SCIENTIFIC OPINION

Scientific Opinion on the pest categorisation of *Pseudomonas syringae* pv. *persicae* (Prunier et al.) Young et al.[1]

EFSA Panel on Plant Health (PLH)[2, 3]

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ABSTRACT

The European Commission requested the EFSA Panel on Plant Health to perform the pest categorisation for *Pseudomonas syringae* pv. *persicae* (*P. s.* pv. *persicae*). The agent is responsible for bacterial die-back in peach, nectarine, Japanese plum and, possibly, myrobalan plum. The disease is caused by a genetic clade within genomic species 3 of *P. syringae*, but there is only limited knowledge of the diversity of the causative agent. The host plants are cultivated throughout Europe, although it is only in southern European countries that the production of peaches and/or nectarines is of economic importance, and the cultivation of Japanese plums is restricted to some parts of southern Europe. Outbreaks are rare and currently the disease occurs only sporadically in Portugal, France and Germany. *P. s.* pv. *persicae* causes symptoms on the bark, shoots, leaves and fruit. Detection is based on symptomatology and isolation; no DNA amplification (polymerase chain reaction) protocols are available. The pathogen can be identified on the basis of disease symptoms, including shoot die-back and leaf spots, and on the basis of distinct biochemical and genetic properties. No effective management strategies are available, although disease incidence and severity can be somewhat reduced by disinfection of tools, machines and materials, the use of planting material from disease-free areas, and the avoidance of conditions favouring disease expression. Initial infections may be due to the use of (latently) infected plant material, but infections may also occur from the environment. No effective biological or chemical control agents are registered for bacterial die-back in Europe. The outbreaks, although they occur sporadically, are usually severe and can result in the loss of entire orchards.

KEY WORDS

Pseudomonas syringae pv. *persicae*, bacterial die-back of peach, bacterial decline of nectarine and peach, bacterial canker of peach, quarantine pest, regulated non-quarantine pest

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BACKGROUND AS PROVIDED BY THE EUROPEAN COMMISSION

The current European Union plant health regime is established by Council Directive 2000/29/EC[4] on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community (OJ L 169, 10.7.2000, p. 1).

The Directive lays down, amongst others, the technical phytosanitary provisions to be met by plants and plant products and the control checks to be carried out at the place of origin on plants and plant products destined for the Union or to be moved within the Union, the list of harmful organisms whose introduction into or spread within the Union is prohibited and the control measures to be carried out at the outer border of the Union on arrival of plants and plant products.

The Commission is currently carrying out a revision of the regulatory status of organisms listed in the Annexes of Directive 2000/29/EC. This revision targets mainly organisms which are already locally present in the EU territory and that in many cases are regulated in the EU since a long time. Therefore it is considered to be appropriate to evaluate whether these organisms still deserve to remain regulated under Council Directive 2000/29/EC, or whether, if appropriate, they should be regulated in the context of the marketing of plant propagation material, or be deregulated. The revision of the regulatory status of these organisms is also in line with the outcome of the recent evaluation of the EU Plant Health Regime, which called for a modernisation of the system through more focus on prevention and better risk targeting (prioritisation).

In order to carry out this evaluation, a recent pest risk analysis is needed which takes into account the latest scientific and technical knowledge on these organisms, including data on their agronomic and environmental impact, as well as their present distribution in the EU territory. In this context, EFSA has already been asked to prepare risk assessments for some organisms listed in Annex IIAII. The current request concerns 23 additional organisms listed in Annex II, Part A, Section II as well as five organisms listed in Annex I, Part A, Section I, one listed in Annex I, Part A, Section II and nine organisms listed in Annex II, Part A, Section I of Council Directive 2000/29/EC. The organisms in question are the following:

Organisms listed in Annex II, Part A, Section II:

