SCIENTIFIC OPINION

efsa JOURNAL

ADOPTED: 26 January 2023

doi: 10.2903/j.efsa.2023.7848

Pest categorisation of *Coniella granati*

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Abstract

The EFSA Plant Health Panel performed a pest categorisation of *Coniella granati*, a clearly defined fungus of the Order Diaporthales and the family Schizoparmaceae, described for the first time in 1876 as *Phoma granatii* and later named as *Pilidiella granati*. The pathogen mainly affects *Punica granatum* (pomegranate) and *Rosa* spp. (rose), causing fruit rot, shoot blight and cankers on crown and branches. The pathogen is present in North America, South America, as well as in Asia, Africa, Oceania and Eastern Europe and has also been reported in the EU (Greece, Hungary, Italy and Spain), where it is widespread in the major pomegranate growing areas. *Coniella granati* is not included in Commission Implementing Regulation (EU) 2019/2072 and there are no interceptions in the EU. This pest categorisation focused on those hosts for which the pathogen was detected and formally identified in natural conditions. Plants for planting, fresh fruits and as well as soil and other plant growing media are the main pathways for the further entry of the pathogen into the EU. Host availability and climate suitability factors occurring in parts of the EU are favourable for the further establishment of the pathogen. In the area of its present distribution, including Italy and Spain, the pathogen has a direct impact in pomegranate orchards as well as during post-harvest storage. Phytosanitary measures are available to prevent the further introduction and spread of the pathogen into the EU. *Coniella granati* does not satisfy the criteria that are within the remit of EFSA to assess for this species to be regarded as potential Union quarantine pest as it is present in several EU MSs.

Keywords: Diaporthales, pest risk, plant health, plant pest, pomegranate, quarantine

Requestor: European Commission

Question number: EFSA-Q-2022-00392

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

Acknowledgments: EFSA wishes to acknowledge the contribution of Oresteia Sfyra to this opinion.

Suggested citation: EFSA PLH Panel (EFSA Panel on Plant Health), Bragard C, Baptista P, Chatzivassiliou E, Di Serio F, Gonthier P, Jaques Miret JA, Justesen AF, MacLeod A, Magnusson CS, Milonas P, Navas-Cortes JA, Parnell S, Potting R, Reignault PL, Stefani E, Thulke H-H, Van der Werf W, Civera AV, Yuen J, Zappalà L, Migheli Q, Vloutoglou I, Maiorano A, Streissl F and Reignault PL, 2023. Scientific Opinion on the pest categorisation of *Coniella granati*. EFSA Journal 2023;21(2):7848, 33 pp. https://doi.org/10.2903/j.efsa.2022.7848

ISSN: 1831-4732

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

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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 1 E (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

Coniella granati is one of a number of pests listed in Annex 1D to the Terms of Reference (ToR) to be subject to pest categorisation to determine whether it fulfils the criteria of a potential Union quarantine pest (QP) for the area of the EU excluding Ceuta, Melilla and the outermost regions of Member States referred to in Article 355(1) of the Treaty on the Functioning of the European Union (TFEU), other than Madeira and the Azores, and so inform EU decision making as to its appropriateness for potential inclusion in the lists of pests of Commission Implementing Regulation (EU) 2019/2072. If a pest fulfils the criteria to be potentially listed as a Union QP, risk reduction options will be identified.

1.3. Additional information

This pest categorisation was initiated as a result of media monitoring, PeMoScoring and subsequent discussion in Standing Committee on Plants, Animals, Food and Feed (PAFF), resulting in it being included in the current mandate within the list of pests identified by Horizon Scanning and selected for pest categorisation.

2. Data and Methodologies

2.1. Data

2.1.1. Information on pest status from NPPOs

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

2.1.2. Literature search

A literature search on *C. granati* was conducted at the beginning of the categorisation in the ISI Web of Science bibliographic database, using the scientific name of the pest as search term. Papers relevant for the pest categorisation were reviewed, and further references and information were obtained from experts, as well as from citations within the references and grey literature.

2.1.3. Database search

Pest information, on host(s) and distribution, was retrieved from the 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 is a web-based network run by the Directorate General for Health and Food Safety (DG SANTÉ) of the European Commission as a subproject of PHYSAN (Phyto-Sanitary Controls) specifically concerned with plant health information. TRACES is the European Commission's multilingual online platform for sanitary and phytosanitary certification required for the importation of animals, animal products, food and feed of non-animal origin and plants into the European Union, and the intra-EU trade and EU exports of animals and certain animal products. Up until May 2020, the Europhyt database managed notifications of interceptions of plants or plant products that do not comply with EU legislation, as well as notifications of plant pests detected in the territory of the Member States and the phytosanitary measures taken to eradicate or avoid their spread. The recording of interceptions switched from Europhyt to TRACES in May 2020.

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

2.2. Methodologies

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

The criteria to be considered when categorising a pest as a potential Union QP is given in Regulation (EU) 2016/2031 Article 3 and Annex I, Section 1 of the Regulation. Table 1 presents the Regulation (EU) 2016/2031 pest categorisation criteria on which the Panel bases its conclusions. In judging whether a criterion is met the Panel uses its best professional judgement (EFSA Scientific Committee, 2017) by integrating a range of evidence from a variety of sources (as presented above in Section 2.1) to reach an informed conclusion as to whether or not a criterion is satisfied.

The Panel's conclusions are formulated respecting its remit and particularly with regard to the principle of separation between risk assessment and risk management (EFSA founding regulation (EU) No 178/2002); therefore, instead of determining whether the pest is likely to have an unacceptable impact, deemed to be a risk management decision, the Panel will present a summary of the observed impacts in the areas where the pest occurs, and make a judgement about potential likely impacts in the EU. While the Panel may quote impacts reported from areas where the pest occurs in monetary terms, the Panel will seek to express potential EU impacts in terms of yield and quality losses and not in monetary terms, in agreement with the EFSA guidance on quantitative pest risk assessment (EFSA PLH Panel, 2018). Article 3(d) of Regulation (EU) 2016/2031 refers to unacceptable social impact as a criterion for QP status. Assessing social impact is outside the remit of the Panel.

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

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

3. Pest categorisation

3.1. Identity and biology of the pest

3.1.1. Identity and taxonomy

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

Yes, the identity of *C. granati* is well established and the pathogen has been shown to produce consistent symptoms and to be transmissible.

C. granati (Sacc.) Petr. & Syd. is a plant pathogenic fungus of the order Diaporthales and the family Schizoparmaceae, described for the first time in 1876 by Saccardo as *Phoma granatii* and later named as *Pilidiella granati* (Alvarez et al., 2016). *Schizoparme versoniana* has been described as the sexual morph of *C. granati*, but this sexual-asexual connection has not been confirmed so far (Alvarez et al., 2016). Alvarez et al. (2016), by conducting multigene phylogenetic and morphological analyses, demonstrated that the genera *Coniella*, *Pilidiella* and *Schizoparme* are synonymous.

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

Preferred scientific name: *Coniella granati* (Saccardo) Petrák & Sydow.
Order: Diaporthales.
Family: Schizoparmaceae.
Genus: *Coniella*.
Species: *Coniella granati*.
Common names: leaf blotch of pomegranate.
Synonyms: *Phoma granati* (Saccardo), *Phoma versoniana* (Saccardo), *Pilidiella granati* (Saccardo) van der Aa, *Zythia versoniana* (Saccardo) Saccardo.

Additional synonyms include *Macrophoma granati* (Sacc.) Berl. & Voglino, *Anathasthoopa simba* Subram. Ramakr. and *Coniella simba* (Subram. & Ramakr.) Sutton as reported by Alvarez et al. (2016) and *Cytoplea granati* (Sacc.) Petr. & Syd. as listed in Index Fungorum (www.indexfungorum.org).

The EPPO code[1] (Griessinger and Roy, 2015; EPPO, 2019) for this species is: CONLGR (EPPO, online).

3.1.2. Biology of the pest

The life cycle of *C. granati* is not fully known for some of its stages including the putative sexual stage. It is suggested that this fungus overwinters as pycnidia and mycelium in mummified or rotted fruits, blighted shoots and other infected aerial vegetative parts of pomegranate trees since the pathogen also causes cankers on the crown and on branches (Michailides et al., 2010; Thomidis, 2015). In addition, infected debris (e.g. pruned limbs, mummified fruits, etc.) left on the orchard floor have also been suggested to be important for the overwintering of the fungus. They may represent the primary inoculum source (Jabnoun-Khiareddine et al., 2018). Indeed, the incidence of the disease caused by *C. granati* was higher in regions where infected fruit mummies were scattered on the orchard floor (Sharma and Tegta, 2011). The conidia (pycnidiospores) from overwintered pycnidia can be dispersed by water (rain, irrigation) to infect aerial parts of susceptible host trees, including young fruits (Michailides et al., 2010). The main way of penetration into young fruits is through wounds or natural openings of fruits (Michailides et al., 2010; Mincuzzi et al., 2020). Although it has not been investigated specifically for *C. granati*, conidia of the pathogen could be potentially transferred on the bodies of insects inside the fruit through the open crown, a feature which is very common in the case of fungi-producing pycnidiospores, i.e. conidia in slimy droplets (Ingold, 1953; Agrios, 1980; McGee, 2003). Nevertheless, artificial inoculations performed under laboratory conditions showed that *C. granati* can also infect intact fruits when stored in contact with infected ones (Michailides et al., 2010). The infection of fruits is also likely to result from infection of the corresponding flower during blooming (Mincuzzi et al., 2020).

