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Pest categorisation of *Takahashia japonica*

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Abstract

The EFSA Panel on Plant Health performed a pest categorisation of *Takahashia japonica* (Hemiptera: Sternorrhyncha: Coccidae), the Asian string cottony scale, for the EU. This insect is native to Japan, and it is now established in many countries in Asia. It was first recorded in the EU (Italy) in 2017 and has also been found in Croatia. It is not listed in Annex II of Commission Implementing Regulation (EU) 2019/2072. It is polyphagous, feeding on broad-leafed trees and shrubs assigned to 25 genera belonging to 17 families. Host plant species commonly found in EU include maple (*Acer* spp.), alder (*Alnus japonica*), silkworm mulberry (*Morus alba*), black mulberry (*Morus nigra*), quince (*Cydonia oblonga*), walnut (*Juglans regia*), cherry plum (*Prunus cerasifera*), apple (*Malus domestica*) and citrus (*Citrus* sp.). Climatic conditions and availability of host plants in southern and central EU countries have allowed this species to establish and spread. Impact in cultivated hosts including citrus, mulberries, quinces, apples, plums, forest trees, as well as ornamental plants, is anticipated. Phytosanitary measures are available to reduce the likelihood of entry and further spread. *T. japonica* meets the criteria that are within the remit of EFSA to assess for this species to be regarded as a potential Union quarantine pest.

Keywords: string cottony scale, Hemiptera, Coccidae, pest risk, plant health, plant pest, quarantine

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Table of contents

1. Introduction

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

1.1.1. Background

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

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

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

1.1.2. Terms of Reference

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

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

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

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

1.2. Interpretation of the Terms of Reference

Takahashia japonica 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 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 quarantine pest, risk reduction options will be identified.

1.3. Additional information

This pest categorisation was initiated as a result of media monitoring, PeMoScoring[1] and subsequent discussion at the Standing Committee on Plants, Animals, Food and Feed, 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 *T. japonica*, EFSA has consulted the NPPOs of Italy and Croatia. The results of this consultation are presented in Section 3.2.2.

2.1.2. Literature search

A literature search on *T. japonica* 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 *T. japonica* 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 *T. japonica*, following guiding principles and steps presented in the EFSA guidance on quantitative pest risk assessment (EFSA PLH Panel, 2018), the

[1] PeMoScoring is a ranking system that orders pests by risks posed to the EU and provide a tool to support risk managers in the decision of actions to take. It helps risk managers decide (i) whether further risk assessment, such as pest categorisation, is needed, (ii) whether EU surveillance and import control must be enforced for newly identified specific pests.

EFSA guidance on the use of the weight of evidence approach in scientific assessments (EFSA Scientific Committee, 2017) and the International Standards for Phytosanitary Measures No. 11 (FAO, 2013).

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

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

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

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

3. Pest categorisation

3.1. Identity and biology of the pest

3.1.1. Identity and taxonomy

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

Yes, the identity of the pest is established and *Takahashia japonica* (Cockerell) is the accepted name.

Takahashia japonica (Cockerell) is an insect within the order Hemiptera, suborder Sternorhyncha, family Coccidae, and is commonly known as string cottony scale (EPPO, online; García Morales

et al., 2016). *T. japonica* was originally described as *Pulvinaria* ((*Takahashia*) *japonica* by Cockerell in 1896 from specimens collected in Tokyo, Japan, on *Morus alba* (mulberry). Later Kuwana (1902) changed the status of *Takahashia* to generic level (García Morales et al., 2016).

The EPPO code[2] (Griessinger and Roy, 2015; EPPO, 2019a) for this species is: TAKAJA (EPPO, online).

3.1.2. Biology of the pest

T. japonica is a parthenogenetic species. In Italy it has one generation per year (Limonta et al., 2022; Malumphy et al., 2019; Tuffen et al., 2019). Oviposition starts in late April and continues until early May (Limonta et al., 2022). Fecundity is high and the females can lay up to 5,000 eggs. The eggs are laid in a long string-like white waxy ovisac about 6–7 cm in length, hanging from tree branches and twigs in a characteristic loop (Figure 1) (Limonta et al., 2022). First instars crawl over the host plant or are locally dispersed by wind (Limonta et al., 2022). Nymphs feed on the lower leaf surface during the summer before moving to the branches in autumn, where they overwinter (Malumphy et al., 2019; Tuffen et al., 2019). The moult to the adult female occurs at the same overwintering site (Limonta et al., 2022). Important features of the life history strategy are presented in Table 2.