- *Ditylenchus destructor* Thome
- *Circulifer haematoceps*
- *Circulifer tenellus*
- *Helicoverpa armigera* (Hübner)
- *Radopholus similis* (Cobb) Thome (could be addressed together with the IIAI organism *Radopholus citrophilus* Huettel Dickson and Kaplan)
- *Paysandisia archon* (Burmeister)
- *Clavibacter michiganensis* spp. *insidiosus* (McCulloch) Davis *et al.*
- *Erwinia amylovora* (Burr.) Winsl. *et al.* (also listed in Annex IIB)
- *Pseudomonas syringae* pv. *persicae* (Prunier *et al.*) Young *et al.*
- *Xanthomonas campestris* pv. *phaseoli* (Smith) Dye
- *Xanthomonas campestris* pv. *pruni* (Smith) Dye
- *Xylophilus ampelinus* (Panagopoulos) Willems *et al.*
- *Ceratocystis fimbriata* f. sp. *platani* Walter (also listed in Annex IIB)
- *Cryphonectria parasitica* (Murrill) Barr (also listed in Annex IIB)
- *Phoma tracheiphila* (Petri) Kanchaveli and Gikashvili
- *Verticillium albo-atrum* Reinke and Berthold
- *Verticillium dahliae* Klebahn
- Beet leaf curl virus

[4] Council Directive 2000/29/EC of 8 May 2000 on protective measures against the introduction into the Community of organisms harmful to plants or plant products and against their spread within the Community. OJ L 169/1, 10.7.2000, p. 1–112.

- Citrus tristeza virus (European isolates) (also listed in Annex IIB)
- Grapevine flavescence dorée MLO (also listed in Annex IIB)
- Potato stolbur mycoplasma
- *Spiroplasma citri* Saglio *et al.*
- Tomato yellow leaf curl virus

Organisms listed in Annex I, Part A, Section I:

- *Rhagoletis cingulata* (Loew)
- *Rhagoletis ribicola* Doane
- Strawberry vein banding virus
- Strawberry latent C virus
- Elm phloem necrosis mycoplasm

Organisms listed in Annex I, Part A, Section II:

- *Spodoptera littoralis* (Boisd.)

Organisms listed in Annex II, Part A, Section I:

- *Aculops fuchsiae* Keifer
- *Aonidiella citrina* Coquillet
- Prunus necrotic ringspot virus
- Cherry leafroll virus
- *Radopholus citrophilus* Huettel Dickson and Kaplan (could be addressed together with IIAII organism *Radopholus similis* (Cobb) Thome
- *Scirtothrips dorsalis* Hendel
- *Atropellis* spp.
- *Eotetranychus lewisi* McGregor
- *Diaporthe vaccinii* Shaer.

Terms of reference as provided by the European Commission

EFSA is requested, pursuant to Article 29(1) and Article 22(5) of Regulation (EC) No 178/2002, to provide a pest risk assessment of *Ditylenchus destructor* Thome, *Circulifer haematoceps, Circulifer tenellus, Helicoverpa armigera* (Hübner), *Radopholus similis* (Cobb) Thome, *Paysandisia archon* (Burmeister), *Clavibacter michiganensis* spp. *insidiosus* (McCulloch) Davis *et al, Erwinia amylovora* (Burr.) Winsl. *et al, Pseudomonas syringae pv. persicae* (Prunier *et al)* Young *et al. Xanthomonas campestris* pv. *phaseoli* (Smith) Dye, *Xanthomonas campestris* pv. *pruni* (Smith) Dye, *Xyîophilus ampelinus* (Panagopoulos) Willems *et al, Ceratocystis fimbriata* f. sp. *platani* Walter, *Cryphonectria parasitica* (Murrill) Barr, *Phoma tracheiphila* (Petri) Kanchaveli and Gikashvili, *Verticillium alboatrum* Reinke and Berthold, *Verticillium dahliae* Klebahn, Beet leaf curl virus, Citrus tristeza virus (European isolates), Grapevine flavescence dorée MLO, Potato stolbur mycoplasma, *Spiroplasma citri* Saglio *et al,* Tomato yellow leaf curl virus, *Rhagoletis cingulata* (Loew), *Rhagoletis ribicola* Doane, Strawberry vein banding virus, Strawberry latent C virus, Elm phloem necrosis mycoplasma, *Spodoptera littoralis* (Boisd.), *Aculops fuchsiae* Keifer, *Aonidiella citrina* Coquillet, Prunus necrotic ringspot virus, Cherry leafroll virus, *Radopholus citrophilus* Huettel Dickson and Kaplan (to address with the IIAII *Radopholus similis* (Cobb) Thome), *Scirtothrips dorsalis* Hendel, *Atropellis* spp., *Eotetranychus lewisi* McGregor and *Diaporthe vaccinii* Shaer., for the EU territory.