Jabnoun-Khiareddine et al. (2018) showed that *C. granati* produces *in vitro* extracellular hydrolytic enzymes, such as cellulase, protease and pectinase, that may play an important role in both penetration and colonisation of host plant tissues by the pathogen. After infection, the pathogen usually remains latent until fruit ripening and its signs and disease symptoms eventually become visible even later, during the postharvest stage (Michailides et al., 2010; Mincuzzi et al., 2020). Indeed, higher disease incidence in pomegranate orchards is frequently observed during fruit maturation (Sharma and Tegta, 2011). Although the pathogen also affects the crown, twigs, branches and suckers causing cankers, dieback and twig blight, there are no reports about the infection process of vegetative parts of pomegranate tree by *C. granati*.

Symptoms may also appear during the period of fruit development (half grown or larger) and, reaching a peak mid-to late summer favoured by an extended period of warm and foggy weather (Sharma and Tegta, 2011; Kumari and Ram, 2015). As observed in India, the development of *C. granati* is indeed favoured not only by high relative humidity of around 70–80% (Kumari and Ram, 2015; Kumari, 2017), but also by rainfall, since a higher disease severity on both leaves and fruits of pomegranate was associated with 46.65 mm cumulative rainfall (Kumari and Ram, 2015). As demonstrated *in vitro*, temperature values ranging from 25°C to 30°C are optimal for both conidial

[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).

germination and mycelial growth of *C. granati* (Michailides et al., 2010; Thomidis, 2015). In addition, the fungal growth has been reported to slow down at 15°C and to be inhibited at 5°C (Palou et al., 2013) and 35°C (Munhuweyi et al., 2016a).

3.1.3. Host range/species affected

C. granati has been reported to infect mainly pomegranate (*Punica granatum* L.) (e.g. KC and Vallad, 2016; Mincuzzi et al., 2016; Cintora-Martínez et al., 2017; Mahadevakumar et al., 2019) and to a lesser extent *Rosa* spp. (Mahadevakumar et al., 2022). Nevertheless, the pathogen has been reported to be associated with *Citrus* spp., *Vitis vinifera*, *Hevea* spp. (Sutton, 1980; Van Niekerk et al., 2004; Alvarez et al., 2016), *Anogeissus acuminata* (Thaung, 2008) and *Caesalpinia pulcherrima* (Alaka and Rao, 1998).

The following experimental hosts were also reported for *C. granati* by Jabnoun-Khiareddine et al. (2018), based on wound-inoculated detached fruits and/or branches: apricot (*Prunus armeniaca*), pear (*Pyrus communis*), peach (*Prunus persica*), loquat (*Eriobotrya japonica*), strawberry (*Fragaria vesca*), tomato (*Solanum lycopersicum*), pepper (*Capsicum annuum*) and fakous (*Cucurbita melo var. flexuosus*).

This pest categorisation will focus on pomegranate and rose for which there is robust evidence of the host status in natural conditions. *Citrus* spp., *Vitis vinifera* and *Caesalpinia pulcherrima* will be considered as other potential hosts with high uncertainty.

The complete list of the host plants reported so far for *C. granati* is included in Appendix A (last updated: 22/12/2022).

3.1.4. Intraspecific diversity

No intraspecific diversity has been reported so far in *C. granati*. Nevertheless, although there is an uncertainty about the connection between the asexual and sexual morphs described for the pathogen, the potential ability of the pathogen to differentiate sexual reproductive stages may enhance its genomic plasticity and adaptation to various adverse environmental conditions, including fungicide exposure.

3.1.5. Detection and identification of the pest

Are detection and identification methods available for the pest?
Yes, there are methods available for the detection and identification of *C. granati*.

Symptomatology

Coniella granati can cause symptoms on several vegetative parts of its host plants. However, this pathogen is mostly associated with pomegranate fruit rots, both pre-and postharvest (Kwon and Park, 2002; Tziros and Tzavella-Klonari, 2008; Palou et al., 2010; KC and Vallad, 2016; Mincuzzi et al., 2016; Cintora-Martínez et al., 2017; Mahadevakumar et al., 2019). **Fruit symptoms** consist of circular brownish-yellow spots on the rind that start in the crown area, and later increase in size and develop into softer and brown lesions. These mature lesions are covered by tiny cream-coloured mycelia and then by dark brown to black spherical pycnidia. Ultimately, the entire fruit turns brown to black after completely rotting. The inner portions of the fruit are decayed and soft, with the mesocarp, endocarp, and arils showing a brown colour, whereas dry mummified fruits can also result from the infection by the pathogen (Thomidis, 2014; Cintora-Martínez et al., 2017; Jabnoun-Khiareddine et al., 2018; Mincuzzi et al., 2022). According to Pala et al. (2009) and Mincuzzi et al. (2022), these symptoms caused by *C. granati* can be distinguished easily from other common pomegranate fruit rot pathogens, such as *Alternaria* spp., *Aspergillus* spp., *Penicillium* spp. and *Botrytis cinerea*. Indeed, external decay symptoms are not commonly seen on *Alternaria* fruit rot, compared to *Coniella* fruit rot (Mincuzzi et al., 2022). In contrast to *Coniella* fruit rot, both *Aspergillus* and *Alternaria* fruit rot show a dusty black sporulation inside the fruits, while *B. cinerea* is characterised by a grey one (Mincuzzi et al., 2022). Furthermore, *C. granati* is the only one that produces pycnidia.

Symptoms on leaves caused by *C. granati* consist of small, necrotic, angular lesions that start at the leaf tip and expanded towards the proximal end leading to drying and premature fall of leaves. Then, black pycnidia develop on the surface of infected leaves (Ram and Sharma, 2013; KC and Vallad, 2016; Szendrei et al., 2022).

Concerning the vegetative part of the tree, *C. granati* has been also reported to cause **crown rot** (Thomidis and Exadaktylou, 2011; Çeliker et al., 2012; Mirabolfathy et al., 2012; Mirzaei and Nia, 2013; Pollastro et al., 2016), **shoot blight** (Thomidis, 2015; Jabnoun-Khiareddine et al., 2018; Mahadevakumar et al., 2019), and **branch and stem cankers** (Thomidis, 2015; Jabnoun-Khiareddine et al., 2018; Linaldeddu et al., 2020) on pomegranate trees. Symptoms of crown rot consist of wilting and dieback of the branches, reduce plant growth, small and yellowish leaves, and ultimately plant death (Pollastro et al., 2016). An extensive brown-black wood discoloration can also be observed in longitudinal sections (Pollastro et al., 2016). The first symptoms on the stem appear as small circular spots, which further develop and increase in size into brown lesions covered by black pycnidia, resulting in the dieback of pomegranate branches (Tziros and Tzavella-Klonari, 2008; Jabnoun-Khiareddine et al., 2018). Cankers caused by *C. granati* on the pomegranate stem are reported to be of greater size than those caused by other fungi such as *Botryosphaeria dothidea*, *Cytospora punicae* and *Neofusicoccum parvum* (Linaldeddu et al., 2020).

Morphology

C. granati can be isolated on culture media and description of its cultural and morphological characteristics is available in the literature (Çeliker et al., 2012; Alvarez et al., 2016; Mahadevakumar et al., 2019). Colonies growing on potato dextrose agar (PDA) medium produce aerial yellowish cream-coloured mycelium covered with abundant spherical pycnidia (Çeliker et al., 2012). Pycnidia are solitary, globose and black with thin membranous walls (Mahadevakumar et al., 2019). Hyphae are hyaline, septate and branched (Mahadevakumar et al., 2019). As shown in Figure 1, conidia are hyaline to olivaceous brown, ellipsoid, apex obtuse, base truncate, with mucoid appendage along the side of the conidium (Alvarez et al., 2016). Conidial pigmentation was used in the past as a character to separate *Pilidiella* (hyaline to pale brown conidia) from *Coniella* (dark brown conidia). Nevertheless, in recent years, these two genera have been regarded as synonymous, *Coniella* being the adopted genus name (Alvarez et al., 2016).