Figure 1: *Takahashia japonica*: mature adult females with their characteristic long, string-like, looped ovisacs, hanging from the bark (Copyright: EPPO, Matteo Maspero)

Six species of parasitoid wasps in the family Encyrtidae have been reported attacking *T. japonica* (Limonta et al., 2022) and parasitised scales were observed in the UK (Malumphy et al., 2019; Tuffen et al., 2019).

Table 2: Important features of the life history strategy of *Takahashia japonica*

Life stage	Phenology and relation to host	Other relevant information
Egg	Oviposition takes place from late April to early May (Limonta et al., 2022). Eggs hatch in early June (Limonta and Pellizzari, 2018; Tuffen et al., 2019).	
Nymph	First instar nymphs (crawlers) move from twigs to the underside of leaves and settle on the veins in May–June. Second instar nymphs move from leaves to twigs in September–October, to overwinter. They are active again in March (Limonta et al., 2022).	Crawlers can be dispersed by the wind, insects, or birds (Limonta et al., 2022).
Adult	First adults appear in April, and all the population reaches the adult stage over a period of 10 days (Limonta et al., 2022).	

[2] 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, 2019a).

3.1.3. Host range/species affected

T. japonica is polyphagous, feeding on plants in more than 25 genera from 17 plant families (Appendix A provides a full host list). *T. japonica* has been recorded on broad-leafed trees and shrubs such as maple (*Acer* spp.), elm (*Ulmus davidiana*), alder (*Alnus japonica*), citrus (*Citrus* sp.), silkworm mulberry (*Morus alba*), black mulberry (*Morus nigra*), quince (*Cydonia oblonga*), walnut (Juglans regia), sweetgum (*Liquidambar styraciflua*), cherry plum (*Prunus cerasifera*), Asian pear (*Pyrus serotina*) and apple (*Malus domestica*), as well as on ornamental plants (García Morales et al., 2016; Limonta et al., 2022).

3.1.4. Intraspecific diversity

No intraspecific diversity has been reported for *T. japonica*.

3.1.5. Detection and identification of the pest

Are detection and identification methods available for the pest?

Yes, visual detection is possible, and morphological and molecular identification methods are available.

Detection

Visual examination on plants is an effective way for detection. Plant damage might not be obvious in early infestation, but the presence of the scales is noticeable due to the white ovisacs hanging from twigs and branches (Figure 1) (Limonta et al., 2022). During the crawler stage, infestation is difficult to detect (Malumphy et al., 2019).

Symptoms

According to Landeka et al. (2021), Limonta et al. (2022), Malumphy et al. (2019) and Tuffen et al. (2019), the main symptoms of *T. japonica* infestation are:

- dieback and necrosis of buds,
- white string-like ovisacs hanging from twigs and branches (unique among scale insects present in Europe),
- heavy infestation causes yellowing, defoliation, reduced plant growth, dieback of the branches or of the entire plant.

Identification

The identification of *T. japonica* requires microscopic examination of slide-mounted adults and verification of the presence of key morphological characteristics. Detailed morphological descriptions, illustrations, and keys of adult *T. japonica* can be found in De Lotto (1968), Hodgson (1994) and Limonta et al. (2022). *Takahashia* is a monotypic genus (contains a single species).

Molecular techniques based on the nucleotide sequence of the mitochondrial S1843 cytochrome c oxidase subunit I (COI) gene have been developed for species identification. GenBank contains gene nucleotide sequence for *T. japonica* (https://www.ncbi.nlm.nih.gov/nuccore/MW450951.1).

Description

The ovisacs of *T. japonica* are white, string-like, looped, hanging from the bark (EPPO, 2019b), about 2.5–4.0 cm, up to 7.0 cm in length (Limonta et al., 2022). First instar nymphs are oval, flattened about 740 μm long and 325 μm wide (Limonta et al. 2022). Second instar nymphs are oval, brown (Limonta et al., 2022). Pre-reproductive adult females are pale green-yellow (Limonta et al., 2022) turning to pale brown, oblong, and up to 7 mm long and 4 mm wide. Mature adult females are dark brown with a deeply wrinkled dorsum (Malumphy et al., 2019; Tuffen et al., 2019).

3.2. Pest distribution

3.2.1. Pest distribution outside the EU

T. japonica is an Asian species which was first described in Japan (García Morales et al., 2016). Its current distribution includes most of Eastern China, South Korea and parts of India (García Morales et al., 2016; Limonta et al., 2022) (Figure 2). In the United Kingdom it was reported in December 2018 on *Magnolia* species that had been planted in a private garden in 2015 (Malumphy et al., 2019; Tuffen et al., 2019).