In line with the experience gained with the previous two batches of pest risk assessments of organisms listed in Annex II, Part A, Section II, requested to EFSA, and in order to further streamline the preparation of risk assessments for regulated pests, the work should be split in two stages, each with a specific output. EFSA is requested to prepare and deliver first a pest categorisation for each of these 38 regulated pests (step 1). Upon receipt and analysis of this output, the Commission will inform EFSA for which organisms it is necessary to complete the pest risk assessment, to identify risk reduction options and to provide an assessment of the effectiveness of current EU phytosanitary requirements (step 2). *Clavibacter michiganensis* spp. *michiganensis* (Smith) Davis *et al.* and *Xanthomonas campestris* pv. *vesicatoria* (Doidge) Dye, from the second batch of risk assessment requests for Annex IIAII organisms requested to EFSA (ARES(2012)880155), could be used as pilot cases for this approach, given that the working group for the preparation of their pest risk assessments has been constituted and it is currently dealing with the step 1 "pest categorisation". This proposed modification of previous request would allow a rapid delivery by EFSA by May 2014 of the first two outputs for step 1 "pest categorisation", that could be used as pilot case for this request and obtain a prompt feedback on its fitness for purpose from the risk manager's point of view.

As indicated in previous requests of risk assessments for regulated pests, in order to target its level of detail to the needs of the risk manager, and thereby to rationalise the resources used for their preparation and to speed up their delivery, for the preparation of the pest categorisations EFSA is requested, in order to define the potential for establishment, spread and impact in the risk assessment area, to concentrate in particular on the analysis of the present distribution of the organism in comparison with the distribution of the main hosts and on the analysis of the observed impacts of the organism in the risk assessment area.

ASSESSMENT

1. Introduction

1.1. Purpose

This document presents a pest categorization prepared by the EFSA Scientific Panel on Plant Health (hereinafter referred to as the Panel) for the species *Pseudomonas syringae* pv. *persicae* in response to a request from the European Commission.

1.2. Scope

The risk assessment area is the territory of the European Union (hereinafter referred to as the EU) with 28 Member States (hereinafter referred to as MSs), restricted to the area of application of Council Directive 2000/29/EC.

2. Methodology and data

2.1. Methodology

The Panel performed the pest categorisation for *Pseudomonas syringae* pv. *persicae* following guiding principles and steps presented in the EFSA Guidance on a harmonised framework for pest risk assessment (EFSA PLH Panel, 2010) and as defined in the International Standard for Phytosanitary Measures (ISPM) No 11 (FAO, 2013) and ISPM No 21 (FAO, 2004).

In accordance with the Guidance on a harmonised framework for pest risk assessment in the EU (EFSA PLH Panel, 2010), this work is initiated as result of the review or revision of phytosanitary policies and priorities. As explained in the background of the European Commission request, the objective of this mandate is to provide updated scientific advice to the European risk managers for their evaluation of whether these organisms listed in the Annexes of the Directive 2000/29/EC still deserve to remain regulated under Council Directive 2000/29/EC, or whether they should be regulated in the context of the marketing of plant propagation material, or be deregulated. Therefore, to facilitate the decision making process, in the conclusions of the pest categorisation, the Panel addresses explicitly each criterion for quarantine pest according to ISPM 11 (FAO, 2013) but also for regulated non quarantine pest according to ISPM 21 (FAO, 2004) and includes additional information required as per the specific terms of reference received by the EC. In addition, for each conclusion the Panel provides a short description of its associated uncertainty.

Table 1 below presents the ISPM 11 (FAO, 2013) and ISPM 21 (FAO, 2004) pest categorisation criteria on which the Panel bases its conclusions. It should be noted that the Panel's conclusions are formulated respecting its remit and particularly with regards to the principle of separation between risk assessment and risk management (EFSA founding regulation[5]); therefore, instead of determining whether the pest is likely to have an unacceptable impact, the Panel will present a summary of the observed pest impacts. Economic impacts are expressed in terms of yield and quality losses and not in monetary terms, in agreement with EFSA guidance on a harmonised framework for pest risk assessment (EFSA PLH Panel, 2010).

[5] Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. OJ L 31/1, 1.2.2002, p. 1–24.

Table 1: International Standards for Phytosanitary Measures ISPM 11 (FAO, 2013) and ISPM 21 (FAO, 2004) pest categorisation criteria under evaluation.