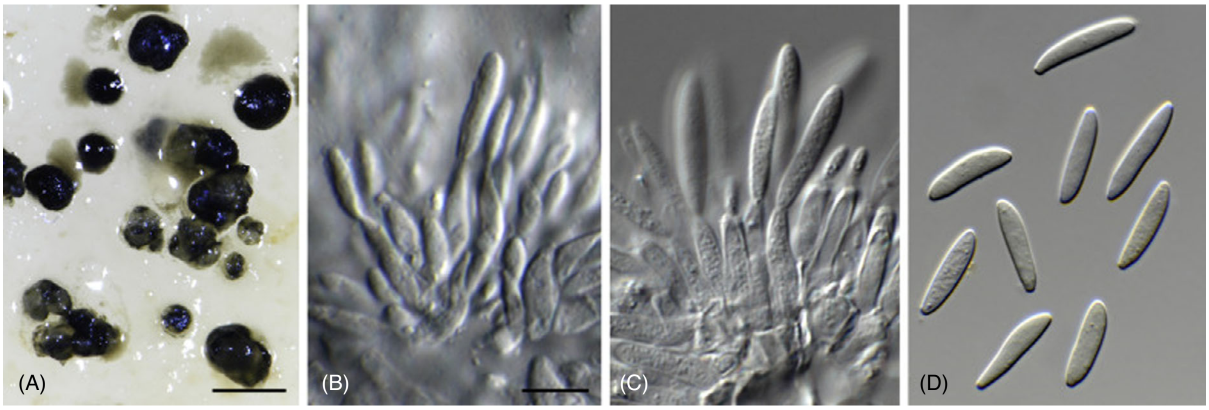

Figure 1: *Coniella granati* (CBS 130974). A. Conidiomata forming *in vitro* on oatmeal agar medium. B, C. Conidiogenous cells giving rise to conidia. D. Conidia. Scale bars: A = 300 μm, others = 10 μm (from Alvarez et al., 2016)

DNA-based identification

The detection of *C. granati* on infected hosts relies primarily on isolation of the pathogen on culture medium followed by its molecular identification by DNA sequencing. The DNA barcode most used to identify *C. granati* is the internal transcribed spacers (ITS) of genomic rDNA, in particular the region ITS1–5.8 S–ITS2 (Palou et al., 2010; Thomidis and Exadaktylou, 2011; Mirabolfathy et al., 2012; KC and Vallad, 2016; Cintora-Martínez et al., 2017; Jabnoun-Khiareddine et al., 2018). However, other DNA regions have been used together with the ITS for a more reliable identification of *C. granati*. These include the D1/D2 in the 5′ end of the 28 S rDNA gene (Palou et al., 2010) and the large subunit (LSU) (Alvarez et al., 2016) as well as several protein-coding genes, such as translation elongation factor 1-alpha (TEF1-α) (Szendrei et al., 2022) and RNA polymerase II (RPB2) (Alvarez et al., 2016). Nucleotide sequences of *C. granati* are available in GenBank (www.ncbi.nlm.nih.gov/genbank) and could be used as reference material for molecular diagnosis.

The pathogen can also be identified by non-culturing molecular techniques via detection of *C. granati* directly from diseased pomegranate fruits. These include several DNA-based methods, such as loop-mediated isothermal amplification (LAMP) (Yang et al., 2020), nested PCR (Yang et al., 2017) and quantitative real-time PCR (qPCR) (Mincuzzi et al., 2020). The former method is based on the use of four primers recognising six distinct sequences of *Coniella* spp. TEF1-α region, while the remaining two methods are based on the amplification of a fragment from *C. granati* ITS region of rDNA, to detect the presence of the pathogen on pomegranate fruits. More recently, a portable electrochemical DNA potentiostat biosensor was developed for the detection of *C. granati* on pomegranate fruits (Madufor et al., 2022).

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

3.2. Pest distribution

3.2.1. Pest distribution outside the EU

C. granati has been reported to be present in North America (California, Florida and North Carolina, Mexico), South America (Brazil), as well as in Asia (China, India, Iran, Israel, Japan, Korea, Pakistan, Thailand, Turkey and Myanmar), Africa (Kenya, South Africa and Tunisia), Oceania (Solomon Islands), and Eastern Europe (Ukraine). A complete list of the countries and states/provinces from where *C. granati* has been reported is included in Appendix B. These records are based on CABI Invasive Species Compendium (accessed on 28/10/2022), EPPO Global Database (accessed on 28/10/2022) and other sources as indicated in Appendix B. The current geographical distribution of *C. granati* is shown in Figure 2.

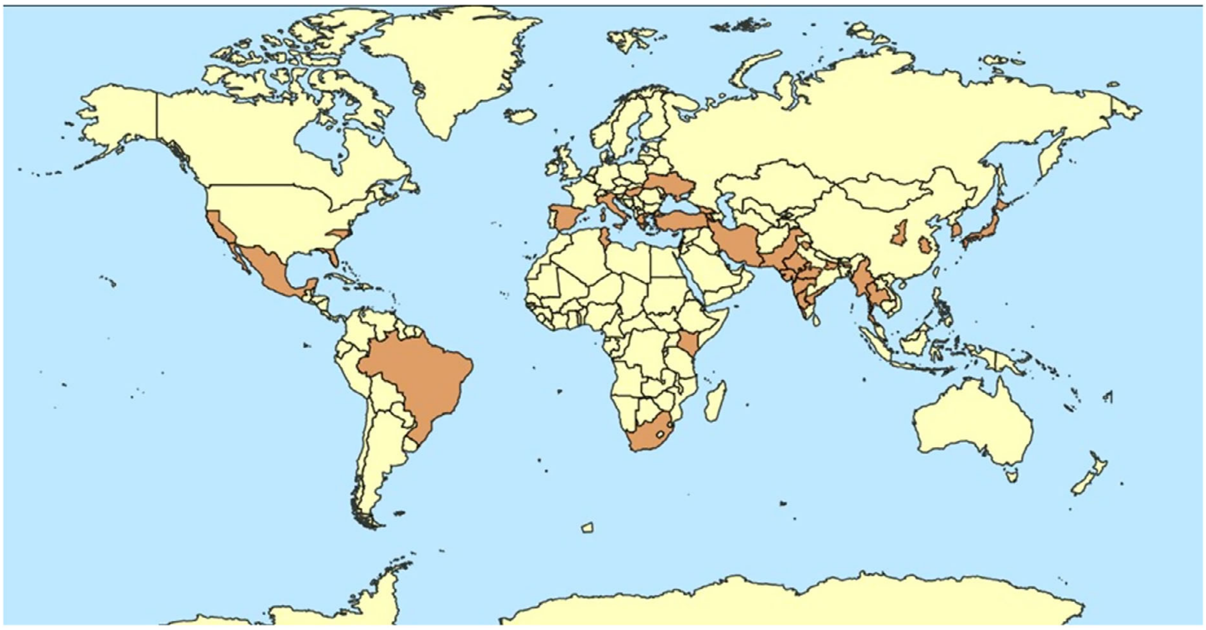

Figure 2: Global distribution of *Coniella granati* (Source: EPPO Global Database (EPPO, online); CABI, online (accessed on 28/10/2022 and literature)

3.2.2. Pest distribution in the EU

Is the pest present in the EU territory? If present, is the pest in a limited part of the EU or is it scarce, irregular, isolated or present infrequently? If so, the pest is considered to be not widely distributed.
Yes, *C. granati* is reported to be present in the EU (Cyprus, Greece, Hungary, Italy, and Spain). There is uncertainty on the actual distribution in those countries due to the absence of systematic surveys.

Coniella granati has been reported in **Greece** (Tziros and Tzavella-Klonari, 2008; Thomidis and Exadaktylou, 2011; Thomidis, 2015), **Spain** (Palou et al., 2010, 2011), **Italy** (Mincuzzi et al., 2016; Pollastro et al., 2016; Linaldeddu et al., 2020) and **Hungary** (Szendrei et al., 2022) as an agent causing fruit rot, cankers on branches and stems, necrotic black lesions on leaves, defoliation and crown rot of pomegranate tree. Moreover, in Italy, Alvarez et al. (2016) and Van Niekerk et al. (2004) used in their phylogenetic studies one isolate (referred to as *Pilidiella granati* from *Vitis vinifera)* obtained from the Culture Collection of the Westerdijk Fungal Biodiversity Institute (former CBS-KNAW Fungal Biodiversity Centre), but there is no other report of the presence of *C. granati* on *V. vinifera* in Italy. In the same study of Alvarez et al. (2016), one strain of *C. granati* (CBS 152.33) maintained in the Westerdijk Fungal Biodiversity Institute Culture Collection and isolated in **Cyprus** from pomegranate mummified fruits is also used. Far and Rossman (online; https://nt.ars-grin.gov/fungaldatabases/) reported *C. granati* as being present in the **Netherlands** and cited Richardson (1990). However, this is maybe an unreliable record because there are no reports on the literature for the presence of *C. granati* in Netherlands since 1990. Furthermore, the NPPO of the Netherlands confirmed that *C. granati* is absent from the Netherlands. The presence with restricted distribution in Hungary was confirmed by the Hungarian NPPO. The Spanish NPPO informed that *C. granati* is present in the regions of Valencia and Andalucia and that no measures are taken as the fungus is causing hardly any economic damage in Spain. The NPPO of Cyprus provided the following information: 'We would like to inform you that in Cyprus we do not apply any measures for *Coniella granati*. Based on the information received from our district offices and our laboratory, *Coniella granati* does not seem to cause severe problems for pomegranates. However, the status of *Coniella granati* is Cyprus is not known. To this end, we will proceed with some sampling where symptoms are noted to confirm its status. We will keep you updated with any new information relevant to this matter'.