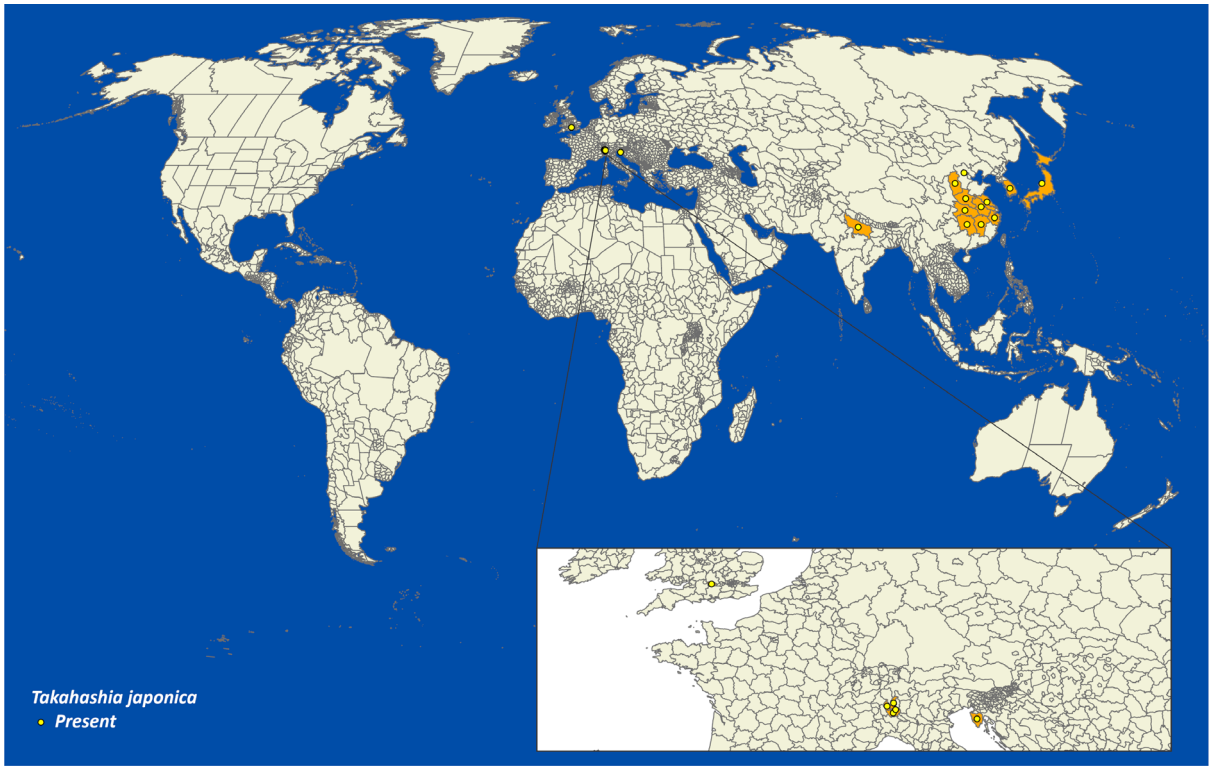

Figure 2: Global distribution of *Takahashia japonica* (data source: García Morales et al., 2016)

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. *T. japonica* has been recorded in Croatia and Italy. It is not considered widely distributed in the EU.

T. japonica was first reported in Italy, in Cerro Maggiore (Milano Province), May 2017, on black mulberry trees (*Morus nigra*) (Limonta and Pellizzari, 2018; Limonta et al., 2022). The Italian NPPO confirmed that the first finding of the pest was in Lombardy in 2017. The Regional Phytosanitary Service is monitoring the pest, but so far, no further reports have been made or relevant damage reported. No official measures are in place. In 2019, *T. japonica* was found in Pula, Istrian County, Croatia, but was not identified until found again on *Albizia julibrissim* in May 2020 (Landeka et al., 2021). The Croatian NPPO confirmed that the pest is present with few occurrences, and no official measures to limit the spread of the pest are applied.

3.3. Regulatory status

3.3.1. Commission Implementing Regulation 2019/2072

T. japonica 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 or species affected that are prohibited from entering the Union from third countries

According to the Commission Implementing Regulation (EU) 2019/2072, Annex VI, introduction of several *T. japonica* hosts in the Union from certain third countries is prohibited (Table 3).

Plants for planting of *Malus* Mill. and *Prunus* L. which are hosts of *T. japonica* (Appendix A) are considered High-Risk Plants for the EU and their import is prohibited pending risk assessment (EU 2018/2019).