Pest categorisation criteria	ISPM 11 for being a potential quarantine pest	ISPM 21 for being a potential regulated non-quarantine pest
Identity of the pest	The identity of the pest should be clearly defined to ensure that the assessment is being performed on a distinct organism, and that biological and other information used in the assessment is relevant to the organism in question. If this is not possible because the causal agent of particular symptoms has not yet been fully identified, then it should have been shown to produce consistent symptoms and to be transmissible	The identity of the pest is clearly defined
Presence (ISPM 11) or absence (ISPM 21) in the PRA area	The pest should be **absent from all or a defined part of the PRA area**	The pest is **present** in the PRA area
Regulatory status	If the pest is present but not widely distributed in the PRA area, it should be under official control or expected to be under official control in the near future	The pest is under official control (or being considered for official control) in the PRA area with respect to the specified plants for planting
Potential for establishment and spread in the PRA area	The PRA area should have ecological/climatic conditions including those in protected conditions suitable for the establishment and spread of the pest and, where relevant, host species (or near relatives), alternate hosts and vectors should be present in the PRA area	–
Association of the pest with the plants for planting and the effect on their intended use	–	Plants for planting are a pathway for introduction and spread of this pest
Potential for consequences (including environmental consequences) in the PRA area	There should be clear indications that the pest is likely to have an unacceptable economic impact (including environmental impact) in the PRA area	–
Indication of impact(s) of the pest on the intended use of the plants for planting	–	The pest may cause severe economic impact on the intended use of the plants for planting
Conclusion	If it has been determined that the pest has the potential to be a quarantine pest, the PRA process should continue. If a pest does not fulfil all of the criteria for a quarantine pest, the PRA process for that pest may stop. In the absence of sufficient information, the uncertainties should be identified and the PRA process should continue	If a pest does not fulfil all the criteria for a regulated non-quarantine pest, the PRA process may stop

In addition, in order to reply to the specific questions listed in the terms of reference, three issues are specifically discussed only for pests already present in the EU: the analysis of the present EU distribution of the organism in comparison with the EU distribution of the main hosts, the analysis of the observed impacts of the organism in the EU and the pest control and cultural measures currently implemented in the EU.

The Panel will not indicate in its conclusions of the pest categorisation whether to continue the risk assessment process as it is clearly stated in the terms of reference that the European Commission will indicate if further risk assessment work is required following their analysis of the Panel's scientific opinion.

2.2. Data

2.2.1. Literature search

A literature search on *Pseudomonas syringae* pv. *persicae* was conducted at the beginning of the mandate. The search was conducted for the scientific names of the pest together with the most frequently used common names on the ISI Web of Knowledge database. Further references and information were obtained from experts, from citations within the references as well as from grey literature.

2.2.2. Data collection

To complement the information concerning the current situation of the pest provided by the literature and online databases on pest distribution, damage and management, the PLH Panel sent a short questionnaire, on the current situation at country level, based on the information available in the European and Mediterranean Plant Protection Organization (EPPO) Plant Quarantine Retrieval (PQR) system, to the National Plant Protection Organisation (NPPO) contacts of the 28 EU Member States, and of Iceland and Norway. Iceland and Norway are part of the European Free Trade Association (EFTA) and are contributing to EFSA data collection activities, as part of the agreements EFSA has with these two countries. A summary of the pest status based on EPPO PQR and NPPO replies, is presented in Table 2.

Information on the distribution of the main host plants was obtained from Hucorne (2012), who retrieved data from the EUROSTAT database.

3. Pest categorisation

3.1. Identity and biology of *Pseudomonas syringae* pv. *persicae*

3.1.1. Taxonomy

Pseudomonas syringae pv. *persicae* (*P. s.* pv. *persicae*) was found for the first time in the Ardèche region in France and described under the name *Pseudomonas mors-prunorum* f. sp. *persicae* (Prunier et al., 1970).