Available information suggests that *C. granati* is present in all major pomegranate growing areas except Portugal, where information is lacking.

3.3. Regulatory status

3.3.1. Commission Implementing Regulation 2019/2072

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

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

A list of hosts included in Annex VI of Commission Implementing Regulation (EU) 2019/2072 is provided in Table 2. Hosts of the genera *Caesalpinia*, *Malus* and *Prunus* are included in the Commission Implementing Regulation (EU) 2018/2019 on high risk plants.

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

List of plants, plant products and other objects whose introduction into the Union from certain third countries is prohibited			
	Description	CN Code	Third country, group of third countries or specific area of third country
8.	Plants for planting of [...] *Rosa* 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	Third countries other than Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canary Islands, Faeroe Islands, Georgia, Iceland, Liechtenstein, Moldova, Monaco, Montenegro, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo- Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino,

List of plants, plant products and other objects whose introduction into the Union from certain third countries is prohibited			
		ex 0602 90 91 ex 0602 90 99	Serbia, Switzerland, Turkey, Ukraine and the United Kingdom
19.	Soil as such consisting in	ex 2530 90 00	Third countries other than Switzerland
20.	part of solid organic substances Growing medium as such, other than soil, consisting in whole or in part of solid organic substances, other than that composed entirely of peat or fibre of *Cocos nucifera* L., previously not used for growing of plants or for any agricultural purposes	ex 3824 99 93 ex 2530 10 00 ex 2530 90 00 ex 2703 00 00 ex 3101 00 00 ex 3824 99 93 ex 2530 90 00 ex 3824 99 93	Third countries other than Switzerland

3.4. Entry, establishment and spread in the EU

3.4.1. Entry

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

Yes, the pathogen can enter further into the EU territory via host plants for planting (including seeds), fruits, parts of host plants (e.g., foliage, branches) and soil/growing media attached to or associated with plants.

Comment on plants for planting as a pathway.

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

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

1) host plants for planting (cuttings and rooted plants),
2) fresh fruits of host plants,
3) soil and other plant growing media originating in infested third countries.

C. granati could potentially enter further into the EU territory on plant parts (e.g. stems, branches) of its hosts for ornamental purposes. However, these are considered minor pathways for the further entry of the pathogen into the EU.

Seeds as a potential pathway of entry is not investigated. Seeds are not a likely pathway of entry, since cuttings are the most used propagation material.

The pathogen is unlikely to enter further into the EU by rain or wind-driven rain, because of the long distance between most of the infested third countries and the EU Member States. However, wind (ascospores if their occurrence is established) and insects might be a means to enter the EU.

Although there are no quantitative data available, conidia of the pathogen may also be present as contaminants on other substrates or objects (e.g. non-host plants, second-hand agricultural machinery and equipment, crates, etc.) imported into the EU. Nevertheless, these are considered minor pathways for the further entry of the pathogen into the EU territory (Table 3).

Table 3: Potential pathways of further entry of *Coniella granati* into the EU 27

Pathways (e.g., host/ intended use/source)	**Life stage**	**Relevant mitigations [e.g. prohibitions (Annex VI), special requirements (Annex VII) or phytosanitary certificates (Annex XI) within Implementing Regulation 2019/2072]**
Host plants for planting, other than seeds	Mycelium, pycnidia and possibly ascomata	• Annex VI (8) of Commission Implementing Regulation (EU) 2019/2072 prohibits the introduction into the Union from certain third countries of plants for planting of *Rosa*, other than dormant plants free from leaves, flowers and fruits. Among the third countries from where the introduction of plants for planting of *Rosa* is not prohibited, Türkiye has been reported to be infested with the pathogen (see Section 3.2.1). In addition, this pathway is partially open, as dormant plants of the above plant genera free from leaves, flowers and fruits could still carry the pathogen.
Fresh fruits of host plants	Mycelium, pycnidia	
Parts of host plants, other than fruits and seeds	Mycelium, pycnidia, and possibly ascomata	
Soil associated or not with host and non-host plants for planting	Chlamydospores, mycelium, pycnidia, and possibly ascomata (the last three life stages are most likely to be associated with the presence of infected plant debris in the soil)	Annex VI (19) of Commission Implementing Regulation (EU) 2019/2072 bans the introduction into the Union from third countries other than Switzerland of soil as such consisting in part of solid organic substances
Growing medium associated or not with host and non-host plants	Chlamydospores, mycelium, pycnidia, and possibly ascomata (the last three life stages are most likely to be associated with the presence of infected plant debris in the growing medium)	• Annex VI (20) of Commission Implementing Regulation (EU) 2019/2072 bans the introduction into the Union from third countries other than Switzerland of growing medium as such, other than soil, consisting in whole or in part of solid organic substances, other than that composed entirely of peat or fibre of *Cocos nucifera* L., previously not used for growing of plants or for any agricultural purposes. • Annex VII (1) of Commission Implementing Regulation (EU) 2019/2072 requires official statement of special requirements for the introduction into the Union from third countries other than Switzerland of growing medium, attached to or associated with plants, intended to sustain the vitality of the plants, with the exception of sterile medium of *in vitro* plants. • Annex XI, Part A (1) of Commission Implementing Regulation (EU) 2019/2072 requires phytosanitary certificate for the introduction into the Union from third countries other

Pathways (e.g., host/ intended use/source)	Life stage	Relevant mitigations [e.g. prohibitions (Annex VI), special requirements (Annex VII) or phytosanitary certificates (Annex XI) within Implementing Regulation 2019/2072]
		than Switzerland of growing medium attached to or associated with plants, intended to sustain the vitality of the plants.
Machinery and vehicles with contaminated soil and/or infected debris of host plants.	Mycelium, pycnidia, chlamydospores and possibly ascomata	• Annex VII (2) of Commission Implementing Regulation (EU) 2019/2072 requires official statement that machinery or vehicles are cleaned and free from soil and plant debris. • Annex XI, Part A (1) of Commission Implementing Regulation (EU) 2019/2072 requires phytosanitary certificate for the introduction into the Union territory of machinery and vehicles from third countries other than Switzerland.

The quantity of main hosts imported into the EU from countries where *C. granati* is present is provided in Table 4 and Appendix C. The import data are aggregated and may also contain the major host pomegranate. No pomegranate plant specific import data are available in Eurostat.

Table 4: EU 27 annual imports of main hosts from countries where *Coniella granati* is present, 2016–2020 (in 100 kg). Source: Eurostat accessed on 16/11/2022

Commodity	HS code	2016	2017	2018	2019	2020
Roses, whether or not grafted	0602 4000	2,433.19	1,199.29	4,149.06	954.43	161.73
Trees, shrubs and bushes, grafted or not, of kinds which bear edible fruit or nuts (excl. with bare roots, citrus, and vine slips)	0602 2080	6,934	7,803.1	7,920.84	11,896.7	3,776.71
Unrooted cuttings and slips (excl. vines)	0602 1090	36,594.93	37,436.16	38,014.50	38,353.05	33,316.42
Trees, shrubs and bushes, with bare roots, grafted or not, of kinds which bear edible fruit or nuts (excl. vine slips)	0602 2020	1,124.81	1,349.74	1,432.96	1,795.97	33.53

Notifications of interceptions of harmful organisms began to be compiled in Europhyt in May 1994 and in TRACES in May 2020. As at 9/12/2022, there were no records of interception of *C. granati* or its synonyms in the TRACES databases. Due to technical issues it was not possible to access the Europhyt database. However, since *C. granati* is not a QP, EU member states have no obligation to notify interceptions of the pathogen via Europhyt.

3.4.2. Establishment

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

Yes, *C. granati* has already established in the EU (Greece, Hungary, Italy and Spain) (see Section 3.2.2). Both the biotic (host availability) and abiotic (climate suitability) factors occurring in the EU suggest that the pathogen could further establish in other parts of the EU territory where susceptible hosts are grown.

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

3.4.2.1. EU distribution of main host plants

Host of *C. granati* are noted above (see Section 3.1.3) and shown in Appendix A. In addition, most of its main hosts are present in the EU territory, in commercial production (fields, orchards, greenhouses) and in home gardens. Pomegranates are also cultivated in Mediterranean countries but pomegranate production data are not provided by EUROSTAT.