Table 3: List of plants, plant products and other objects that are *Takahashia japonica* 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 *Chaenomeles* Ldl., *Crateagus* L., *Cydonia* Mill., *Malus* Mill., *Prunus* L., *Pyrus* L. and *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 ex 0602 90 91 ex 0602 90 99	Third countries other than: Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canary Islands, Faeroe Islands, Georgia, Iceland, Liechtenstein, Moldova, Monaco, Montenegro, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo-Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Türkiye, Ukraine and the United Kingdom.
9.	Plants for planting of *Cydonia* Mill., *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 41 ex 0602 90 45 ex 0602 90 46 ex 0602 90 48 ex 0602 90 50 ex 0602 90 70 ex 0602 90 91 ex 0602 90 99	Third countries, other than: Albania, Algeria, Andorra, Armenia, Australia, Azerbaijan, Belarus, Bosnia and Herzegovina, Canada, Canary Islands, Egypt, Faeroe Islands, Georgia, Iceland, Israel, Jordan, Lebanon, Libya, Liechtenstein, Moldova, Monaco, Montenegro, Morocco, New Zealand, North Macedonia, Norway, Russia (only the following parts: Central Federal District (Tsentralny federalny okrug), Northwestern Federal District (Severo-Zapadny federalny okrug), Southern Federal District (Yuzhny federalny okrug), North Caucasian Federal District (Severo-Kavkazsky federalny okrug) and Volga Federal District (Privolzhsky federalny okrug)), San Marino, Serbia, Switzerland, Syria, Tunisia, Türkiye, Ukraine, the United Kingdom and United States other than Hawaii

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**
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 0602 20 30 ex 0602 20 80 ex 0602 90 45 ex 0602 90 46 ex 0602 90 47 ex 0602 90 50 ex 0602 90 70 ex 0602 90 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

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

Yes. *T. japonica* has already entered the EU territory. Possible pathways of entry are plants for planting (except seeds bulbs and tubers).

Comment on plants for planting as a pathway.

Plants for planting are one of the main pathways for *T. japonica* to enter the EU (Table 4).

Plants for planting, fruits and cut flowers are the main potential pathways for entry of *T. japonica* (Table 4).

Table 4: Potential pathways for *Takahashia japonica* 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]
Plants for planting	All life stages	Plants for planting that are hosts of *T. japonica* and are prohibited to import from third countries (Regulation 2019/2072, Annex VI), are listed in Table 3. Plants for planting from third countries require a phytosanitary certificate (Regulation 2019/2072, Annex XI, Part A). Some hosts are considered high risk plants (**EU 2018/2019**) for the EU and their import is prohibited subject to risk assessment
Fruits and cut flowers	All life stages	Fruits and cut flowers from third countries require a phytosanitary certificate to be imported into the EU (2019/2072, Annex XI, Part A). However, no specific requirements are set for *T. japonica*.

Annual imports of *T. japonica* hosts from countries where the pest is known to occur are provided in Appendix C.

Notifications of interceptions of harmful organisms began to be compiled in Europhyt in May 1994 and in TRACES in May 2020. As of 8 March 2023, there were no records of interceptions of *T. japonica* in the Europhyt and TRACES databases.

3.4.2. Establishment

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

Yes. *T. japonica* has already established in Italy and Croatia. The climate in some other EU MS is suitable and there are many available hosts that could support establishment.

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, 2002). 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

T. japonica is a polyphagous pest of deciduous woody plants. The main hosts of the pest cultivated in the EU 27 between 2016 and 2021 are shown in Table 5. Among others, apples, plums, mulberries, quinces, walnuts and some ornamental plants are important crops in the EU.

Table 5: Crop area of *Takahashia japonica* key hosts in EU 27 in 1,000 ha (Eurostat accessed on 17 October 2022)

Crop	2016	2017	2018	2019	2020	2021
Pome fruits	–	626.02	627.16	608.61	599.84	612.04
Stone fruits	–	625.46	621.32	612.67	–	613.43
Apples	505.66	504.61	506.27	491.08	484.63	496.62
Plums	152.79	153.88	153.43	154.51	159.51	157.04
Berries (excluding strawberries)	140.83	146.27	150.42	154.44	153.87	156.47
Walnuts	72.61	74.15	80.60	87.62	97.02	100.01

3.4.2.2. Climatic conditions affecting establishment

T. japonica occurs in eastern China, Japan, South Korea, India, the United Kingdom and in the EU (northern Italy and Pula, Croatia). Central and southern EU countries provide suitable climatic conditions for the establishment of *T. japonica*. There is uncertainty as to whether *T. japonica* could establish outdoors further north in the EU. Nevertheless, there is a possibility that *T. japonica* could occur in glasshouses and on indoor plantings. Figure 3 shows the world distribution of Köppen–Geiger climate types (Kottek et al., 2006) that occur in the EU and which occur in countries where *T. japonica* has been reported.

