53 | 166.15 | 155.62 | 163.25 |
| Portugal | 14.98 | 14.79 | 14.58 | 14.58 | 14.58 |
| Romania | 55.53 | 55.60 | 53.94 | 52.74 | 53.40 |
| Slovenia | 2.42 | 2.36 | 2.33 | 2.27 | 2.18 |
| Slovakia | 2.31 | 2.18 | 2.14 | 2.06 | 1.80 |
| Finland | 0.62 | 0.63 | 0.63 | 0.65 | 0.67 |
| Sweden | 1.54 | 1.40 | 1.41 | 1.52 | 1.49 |

|   | Pears | 2016  | 2017  | 2018  | 2019  | 2020  |
|---|---|---|---|---|---|---|
| EU 27 | 115.76 | 114.84 | 114.84 | 111.84 | 108.93 |
| Belgium | 9.69 | 10.02 | 10.15 | 10.37 | 10.66 |
| Bulgaria | 0.41 | 0.45 | 0.57 | 0.7 | 0.6 |
| Czechia | 0.74 | 0.71 | 0.75 | 0.8 | 0.83 |
| Denmark | 0.3 | 0.3 | 0.29 | 0.3 | 0.3 |
| Germany | 1.93 | 2.14 | 2.14 | 2.14 | 2.14 |
| Estonia | 0 | 0 | 0 | 0 | 0 |
| Ireland | 0 | 0 | 0 | 0 | 0 |
| Greece | 4.08 | 4.07 | 4.41 | 4.34 | 4.34 |
| Spain | 22.55 | 21.89 | 21.33 | 20.62 | 20.22 |
| France | 5.3 | 5.25 | 5.24 | 5.25 | 5.61 |
| Croatia | 0.93 | 0.71 | 0.8 | 0.86 | 0.72 |
| Italy | 32.29 | 31.73 | 31.34 | 28.71 | 25.75 |
| Cyprus | 0.07 | 0.07 | 0.06 | 0.06 | 0.06 |
| Latvia | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
### Pears

|        | 2016 | 2017 | 2018 | 2019 | 2020 |
|--------|------|------|------|------|------|
| Lithuania | 0.8  | 0.82 | 0.82 | 0.82 | 0.85 |
| Luxembourg | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| Hungary | 2.87 | 2.9  | 2.84 | 2.81 | 2.6  |
| Malta | 0    | 0    | 0    | 0    | 0    |
| Netherlands | 9.4  | 9.7  | 10   | 10.09 | 10   |
| Austria | 0.46 | 0.46 | 0.49 | 0.5  | 0.54 |
| Poland | 7.49 | 7.26 | 7.3  | 7.22 | 7.39 |
| Portugal | 12.62 | 12.56 | 12.5 | 12.5 | 12.5 |
| Romania | 3.15 | 3.12 | 3.1  | 3.08 | 3.1  |
| Slovenia | 0.2  | 0.21 | 0.21 | 0.21 | 0.23 |
| Slovakia | 0.11 | 0.12 | 0.12 | 0.11 | 0.1  |
| Finland | 0.04 | 0.04 | 0.05 | 0.04 | 0.05 |
| Sweden | 0.12 | 0.12 | 0.11 | 0.1  | 0.13 |