Concerning pomegranate, in the European market, Spain has one of the largest production, reaching up to 50,000 tonnes, and its cultivation is concentrated mainly in the region of Alicante, Valencia and Murcia (unece.org). In Italy, pomegranate-growing-area is over 1,500 ha (Cossio, 2017). In addition, new plantations are being established, both in south and north of the country and the Apulia region. Production in the south is reported to be used in fresh consumption (Kahramanoglu, 2019).

Production and growing regions are also described for Portugal and Greece (Ferrara et al., 2021). For Greece, the total number of pomegranate trees and the total production (in tonnes) for the year 2018 are in 2018 41.9 thousand tonnes and 28,530 ha and in 2019 44.7 thousand tonnes and 28,994 ha (acreage including also quince and figs) (Hellenic Statistical Authority, www.statistics.gr). Similarly, in Portugal the production of pomegranates has been increasing during the last decade, reaching up to 6,800 tonnes in 2021, being the new plantations mainly established in Algarve and Alentejo region (Statistics Portugal, www.ine.pt).

3.4.2.2. Climatic conditions affecting establishment

Based on the data available in the literature on the geographic coordinates of the locations from where *C. granati* has been reported, the pathogen is present in non-EU areas with BSh, BSk, Cfa, Cfb, Cfc, Csa, Csb, Csc, Dfb and Dfc Köppen-Geiger climate zones. These climate zones also occur in the EU territory, where hosts of *C. granati* are also grown (Figure 3).

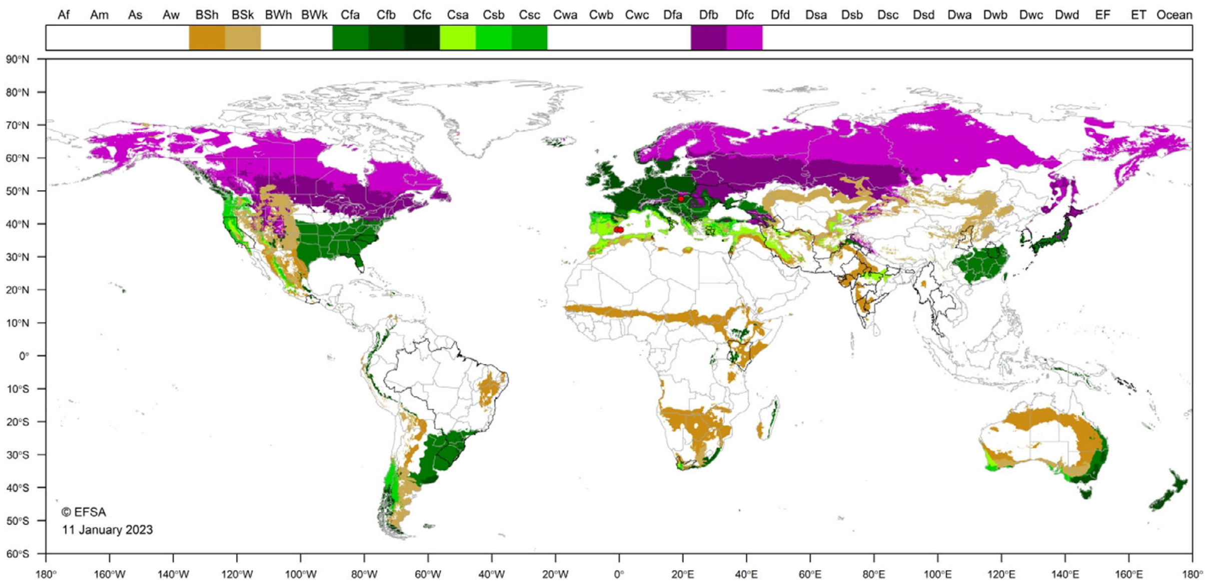

Figure 3: Distribution of 10 Köppen–Geiger climate types, i.e. BSh, BSk, Cfa, Cfb,Cfc, Csa, Csb, Csc, Dfb and Dfc that occur in the EU and in third countries where *Coniella granati* has been reported

3.4.3. Spread

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

Comment on plants for planting as a mechanism of spread.

Coniella granati could potentially spread within the EU by both natural and human-assisted means.

Host plants for planting is a main means of spread of the pathogen within the EU territory.

C. granati could potentially spread via natural and human-assisted means.

Spread by natural means. Conidia can spread over relatively short distances by water splash (rain, irrigation). Wind may increase the dispersal distance of water-splashed conidia, although this has not been studied in the case of *C. granati*. Although it has not been documented, conidia of the pathogen could potentially be dispersed by insects, similarly to other conidia-producing fungi. Birds, rodents and other small animals could potentially disperse the pathogen via infected branches, fruits and seeds. In addition, in case the sexual connection with *S. versoniana* would be confirmed, the pathogen could potentially spread by the wind-disseminated spores (ascospores) of its sexual stage. However, the role of those spores in the epidemiology of the diseases caused by *C. granati* is still unknown, mainly because although *Schizoparme versoniana* has been described as the sexual morph of *C. granati*, this sexual-asexual connection has not been confirmed so far (Alvarez et al., 2016).

Spread by human-assisted means. The pathogen can spread over long distances via the movement of infected host plants for planting (rootstocks, grafted plants, scions, etc.), including dormant plants, as well as fresh fruits, contaminated soil and agricultural machinery, tools, etc. The spread via the seeds of its host plants has not been documented.

3.5. Impacts

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

Yes, the further introduction of *C. granati* into the EU is expected to have yield and quality impacts in parts of the territory where susceptible hosts are grown.

Nevertheless, the magnitude of the impacts is not known, especially in cases where hosts other than pomegranate are infected by the pathogen.

C. granati is emerging very fast in almost all pomegranate producing regions of the world (Cintora-Martínez et al., 2017). In the area of its present distribution, *C. granati* affects mainly pomegranate trees (*Punica granatum* L.), damaging severely leaves, branches, stems and fruits. The pathogen is responsible for substantial losses occurring before and after harvest, by causing fruit rot in the field and postharvest, branch and stem cankers, shoot blight and crown rot, resulting in decline and eventual death of young pomegranate shoots (see Section 3.1.5).

Outside the EU, *C. granati* has been reported to cause severe yield losses, particularly in pomegranate crops. In India, field surveys conducted by Mahadevakumar et al. (2019) during 2015–2016 revealed dieback and fruit rot diseases on pomegranate caused by *C. granati*, with an incidence of 24% and 18%, respectively. This dieback disease was characterised by sudden death with necrosis and drying of young shoots with disease progress downwardly, leading to high yield losses. An extensive survey of various pomegranate orchards in Himachal Pradesh (India), revealed an incidence of fruit rot up to 23%, caused by *C. granati* (Sharma and Tegta, 2009; Kishore and Bhardwaj, 2013; Kishore and Gupta, 2015).

In the major pomegranate cultivation area of China, *C. granati* has been reported to cause important damage by causing about 10–30% twig dieback and fruit rot incidence (Chen et al., 2014), inducing up to 40% of yield loss (Wang et al., 2019).

In Mexico, severe symptoms of fruit rot disease caused by *C. granati* were observed on up to 85% of pomegranate fruits in an orchard, during the spring of 2015 (Cintora-Martinez et al., 2017).

In Iran, Mirabolfathy et al. (2012) reported a decline and dieback of young pomegranate trees (7–10 years old) caused by *C. granati*, resulting in the death of aerial tree parts and growing suckers from roots.

Losses due to pomegranate fruit rots caused by *C. granati* have been also reported in South Africa (Lennox et al., 2018), USA – California and Florida (Michailides et al., 2010; KC and Vallad, 2016) and Türkiye (Çeliker et al., 2012).

Besides pomegranate, rose plants have been reported to showed dieback symptoms caused by *C. granati* in India, with a disease incidence of 7% in a 30-ha rose field (Mahadevakumar et al., 2022). Dieback symptoms included necrotic lesions that started at the tips of shoots and progressed downward, leading to the death of young shoots.

A severe decline and mortality of pomegranate trees has been reported in several orchards in north-eastern Italy, *C. granati* being identified as the main species associated with branch cankers and canopy dieback (Linaldeddu et al., 2020).

Concerning the direct impact on fruit production, in Italy, severe outbreaks of *C. granati* have been reported in the main pomegranate growing areas of north-eastern and southern regions (Pollastro et al., 2016; Linaldeddu et al., 2020). For instances, in the Italian southern regions of Apulia, Basilicata and Calabria, an incidence up to 30% of pomegranate crown rot caused by *C. granati* was reported by Pollastro et al. (2016). More recently, in Hungary, necrotic black lesions on leaves, associated with serious defoliation caused by *C. granati* were observed on 60% of 1- to 3-year-old pomegranate trees grown in a nursery (Szendrei et al., 2022).