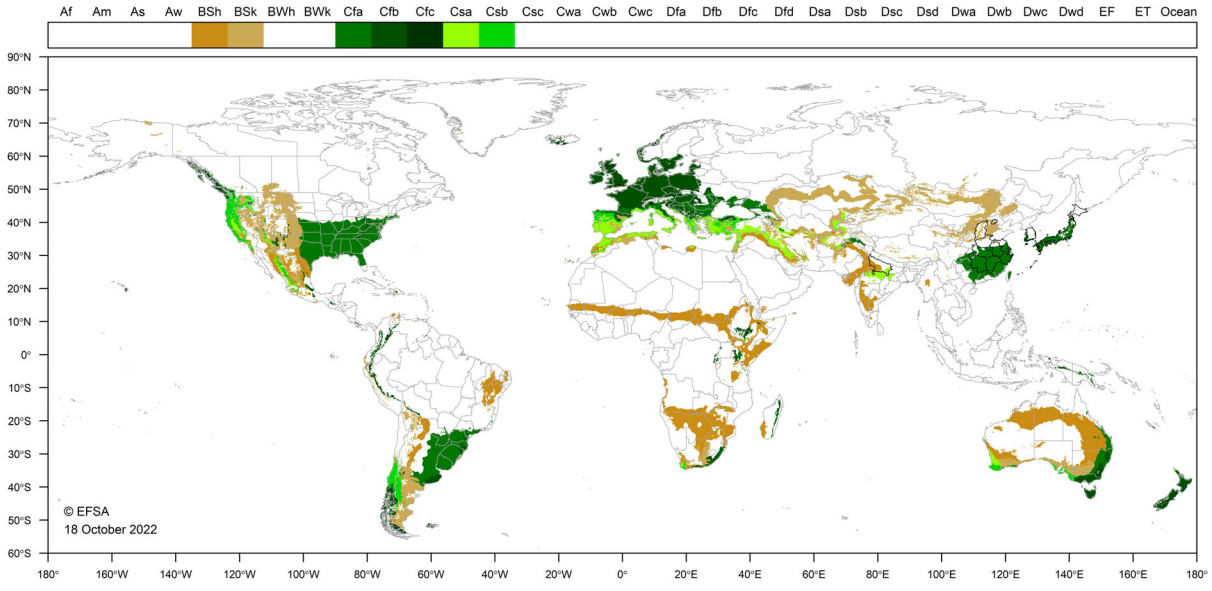

Figure 3: World distribution of Köppen–Geiger climate types that occur in the EU and which occur in countries where *Takahashia japonica* has been reported

3.4.3. Spread

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

Natural spread by first instar nymphs crawling or being carried by wind, other animals or machinery, will occur locally and relatively slowly. All stages may be moved over long distances in trade of infested plant material, of which plants for planting facilitate the greatest risk.

Comment on plants for planting as a mechanism of spread.

Plants for planting provide a main spread mechanism for *T. japonica* over long distances.

First instar nymphs (crawlers) may move to neighbouring plants on their own or be moved by wind or by hitchhiking on clothing, equipment or animals (insects and birds) (EFSA PLH Panel, 2020).

Plants for planting are the main pathways of spread of *T. japonica* over long distances.

3.5. Impacts

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

Yes, *T. japonica* has established in the EU, impacts have been reported.

When abundant, *T. japonica* causes defoliation, and in some cases, dieback of the branches and the entire plant (Landeka et al., 2021). It also egests limited honeydew droplets which cover leaf surface (Limonta et al., 2022). *T. japonica* has been reported to cause significant damage on *Acer* spp. and *Morus alba* L., in Croatia, some of which suffered significant defoliation and crown decline (Landeka et al., 2021). In Italy, heavy infestations of *T. japonica* on twigs cause dieback and necrosis of buds, which is mostly harmful to newly planted young trees. Despite some heavy infestations, no real impact on plant vigour has been noticed in fully grown trees (Limonta et al., 2022). In Asia there are no reports of economic impact. *T. japonica* occurs on several hosts that are important in the wider environment and has the potential to have an impact. However, the related horse-chestnut scale *Pulvinaria regalis* Canard has a similar biology and host range and is the most abundant coccid on woody plants in urban areas in Britain. *P. regalis* has never developed large populations in natural areas and has no environmental impact (Malumphy and Badmin, 2012). There is uncertainty on the potential influence of natural enemies.

Despite being reported in commercial apple orchards in South Korea (Kwon and Han, 2003), there is lack of information regarding the impact of *T. japonica* on apples.