### Stone fruits

|        | 2016 | 2017 | 2018 | 2019 | 2020 |
|--------|------|------|------|------|------|
| EU 27 | :   | 625.46 | 621.32 | 612.33 | :   |
| Belgium | 1.35 | 1.43 | 1.17 | 1.18 | 1.16 |
| Bulgaria | 22.68 | 23.67 | 24.66 | 26.30 | 23.96 |
| Czechia | 5.61 | 5.34 | 5.42 | 5.53 | 5.55 |
| Denmark | 0.85 | 0.72 | 0.62 | 0.61 | 0.70 |
| Germany | 11.49 | 13.13 | 13.10 | 13.11 | 13.07 |
| Estonia | 0.00 | 0.00 | 0.00 | 0.00 | :   |
| Ireland | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Greece | 67.54 | 67.45 | 69.92 | 68.90 | 68.97 |
| Spain | 148.12 | 148.32 | 143.52 | 140.84 | 134.61 |
| France | 46.69 | 46.74 | 46.66 | 44.18 | 44.14 |
| Croatia | 9.54 | 9.13 | 8.36 | 8.46 | 8.19 |
| Italy | 129.90 | 125.34 | 122.99 | 119.50 | 117.84 |
| Cyprus | 1.29 | 1.13 | 1.09 | 1.13 | 1.12 |
| Latvia | 0.20 | 0.60 | 0.80 | 0.18 | 0.20 |
| Lithuania | 1.47 | 1.47 | 1.49 | 1.52 | 1.54 |
| Luxembourg | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| Hungary | 34.09 | 34.38 | 34.24 | 34.13 | 33.38 |
| Malta | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Netherlands | 1.10 | 1.10 | 1.10 | 1.06 | 1.10 |
| Austria | 1.38 | 1.38 | 1.51 | 1.50 | 1.52 |
| Poland | 53.42 | 52.84 | 53.48 | 54.13 | 53.07 |
| Portugal | 12.75 | 12.76 | 12.46 | 12.46 | 12.46 |
| Romania | 75.24 | 76.58 | 76.64 | 75.49 | 77.09 |
| Slovenia | 0.59 | 0.59 | 0.59 | 0.60 | 0.60 |
| Slovakia | :   | 1.26 | 1.40 | 1.43 | 1.26 |
| Finland | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Sweden | 0.07 | 0.07 | 0.06 | 0.06 | 0.05 |

* '-' data not available.

### Citrus fruits

|        | 2016 | 2017 | 2018 | 2019 | 2020 |
|--------|------|------|------|------|------|
| EU 27 | 519.01 | 502.84 | 508.99 | 512.53 | 487.08 |
| Belgium | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
## Citrus fruits

| Country     | 2016 | 2017 | 2018 | 2019 | 2020 |
|-------------|------|------|------|------|------|
| 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      | 45.86| 43.47| 46.26| 44.23| 44.48|
| Spain       | 295.33| 294.26| 297.62| 296.48| 297.97|
| France      | 4.22 | 4.27 | 4.39 | 4.61 | 4.69 |
| Croatia     | 2.19 | 2.06 | 1.97 | 2.20 | 2.04 |
| Italy       | 147.65| 135.36| 134.64| 140.74| 113.80|
| Cyprus      | 3.41 | 2.92 | 3.05 | 3.20 | 3.04 |
| 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    | 20.36| 20.51| 21.07| 21.07| 21.07|
| 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 |

## Grapes

| Country     | 2016   | 2017   | 2018   | 2019   | 2020   |
|-------------|--------|--------|--------|--------|--------|
| EU 27       | 3,136.04| 3,134.93| 3,137.17| 3,160.68| 3,162.48|
| Belgium     | 0.24   | 0.24   | 0.30   | 0.38   | 0.49   |
| Bulgaria    | 36.55  | 34.11  | 34.11  | 30.05  | 28.81  |
| 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 | 101.85 |
| Spain       | 935.11 | 937.76 | 939.92 | 936.89 | 931.96 |
| France      | 751.69 | 750.46 | 750.62 | 755.47 | 758.86 |
| Croatia     | 23.40  | 21.90  | 20.51  | 19.82  | 20.63  |
| 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  | 62.90  |
| Malta       | 0.68   | 0.68   | 0.42   | 0.42   | 0.42   |
| Netherlands | 0.14   | 0.16   | 0.17   | 0.16   | 0.17   |
| Austria     | 46.49  | 48.05  | 48.65  | 48.72  | 48.06  |
### Grapes

| Country      | 2016 | 2017 | 2018 | 2019 | 2020 |
|--------------|------|------|------|------|------|
| Poland       | 0.62 | 0.67 | 0.73 | 0.74 | 0.76 |
| Portugal     | 179.05 | 178.84 | 178.78 | 178.78 | 178.78 |
| Romania      | 174.17 | 175.32 | 172.80 | 176.34 | 176.76 |
| 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 | 0.06 |

*': data not available.

### Avocados

| EU 27 | 2016 | 2017 | 2018 | 2019 | 2020 |
|-------|------|------|------|------|------|
| 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        | 0.48 | 0.60 | 0.72 | 1.08 | 1.08 |
| 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 | 0.00 | 0.00 |
| 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 |