C. granati has been also identified as one of the main causes of postharvest loss of pomegranate fruit in southern Italy, infecting up to 26% of the fruits in storage (Mincuzzi et al., 2016). Important postharvest yield losses of up to 50% of pomegranates, caused by *C. granati* has been reported in Greece (Tziros and Tzavella-Klonari, 2008). Thomidis (2014, 2015) surveyed several pomegranate orchards at various regions in northern Greece from 2010 to 2013 and found that the incidence of fruit rot caused by *C. granati* can reach up to 66 and 32% before and after harvesting, respectively. In Spain the incidence of *C. granati* along with other post-harvest pathogens was important in only one season with relative frequencies reaching up to 40% after 27 weeks of storage at 5°C (Palou and Vicent, 2019). However, pomegranate is usually not stored for such a long time. Therefore, in practice no commercial impact is observed which is in accordance with the statement of the authors that *C. granati* is a minor pathogen and also as pointed out by the reply from the Spanish NPPO.

Given the relevance of the diseases caused by *C. granati*, it is likely that its further establishment and spread in the southern areas of the EU would have a potential impact, especially on pomegranate producing regions. It is noted that according to the information received from NPPOs no measures are applied to limit the spread of *C. granati*.

3.6. Available measures and their limitations

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

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

3.6.1. Identification of potential additional measures

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

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

3.6.1.1. Additional potential risk reduction options

Potential additional control measures are listed in Table 5.

Table 5: Selected control measures (a full list is available in EFSA PLH Panel, 2018) for pest entry/establishment/spread/impact in relation to currently unregulated hosts and pathways. Control measures are measures that have a direct effect on pest abundance

Control measure/Risk reduction option (Blue underline = Zenodo doc, Blue = WIP)	RRO summary	Risk element targeted (entry/establishment/spread/impact)
Require pest freedom	Plants, plant products and other objects come from a pest-free country or a pest-free area or a pest-free place of production.	Entry/Spread
Growing plants in isolation	Description of possible exclusion conditions that could be implemented to isolate the crop from pests and if applicable relevant vectors. E.g. a dedicated structure such as glass or plastic greenhouses. Growing nursery plants in isolation may represent an effective control measure.	Entry (reduce contamination/infestation)/Spread
Managed growing conditions	Description of possible exclusion conditions that could be implemented to isolate the crop from pests and if applicable relevant vectors. E.g. a dedicated structure such as glass or plastic greenhouses. Proper field drainage, plant distancing, use of pathogen-free agricultural tools (e.g. pruning scissors, saws, and grafting blades), and removal of infected plants and plant debris in the field/orchard could potentially mitigate the likelihood of infection at origin as well as the spread of the pathogen.	Entry (reduce contamination/infestation)/Spread
Crop rotation, associations and density, weed/volunteer control	Crop rotation, associations and density, weed/volunteer control are used to prevent problems related to pests and are usually applied in various combinations to make the habitat less favourable for pests. The measures deal with (1) allocation of crops to field (over time and space) (multi-crop, diversity cropping) and (2) to control weeds and volunteers as hosts of pests/vectors. Since *C. granati* does not have a wide host range (Appendix A), crop rotation (in the case of rose cultivation) may represent an effective means to reduce inoculum sources and potential survival of the pathogen. Although weeds have not been reported as hosts for *C. granati* their control could potentially make the micro-climatic conditions less favourable (e.g. by reducing moisture) to pathogen infection and spread.	Entry/Establishment/Impact
Use of resistant and tolerant plant species/varieties	Resistant plants are used to restrict the growth and development of a specified pest and/or the damage they cause when compared to susceptible plant varieties under similar environmental conditions and pest pressure. • It is important to distinguish resistant from tolerant species/varieties. There are few reports eg Neelam and Ved (2015), about pomegranate varieties showing moderate resistance to *C. granati*.	Entry/Establishment/Impact
Roguing and pruning	Roguing is defined as the removal of infested plants and/or uninfested host plants in a delimited area, whereas pruning is defined as the removal of infested plant parts only without affecting the viability of the plant. *Coniella granati* overwinters on infected attached plant organs, which can act as inoculum sources. Thus, pruning of the symptomatic plant organs may be important in reducing the sources of inoculum and spread capacity.	Entry/Spread/Impact

Control measure/Risk reduction option (Blue underline = Zenodo doc, Blue = WIP)	**RRO summary**	**Risk element targeted (entry/ establishment/ spread/impact)**
Biological control and behavioural manipulation	pest control such as: a) Biological control b) Sterile Insect Technique (SIT) c) Mating disruption d) Mass trapping Some bio-fungicides (e.g. hydrolysable tannins, essential oils, chitosan) (Thomidis and Filotheou, 2016; Munhuweyi et al., 2016b, 2017; Brighenti et al., 2021) or biocontrol agents (e.g. *Bacillus amyloliquefaciens*, *B. subtilis*) (Ma et al., 2013, 2015; Tekiner et al., 2020) have shown *in vitro* promising results against *C. granati*, but none of them has been tested under field conditions.	Entry/Impact
Chemical treatments on crops including reproductive material	Several fungicides (e.g. pyraclostrobin, fluxapyroxad, mixtures of fluorpyram + tebuconazol, mancozeb, carbendazim + mancozeb, benomyl, copper oxychloride) showed to be effective in the orchard controlling leaf spot and fruit rot on pomegranate (Mahla and Ashok, 1989; Gaikwad, 2000; Xavier et al., 2020; Yang et al., 2021), but some of them have been revoked in the EU.	Entry/Establishment/ Impact
Chemical treatments on consignments or during processing	Use of chemical compounds that may be applied to plants or to plant products after harvest, during process or packaging operations and storage. The treatments addressed in this information sheet are: a) fumigation; b) spraying/dipping pesticides; c) surface disinfectants; d) process additives; e) protective compounds The application of fungicides to plants or plant products after harvest, during process or packaging operations and storage may contribute to mitigate the likelihood of entry or spread of *C. granati*. Similarly, postharvest application on fruits of bio-fungicides is reported to decrease development of *C. granati* on pomegranate fruits (Thomidis and Filotheou, 2016).	Entry/Spread
Physical treatments on consignments or during processing	This information sheet deals with the following categories of physical treatments: irradiation /ionisation; mechanical cleaning (brushing, washing); sorting and grading, and; removal of plant parts (e.g. debarking wood). This information sheet does not address: heat and cold treatment (information sheet 1.14); roguing and pruning (information sheet 1.12). Physical treatments can be an efficient measure.	Entry/Spread
Cleaning and disinfection of facilities, tools and machinery	The physical and chemical cleaning and disinfection of facilities, tools, machinery, transport means, facilities and other accessories (e.g., boxes, pots, pallets, palox, supports, hand tools). The measures addressed in this information sheet are: washing, sweeping and fumigation. *C. granati* commonly enters its host plants through wounds, and among them those created by pruning. Therefore, cleaning and surface sterilisation of pruning tools as well as of equipment and facilities (including premises, storage	Entry/Spread

Control measure/Risk reduction option (**Blue underline = Zenodo doc, Blue = WIP)**	**RRO summary**	**Risk element targeted (entry/ establishment/ spread/impact)**
	areas) are good cultural and handling practices employed in the production and marketing of any commodity and may mitigate the likelihood of further re-entry or spread of *C. granati*.	
Limits on soil	*C. granati* is likely to survive in the soil. Therefore, limits on soil are an efficient mitigation measure.	Entry/Spread
Soil treatment	The control of soil organisms by chemical and physical methods listed below: (a) Fumigation; (b) Heating; (c) Solarisation; (d) Flooding; (e) Soil suppression; (f) Augmentative biological control; (g) Biofumigation Although no specific studies are available on *C. granati*, it is likely that soil and substrate disinfestation with chemical, biological or physical (heat, soil solarisation) means can reduce the persistence and availability of inoculum sources.	Entry/Establishment/ Impact
Use of non-contaminated water	Chemical and physical treatment of water to eliminate waterborne microorganisms. The measures addressed in this information sheet are: chemical treatments (e.g. chlorine, chlorine dioxide, ozone); physical treatments (e.g. membrane filters, ultraviolet radiation, heat); ecological treatments (e.g. slow sand filtration). Although *C. granati* could potentially spread via contaminated irrigation water, physical or chemical treatment of irrigation water is likely not to be feasible under field conditions but may be applied in nurseries and greenhouses.	Entry/Spread
Waste management	Waste management (incineration, production of bioenergy) that takes place in authorised facilities and official restriction on the movement of infected plant material is in force to prevent the pest from escaping. On-site proper management of pruning residues is recommended as an efficient measure	Establishment/Spread
Heat and cold treatments	Controlled temperature treatments aimed to kill or inactivate pests without causing any unacceptable prejudice to the treated material itself. The measures addressed in this information sheet are: autoclaving; steam; hot water; hot air; cold treatment As reviewed by Munhuweyi et al. (2016a), different physical treatments, including heat treatment, can be applied to enhance the quality, storage and shelf life of pomegranate fruit.	Impact
Conditions of transport	Specific requirements for mode and timing of transport of commodities to prevent escape of the pest and/or contamination. a) physical protection of consignment b) timing of transport/trade If plant material, potentially infected or contaminated with *C. granati* (including waste material) must be transported, specific transport conditions (type of packaging/protection, transport means) should be defined to prevent the pathogen from escaping. These may include, albeit not exclusively: physical protection, sorting prior to transport, sealed packaging, etc.	Entry/Spread