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 the existing phytosanitary measures identified in Section 3.3.2 do not specifically target *T. japonica*, they mitigate the likelihood of entry into, establishment and spread within the EU (see also Section 3.6.1).

3.6.1. Identification of potential additional measures

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

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

3.6.1.1. Additional potential risk reduction options

Potential additional control measures are listed in Table 6.

Table 6: Selected control measures (a full list is available in EFSA PLH Panel, 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	Pest free place of production (e.g. place of production and its immediate vicinity is free from pest over an appropriate time period, e.g. since the beginning of the last complete cycle of vegetation, or past 2 or 3 cycles). Pest free production site	Entry/Establishment/Spread
Growing plants in isolation	Place of production is insect proof originate in a place of production with complete physical isolation.	Entry/Establishment/Spread
Managed growing conditions	Used to mitigate likelihood of infestation at origin. Plants collected directly from natural habitats, have been grown, held and trained for at least two consecutive years prior to dispatch in officially registered nurseries, which are subject to an officially supervised control regime.	Entry/Establishment/Spread
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. Pruning of the infested twigs and branches in winter, when the overwintering nymphs are noticeable or in spring, before egg hatching, are suggested to reduce infestations (Limonta et al., 2022).	Entry/Spread/Impact
Biological control and behavioural manipulation	Wang et al., 2016 reported that *Encyrtus sasakii* as a parasitoid of *T. japonica*. In South Korea, *E. sasakii* is associated with *T. japonica* (Soo-Jung, 2019), whereas in Italy no parasitoid has been recorded on *T. japonica* so far (Limonta et al., 2022).	Impact
Chemical treatments on crops including reproductive material	Used to mitigate likelihood of infestation of pests susceptible to chemical treatments. The effectiveness of insecticide applications against *T. japonica* may be reduced by the protective cover over the scale. Urban areas have strong limitations with regards to chemical treatments. Mineral oils and systemic insecticides can be used (Royal Horticultural Society, online).	Entry/Establishment/Spread/ Impact
Cleaning and disinfection of facilities, tools and machinery	The physical and chemical cleaning and disinfection of facilities, tools, machinery, facilities and other accessories (e.g. boxes, pots, hand tools).	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	Entry/Spread
Controlled atmosphere	Treatment of plants by storage in a modified atmosphere (including modified humidity, O_2, CO_2, temperature, pressure). Used to mitigate likelihood of infestation of pests susceptible to modified atmosphere (usually applied during transport) hence to mitigate entry. Controlled atmosphere storage can be used in commodities such as fresh and dried fruits.	Entry/Spread (via commodity)

3.6.1.2. Additional supporting measures

Potential additional supporting measures are listed in Table 7.

Table 7: Selected supporting measures (a full list is available in EFSA PLH Panel, 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.	Entry/establishment/ Spread/Impact
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.	Entry/Establishment/ Spread
Sampling	According to ISPM 31, it is usually not feasible to inspect entire consignments, so phytosanitary inspection is performed mainly on samples obtained from a consignment. It is noted that the sampling concepts presented in this standard may also apply to other phytosanitary procedures, notably selection of units for testing. 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
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)	Entry/Establishment/ 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.	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.	Entry/Spread

Supporting measure (Blue underline = Zenodo doc, Blue = WIP)	Summary	Risk element targeted (entry/establishment/ spread/impact)
Delimitation of Buffer zones	ISPM 5 defines a buffer zone as 'an area surrounding or adjacent to an area officially delimited for phytosanitary purposes in order to minimise the probability of spread of the target pest into or out of the delimited area, and subject to phytosanitary or other control measures, if appropriate' (ISPM 5). The objectives for delimiting a buffer zone can be to prevent spread from the outbreak area and to maintain a pest free production place (PFPP), site (PFPS) or area (PFA).	Spread
Surveillance	Surveillance to guarantee that plants and produce originate from a Pest Free Area could be an option.	Establishment/Spread

3.6.1.3. Biological or technical factors limiting the effectiveness of measures

- *T. japonica* is polyphagous, making the inspections of all consignments containing hosts from countries where the pest occurs difficult.
- Limited effectiveness of insecticides due to the presence of protective cover over the scales.
- Limited available biological data.

3.7. Uncertainty

No key uncertainty was identified.

4. Conclusions

T. japonica satisfies all the criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest (Table 8).

Table 8: The Panel's conclusions on the pest categorisation criteria defined in Regulation (EU) 2016/2031 on protective measures against pests of plants (the number of the relevant sections of the pest categorisation is shown in brackets in the first column)

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Key uncertainties
Identity of the pest (Section 3.1)	The identity of *T. japonica* is established. Taxonomic keys based on morphology of adults exist. There are also molecular techniques for species identification.	None
Absence/presence of the pest in the EU (Section 3.2)	Yes, *T. japonica* is present in the EU (Croatia and Italy).	None
Pest potential for entry, establishment and spread in the EU (Section 3.4)	*Takahashia japonica* is able to enter, become established and spread within the EU territory especially in the central and southern EU MS. The main pathways are plants for planting, cut flowers and fruits.	None
Potential for consequences in the EU (Section 3.5)	The introduction of the pest could cause yield and quality losses on several crops and reduce the value of ornamental plants.	None
Available measures (Section 3.6)	There are measures available to prevent entry, establishment and spread of *T. japonica* in the EU. Risk reduction options include inspections, chemical and physical treatments on consignments of fresh plant material from infested countries and the production of plants for import in the EU in pest free areas.	None

Criterion of pest categorisation	Panel's conclusions against criterion in Regulation (EU) 2016/2031 regarding Union quarantine pest	Key uncertainties
Conclusion (Section 4)	*T. japonica* satisfies all the criteria that are within the remit of EFSA to assess for it to be regarded as a potential Union quarantine pest	
Aspects of assessment to focus on/ scenarios to address in future if appropriate:	More studies on impact and biology, particularly on natural enemies would be beneficial.	

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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 – *Takahashia japonica* host plants/species affected

Host status	Host name	Plant family	Common name	Reference
Cultivated hosts	*Acer buergerianum*	Sapindaceae	Trident maple	Limonta et al. (2022)
	Acer negundo	Sapindaceae	Aash-leaf maple, ash-leaved maple, box elder, Manitoba maple	García Morales et al. (2016)
	Acer pseudoplatanus	Sapindaceae	Common sycamore, great maple, plane maple, sycamore	García Morales et al. (2016)
	Acer pseudosieboldianum	Sapindaceae	Korean maple, purple-bloom maple	García Morales et al. (2016)
	Acer	Sapindaceae		García Morales et al. (2016)
	Albizia julibrissin	Fabaceae	Persian acacia, pink siris, silk tree, varay cotton, silk-tree albizia, silk-tree mimosa	García Morales et al. (2016)
	Alnus japonica	Betulaceae	Japanese alder	García Morales et al. (2016)
	Carpinus betulus	Betulaceae	Common hornbeam, hornbeam, white beech	García Morales et al. (2016)
	Celtis australis	Cannabaceae	European hackberry, European nettle tree, hackberry, honeyberry, lote tree, lotus tree, Mediterranean hackberry, nettle tree, southern nettle tree	García Morales et al. (2016)
	Celtis sinensis	Cannabaceae	Japanese hackberry, Chinese elm	García Morales et al. (2016)
	Citrus	Rutaceae		Limonta et al. (2022)
	Cornus officinalis	Cornaceae	Japanese cornel	Limonta et al. (2022)
	Cydonia oblonga	Rosaceae	Quince	García Morales et al. (2016)
	Diospyros kaki	Ebenaceae	Chinese date plum, Chinese persimmon, Japanese persimmon, kaki, kaki plum, persimmon	García Morales et al. (2016)
	Juglans regia	Juglandaceae	Common walnut, Persian walnut, walnut	García Morales et al. (2016)
	Lespedeza bicolor	Fabaceae	Bicolor lespedeza, shrub lespedeza	García Morales et al. (2016)
	Lespedeza	Fabaceae		García Morales et al. (2016)
	Liquidambar styraciflua	Altingiaceae	American sweet gum, red gum, sweetgum	García Morales et al. (2016)
	Loropetalum chinense	Hamamelidaceae	Chinese fringe flower, hazelberry	Limonta et al. (2022)
	Magnolia kobus	Magnoliaceae	Northern Japanese magnolia	García Morales et al. (2016)
	Magnolia obovata	Magnoliaceae	Japanese big-leaved magnolia, silver-leaf magnolia, silverleaf magnolia	García Morales et al. (2016)
	*Malus domestica**	Rosaceae	Apple	García Morales et al. (2016)