Control measure/Risk reduction option (Blue underline = Zenodo doc, Blue = WIP)	RRO summary	Risk element targeted (entry/ establishment/ spread/impact)
Controlled atmosphere	Treatment of plants by storage in a modified atmosphere (including modified humidity, O_2, CO_2, temperature, pressure). As reviewed by Munhuweyi et al. (2016a), modified atmosphere packaging (MAP) in combination with optimum low storage temperature has been successfully used to prolong fruit shelf life.	Impact
Post-entry quarantine and other restrictions of movement in the importing country	This information sheet covers post-entry quarantine (PEQ) of relevant commodities; temporal, spatial and end-use restrictions in the importing country for import of relevant commodities; Prohibition of import of relevant commodities into the domestic country. 'Relevant commodities' are plants, plant parts and other materials that may carry pests, either as infection, infestation or contamination. Recommended for plant species known to be host of *C. granati*. Nevertheless, this measure does not apply to fruits of host plants.	Establishment/Spread

3.6.1.2. Additional supporting measures

Potential additional supporting measures are listed in Table 6.

Table 6: Selected supporting measures (a full list is available in EFSA PLH Panel, 2018) in relation to currently unregulated hosts and pathways. Supporting measures are organisational measures or procedures supporting the choice of appropriate risk reduction options that do not directly affect pest abundance

Supporting measure (Blue underline = Zenodo doc, Blue = WIP)	Summary	Risk element targeted (entry/establishment/ spread/impact)
Inspection and trapping	Inspection is defined as the official visual examination of plants, plant products or other regulated articles to determine if pests are present or to determine compliance with phytosanitary regulations (ISPM 5). The effectiveness of sampling and subsequent inspection to detect pests may be enhanced by including trapping and luring techniques. The pathogen may remain quiescent or latent within the host tissues (asymptomatic). Therefore sampling and laboratory testing is needed in addition to visual inspection.	Establishment/Spread
Laboratory testing	Examination, other than visual, to determine if pests are present using official diagnostic protocols. Diagnostic protocols describe the minimum requirements for reliable diagnosis of regulated pests. Morphology and DNA-based identification allow the detection and identification of *C. granati* (see Section 3.1.5).	Entry/Establishment/Spread

Supporting measure (Blue underline = Zenodo doc, Blue = WIP)	Summary	Risk element targeted (entry/establishment/spread/impact)
Sampling	According to ISPM 31, it is usually not feasible to inspect entire consignments, so phytosanitary inspection is performed mainly on samples obtained from a consignment. It is noted that the sampling concepts presented in this standard may also apply to other phytosanitary procedures, notably selection of units for testing. For inspection, testing and/or surveillance purposes the sample may be taken according to a statistically based or a non-statistical sampling methodology.	Entry/Establishment/Spread
Phytosanitary certificate and plant passport	An official paper document or its official electronic equivalent, consistent with the model certificates of the IPPC, attesting that a consignment meets phytosanitary import requirements (ISPM 5) a) export certificate (import) b) plant passport (EU internal trade) Recommended for plant species known to be hosts of *C. granati*, including fruits, plant parts (e.g., branches).	Entry/Spread
Certified and approved premises	Mandatory/voluntary certification/approval of premises is a process including a set of procedures and of actions implemented by producers, conditioners and traders contributing to ensure the phytosanitary compliance of consignments. It can be a part of a larger system maintained by the NPPO in order to guarantee the fulfilment of plant health requirements of plants and plant products intended for trade. Key property of certified or approved premises is the traceability of activities and tasks (and their components) inherent the pursued phytosanitary objective. Traceability aims to provide access to all trustful pieces of information that may help to prove the compliance of consignments with phytosanitary requirements of importing countries. Certified and approved premises reduce the likelihood of the plants and plant products originating in those premises to be infected by *C. granati*.	Entry/Spread
Certification of reproductive material (voluntary/official)	Plants come from within an approved propagation scheme and are certified pest free (level of infestation) following testing; Used to mitigate against pests that are included in a certification scheme. The risk of entry and/or spread of *C. granati* is reduced if host plants for planting, including seeds for sowing, are produced under an approved certification scheme and tested free of the pathogen.	Entry/Spread
Delimitation of Buffer zones	ISPM 5 defines a buffer zone as 'an area surrounding or adjacent to an area officially delimited for phytosanitary purposes in order to minimize the probability of spread of the target pest into or out of the delimited area, and subject	Spread

Supporting measure (Blue underline = Zenodo doc, Blue = WIP)	Summary	Risk element targeted (entry/establishment/ spread/impact)
	to phytosanitary or other control measures, if appropriate' (ISPM 5). The objectives for delimiting a buffer zone can be to prevent spread from the outbreak area and to maintain a pest free production place (PFPP), site (PFPS) or area (PFA). Delimitation of a buffer zone around an outbreak area can prevent spread of the pathogen and maintain a pest-free area, site or place of production.	
Surveillance	Surveillance to guarantee that plants and produce originate from a Pest Free Area could be an option. *C. granati* has been reported to be present in the EU. Therefore, surveillance would be an efficient supporting measure to define pest-free areas or pest-free places of production as well as to prevent further spread of the pathogen.	Spread

3.6.1.3. Biological or technical factors limiting the effectiveness of measures

- Latently infected (asymptomatic) host plants and plant products cannot be detected by visual inspection.
- The theoretical possibility of sexual recombination in *C. granati* may increase the chance of developing resistance against fungicides.

3.7. Uncertainty

The distribution in the EU.

4. Conclusions

C. granati is known to be present in the EU (Spain, Italy, Greece, Hungary) where it is widely distributed in major pomegranate growing areas. Therefore, *C. granati* does not satisfy the criteria that are within the remit of EFSA to assess for this species to be regarded as potential Union QP (Table 7).

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

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of *C. granati* is clearly defined.	None
Absence/presence of the pest in the EU (Section 3.2)	*Coniella granati* is known to be present in Greece, Hungary, Italy, and Spain.	None
Pest potential for entry, establishment and spread in the EU (Section 3.4)	*Coniella granati* has already entered the EU and it may be further introduced into, further established in, and spread within the EU territory. The main pathways for the further entry of the pathogen into, and spread within the EU territory are: (i) host plants for planting, (ii) fresh fruits of host plants, and (iii) soil and other plant growing media, originating in infested third countries. *C. granati* is present in the EU, which indicates that both the biotic (host availability) and abiotic (climate suitability) factors occurring in parts of the EU are favourable for the establishment of the pathogen. *C. granati* could potentially spread within the EU by both natural and human-assisted means.	None

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Key uncertainties
Potential for consequences in the EU (Section 3.5)	The further introduction and/or spread of *C. granati* into the EU is expected to have yield and quality impacts in parts of the territory where susceptible hosts are grown.	None
Available measures (Section 3.6)	Although not specifically targeted against *C. granati*, existing phytosanitary measures mitigate the likelihood of the pathogen's further introduction and spread in the EU territory. Potential additional measures also exist to further mitigate the risk of further introduction and spread of the pathogen in the EU.	None
Conclusion (Section 4)	*Coniella granati* does not satisfy the criteria that are within the remit of EFSA to assess for this species to be regarded as potential Union quarantine pest as it is present in several EU MSs and widespread in at least some of them.	None
Aspects of assessment to focus on/scenarios to address in future if appropriate:	Given the uncertainty on the host range, it is recommended to initiate studies on potential hosts. Surveys are recommended to be conducted in all pomegranate growing areas. In case a country would like to request protected zone status a surveillance program would need to be implemented.	

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Abbreviations

EPPO	European and Mediterranean Plant Protection Organisation
FAO	Food and Agriculture Organisation
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, 2021)
Control (of a pest)	Suppression, containment or eradication of a pest population (FAO, 2021)
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, 2021)
Eradication (of a pest)	Application of phytosanitary measures to eliminate a pest from an area (FAO, 2021)
Establishment (of a pest)	Perpetuation, for the foreseeable future, of a pest within an area after entry (FAO, 2021)
Greenhouse	A walk-in, static, closed place of crop production with a usually translucent outer shell, which allows controlled exchange of material and energy with the surroundings and prevents release of plant protection products (PPPs) into the environment.
Hitchhiker	An organism sheltering or transported accidentally via inanimate pathways including with machinery, shipping containers and vehicles; such organisms are also known as contaminating pests or stowaways (Toy and Newfield, 2010).
Impact (of a pest)	The impact of the pest on the crop output and quality and on the environment in the occupied spatial units
Introduction (of a pest)	The entry of a pest resulting in its establishment (FAO, 2021)

Pathway	Any means that allows the entry or spread of a pest (FAO, 2021)
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, 2021)
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, 2021)
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, 2021)

Appendix A – *Coniella granati* host plants/species affected

Source: CABI (online), Farr, D.F., & Rossman, A.Y. ARS, USDA (online)
Only *Punica granatum* and *Rosa* spp. are confirmed hosts.