Host status	Host name	Plant family	Common name	Reference
	Morus alba	Moraceae	Silkworm mulberry, white mulberry	García Morales et al. (2016)
	Morus nigra	Moraceae	Black mulberry, common mulberry	García Morales et al. (2016)
	Morus	Moraceae		García Morales et al. (2016)
	Parthenocissus tricuspidata	Vitaceae	Boston ivy, Japanese ivy	García Morales et al. (2016)
	Prunus cerasifera	Rosaceae	Cherry plum, myrobalan plum	García Morales et al. (2016)
	Prunus glandulosa	Rosaceae	Chinese bush cherry, flowering almond	García Morales et al. (2016)
	Prunus salicina	Rosaceae	Chinese plum, Japanese plum	García Morales et al. (2016)
	Prunus tomentosa	Rosaceae	Nanking cherry	García Morales et al. (2016)
	Pyrus serotina	Rosaceae	Chinese pear	Limonta et al. (2022)
	Rhododendron schlippenbachii	Ericaceae	Royal azalea	García Morales et al. (2016)
	Robinia pseudoacacia	Fabaceae	Black locust, false acacia, locust, locust tree	Limonta et al. (2022)
	Salix chaenomeloides	Salicaceae	Giant pussy willow, Japanese pussy willow	García Morales et al. (2016)
	Salix chaenomeloides	Salicaceae	Giant pussy willow, Japanese pussy willow	Limonta et al. (2022)
	Salix glandulosa	Salicaceae	Giant pussy willow, Japanese pussy willow	Limonta et al. (2022)
	Styphnolobium japonicum	Fabaceae	Japanese pagoda tree, pagoda tree, Chinese scholar tree	García Morales et al. (2016)
	Ulmus davidiana	Ulmaceae	Japanese elm	García Morales et al. (2016)
	Zelkova serrata	Ulmaceae	Japanese zelkova, saw-leaf zelkova	García Morales et al. (2016)

*Reported as *Malus pumila*

Appendix B – Distribution of *Takahashia japonica*

Distribution records based on García Morales et al. (2016) (ScaleNet) and Limonta et al. (2022)

Region	Country	Sub-national (e.g. State)	Status
Asia	China	Hunan	Present, no details
Asia	China	Shanxi	Present, no details
Asia	China	Hubei	Present, no details
Asia	China	Beijing	Present, no details
Asia	China	Henan	Present, no details
Asia	China	Jiangsu	Present, no details
Asia	China	Anhui	Present, no details
Asia	China	Jiangxi	Present, no details
Asia	China	Zhejiang	Present, no details
Asia	India	Uttar Pradesh	Present, no details
Asia	Japan		Present, no details
Asia	South Korea		Present, no details
EU (27)	Croatia	Pula, Istrian peninsula	Present, no details
EU (27)	Italy	Varese	Present, no details
EU (27)	Italy	Monza and Brianza	Present, no details
EU (27)	Italy	Milano	Present, no details
EU (27)	Italy	Como	Present, no details
Europe, other	United Kingdom	England, Berkshire	Present, not widely distributed

Appendix C – Import data

Table C.1: Pome fruits and stone fruits (CN code: 0124) imported into the EU (27) from regions where *Takahashia japonica* is known to occur (in 100 kg) (Source: Eurostat accessed on 17 October 2022)

Country	2016	2017	2018	2019	2020	2021
United Kingdom	305,322	411,435	624,937	268,502	380,150	102,293
China	115,580	100,124	133,645	84,540	105,074	94,145
Korea, Republic of (South Korea)	789	1,036	666	823	628	334
India	326	622	1,096	1,169	755	779
Japan	11	1	2	3	19	48

Table C.2: Edible fruit or nut trees, shrubs and bushes, whether or not grafted (CN code: 060220) imported into the EU (27) from regions where *Takahashia japonica* is known to occur (in 100 kg) (Source: Eurostat accessed on 17 October 2022)

Country	2016	2017	2018	2019	2020	2021
United Kingdom	13,032	8,034	4,707	9,644	15,410	27,456
China	153	552	405	643	305	32
Japan	67	134	1	41	1	–
Korea, Republic of (South Korea)	–	–	–	164	–	–
India	0	4	–	–	–	–

Table C.3: Conifer and evergreen outdoor trees, shrubs and bushes, incl. their roots (excl. with bare roots, cuttings, slips, young plants and fruit, nut and forest trees) (CN code: 06029047) imported into the EU (27) from regions where *Takahashia japonica* is known to occur (in 100 kg) (Source: Eurostat accessed on 17 October 2022)

Country	2016	2017	2018	2019	2020	2021
United Kingdom	127	127	1,123	5,128	12,358	467
Japan	1,049	935	735	705	438	300
China	–	334	68	–	15	37

Table C.4: Fresh or dried citrus (CN code: 0805) imported into the EU (27) from regions where *Takahashia japonica* is known to occur (in 100 kg) (Source: Eurostat accessed on 17 October 2022)

Country	2016	2017	2018	2019	2020	2021
China	827,841	1,084,857	1,024,163	1,108,595	1,098,690	648,411
United Kingdom*	381,362	430,864	542,728	516,374	536,523	17,462
Japan	353	417	271	319	163	184

*: There is no commercial Citrus production in the UK, hence the data in this table represents re-exports.