Host status	Host name	Plant family	Common name	Reference[A]
Cultivated hosts	*Citrus* spp.	Rutaceae	–	Alvarez et al. (2016)
	Malus spp.	Rosaceae	Ornamental species apple	CABI (online)
	Punica granatum	Punicaceae	Pomegranate	CABI (online)
	Rosa spp.	Rosaceae	–	Mahadevakumar et al. (2022)
	Hevea spp.	Euphorbiaceae	Rubber tree	Sutton (1980)
	Vitis vinifera	Vitaceae	Grapevine	Alvarez et al. (2016)
Ornamental hosts	*Anogeissus acuminata*	Combretaceae	–	Thaung (2008)
	Caesalpinia pulcherrima	Fabaceae	Barbados flower	Alaka and Rao (1998)
Artificial/ experimental host	*Capsicum annuum L*	Solanaceae	Pepper	Jabnoun-Khiareddine et al. (2018)
	Citrus limon L	Rutaceae	Lemon	Jabnoun-Khiareddine et al. (2018)
	Citrus sinensis	Rutaceae	Orange	Jabnoun-Khiareddine et al. (2018)
	Cucurbita melo var. flexuosus L. Naudin	Cucurbitaceae	Snake melon	Jabnoun-Khiareddine et al. (2018)
	Eriobotrya japonica	Rosaceae	Loquat	Jabnoun-Khiareddine et al. (2018)
	Fragaria vesca	Rosaceae	Strawberry	Jabnoun-Khiareddine et al. (2018)
	Malus domestica	Rosaceae	Apple	Jabnoun-Khiareddine et al. (2018)
	Solanum lycopersicum L.	Solanaceae	Tomato	Jabnoun-Khiareddine et al. (2018)
	Prunus armeniaca	Rosaceae	Apricot	Jabnoun-Khiareddine et al. (2018)
	Prunus persica	Rosaceae	Peach	Jabnoun-Khiareddine et al. (2018)

Appendix B – Distribution of *Coniella granati*

Distribution records based on EPPO Global Database (EPPO, online), CABI CPC (CABI, online) and literature.

Region	Country	Sub-national (e.g. State)	Status	References
North America	United States of America		Present, no details	EPPO (online)
	United States of America	California	Present, no details	EPPO (online)
	United States of America	Florida	Present, no details	EPPO (online)
	United States of America	North Carolina	Present, no details	EPPO (online)
Central America	Mexico		Present, few occurences	EPPO (online)
South America	Brazil		Present, no details	EPPO (online)
EU (27)	Cyprus		Present, no details	EPPO (online)
	Greece		Present, no details	EPPO (online)
	Hungary		Present, restricted distribution	EPPO (online)
	Italy		Present, no details	EPPO (online)
	Netherlands		Present, no details	Richardson (1990)
	Spain		Present, no details	EPPO (online)
Other Europe	Türkiye		Present, no details	EPPO (online)
	Ukraine		Present, no details	EPPO (online)
Africa	Kenya		Present, no details	EPPO (online)
	South Africa		Present, restricted distribution	EPPO (online)
	Tunisia		Present, no details	EPPO (online)
Asia	Armenia		Present, no details	Teterevnikova-Babaian and Simonian (1952)
	Azerbaijan		Present, no details	Guliyev et al. (2021)
	China		Present, no details	EPPO (online)
	China	Anhui	Present, no details	EPPO (online)
	China	Nanjing	Present, no details	Tai and Chen (1933)
	China	Shaanxi	Present, no details	EPPO (online)
	Georgia		Present, no details	Hazaradze and Nacvliavili (1961)
	India		Present, restricted distribution	EPPO (online)
	India	Andhra Pradesh	Present, no details	EPPO (online)
	India	Bihar	Present, no details	EPPO (online)
	India	Gujarat	Present, no details	EPPO (online)
	India	Himachal Pradesh	Present, no details	EPPO (online)
	India	Karnataka	Present, no details	EPPO (online)
	India	Kerala	Present, no details	EPPO (online)
	India	Madhya Pradesh	Present, no details	EPPO (online)
	India	Maharashtra	Present, no details	EPPO (online)
	India	Meghalaya	Present, no details	EPPO (online)
	India	Rajasthan	Present, no details	EPPO (online)
	Iran		Present, no details	EPPO (online)
	Israel		Present, few occurences	EPPO (online)

Region	Country	Sub-national (e.g. State)	Status	References
	Japan		Present, no details	Katsura (1951)
	Korea, Republic		Present, no details	EPPO (online)
	Myanmar		Present, no details	EPPO (online)
	Pakistan		Present, no details	EPPO (online)
	Thailand		Present, no details	EPPO (online)
Oceania	Solomon islands		Present, no details	CABI (online)

Appendix C – EU 27 annual imports of hosts from countries where *Coniella granati* is present, 2016–2020 (in 100 kg)

Source: Eurostat accessed on 1 November 2023

		2016	2017	2018	2019	2020
Roses, whether or not grafted	Republic of Korea	3.44	0.79	4.13	29.14	2.28
	South Africa	12.93	2.22	1456.90	14.29	7.64
	Kenya	35.87	:	9.57	6.92	15.70
	Thailand	:	0.08	1.80	0.38	:
	Ukraine	58.28	54.27	148.35	112.12	105.60
	India	3.67	3.52	17.18	17.67	17.80
	Türkiye	:	94.96	0.85	:	8.85
	Japan	0.03	19.97	0.01	0.15	0.85
	Israel	:	4.06	0.04	150.01	:
	Sum	2433.19	1199.29	4149.06	954.43	161.73
		2016	**2017**	**2018**	**2019**	**2020**
Trees, shrubs and bushes, grafted or not, of kinds which bear edible fruit or nuts (excl. with bare roots, citrus, and vine slips)	South Korea	:	:	:	163.76	:
	Iran	:	:	:	8.17	:
	South Africa	0.35	0.13	109.84	29.83	439.58
	China	106.32	551.66	404.53	642.61	305.32
	Tunisia	11.00	55.00	111.42	144.73	129.40
	Mexico		2.44	0.42	0.94	0.63
	Kenya	2.92	4.12	0.74	0.67	1.01
	Thailand	:	:	:	0.02	0.36
	Ukraine	2108.35	2481.79	1680.84	2090.06	284.40
	Türkiye	4111.75	2814.85	4261.34	7016.07	2559.26
	Brazil	:	:	:	:	0.78
	Israel	526.74	1755.36	1350.76	1758.56	55.42
	India	:	4.00	:	0.02	:
	Japan	66.57	133.75	0.95	41.26	0.55
	Sum	6,934	7803.1	7920.84	11896.7	3776.71
		2016	**2017**	**2018**	**2019**	**2020**
Unrooted cuttings and slips (excl. vines)	South Korea	57.20	72.93	46.22	121.83	74.31
	South Africa	50.45	33.31	115.15	23.21	61.33
	China	15897.47	15436.37	15876.22	16665.71	12758.11
	Tunisia	172.45	:	:	:	:
	Mexico	90.58	60.44	49.62	14.10	21.09
	Kenya	15928.13	16770.28	17160.66	17337.16	16292.85
	Thailand	516.11	486.61	567.78	386.53	438.92
	Ukraine	205.79	128.38	212.54	241.35	114.85
	Türkiye	1095.35	1452.37	1573.38	1837.43	1583.51
	Brazil	507.88	575.26	456.74	516.19	812.51
	Israel	1942.68	2227.52	1743.38	1139.94	1074.63
	India	80.64	91.79	77.71	34.64	59.26
	Japan	50.20	100.90	135.10	34.96	25.05
	Sum	36594.93	37436.16	38014.50	38353.05	33316.42

		2016	2017	2018	2019	2020
Trees, shrubs and bushes, with bare roots, grafted or not, of kinds which bear edible fruit or nuts (excl. vine slips)	South Korea	:	:	2.17	0.65	1.23
	Iran	46.38	0.69	0.10	:	:
	South Africa	:	50.00	:	:	:
	China	:	:	:	4.58	:
	Tunisia	:	:	:		:
	Mexico	:	148.75	:	0.20	:
	Kenya	150.20	342.10	503.10	177.71	:
	Thailand	820.80	808.15	927.59	1612.63	32.30
	Ukraine					
	Türkiye	107.43	0.05	:	:	:
	Brazil	:	:	:	0.20	:
	India	:	:	2.17	0.65	1.23
	Sum	1124.81	1349.74	1432.96	1795.97	33.53