Name: *Pseudomonas syringae* pv. *persicae* (Prunier, Luisetti and Gardan, 1970; Young, Dye and Wilkie, 1978)

Taxonomic position: Kingdom: Procaryota; Domain: Bacteria; Phylum: Proteobacteria; Class: Gammaproteobacteria; Family: Pseudomonadacae; Genus: *Pseudomonas*; species: *Pseudomonas syringae*

Synonyms: *Pseudomonas mors-prunorum* f. sp. *persicae* (Prunier et al., 1970)

Common names: Bacterial die-back of peach (EPPO, 1997); bacterial decline of nectarine and peach (Young, 1987a); bacterial canker of peach (Kennelly et al., 2007); dépérissement bactérien du pêcher (French) (EPPO, 1997)

The taxonomy of *P. syringae* is complicated, because of the heterogeneous nature of the species (Gardan et al. 1999; Bull et al., 2011). Gardan et al (1999) have subdivided the species into nine distinct genomic species, but each of these genomic species consists of multiple pathovars, phytopathogenically distinct members, with variable taxonomic characteristics, which makes them difficult to distinguish. Strains causing bacterial die-back of peach belonged to LOPAT group 1a (Lelliott et al., 1966) and were identified as members of *P. syringae* (Young, 1987b): they produced levan on sucrose, were oxidase negative, did not cause potato decay, did not have arginine dihydrolase activity and produced a hypersensitivity response in tobacco. A numerical taxonomic analysis of 109 phenotypic tests on 163 *P. syringae* strains and relatives showed that eight *P. s.* pv. *persicae* strains formed a separate cluster (Fischer-Le Saux, Institut National de la Recherche Agronomique, personal communication, July 2014; see Appendix A). On the basis of DNA–DNA hybridization studies, the pathotype strain of *P. s*. pv. *persicae* , isolated from an outbreak on peach in France, was grouped in genomic species 3 with *syringae* pathovars *tomato*, *antirrhini*, *maculicola*, *viburni*, *berberidis*, *apii*, *delphinii*, *passiflorae*, *philadelphi*, *ribicola* and *primulae.* This grouping was largely confirmed by phylogenetic analyses with multilocus sequence analysis (Fischer-Le Saux et al., 2008; Bull et al., 2011; Parkinson et al., 2011). These studies also showed that *P. s.* pv. *persicae* is very similar to *P. s.* pv. *avii*, a pathogen of *Prunus avium*, a non-host plant of *P. s.* pv. *persicae* (Ménard et al, 2003). However, the number of strains of *P. s.* pv. *persicae* examined in these studies was restricted to only one. It is not known if all *P. syringae* strains causing bacterial die-back in peach, nectarine and plum belong to genomic species 3 and should be designated as *P. s.* pv. *persicae.* In comparative studies with strains from peach, nectarine and Japanese plum, all causing bacterial die-back, a genetic, biochemical and virulence diversity was relatively high (Young et al. 1987b, 1996). The differences in virulence were found to be unrelated to the host of isolation (Young, 1987b). Nevertheless, it was shown that 36 *P. s* pv. *persicae* strains, comprising strains from France (including the pathotype strain) and from New Zealand displayed identical *rpoD* partial sequences, related to genomic species 3 (a sequence also shared by strains of *P. s.* pv. avii) (Fischer-Le Saux, personal communication, 2014). In addition, in a rep-PCR study including 163 strains from 54 pathovars, eight *P. s.* pv. *persicae* strains clustered together (Fischer-Le Saux, Institut National de la Recherche Agronomique, personal communication, July 2014; see Appendix A). This suggests that *P. s.* pv. *persicae,* a distinct genetic clade is responsible for bacterial die-back in peach.

3.1.2. Biology

Initial infections

There are hardly any data on the source of primary inoculum responsible for initial infections. It has been suggested that *P. s.* pv. *persicae* may exist as a small ubiquitous sub-population of *P. syringae* on *Prunus* that can multiply and cause disease problems when susceptible cultivars of peach or nectarines are grown under conditions conducive for the disease (Crosse, 1968; Freigoun and Crosse, 1975; Young, 1988).

Disease cycle

The disease cycle of *P. s.* pv. *persicae* (see Figure 1) is largely similar to that described for *P. s.* pv. *syringae*, the causative agent of bacterial canker (Young, 1987b; Kennelly et al., 2007) . In autumn bacteria invade fresh leaf scars. The bacteria overwinter in cankers, dead and symptomless buds and systemically infected branches (Vigouroux, 1970; Kennelly et al., 2007). In spring, bacteria that infected leaf scars can become active resulting in blast of buds and die-back of shoots and branches (Young, 1987a). During this period, the bacteria can be spread via splash dispersal and wind-driven rain from leaves to blossoms, resulting in blossom blast. Bacteria can also start to grow epiphytically on leaves. In infected orchards, high populations of *P. s.* pv. *persicae* (up to more than 10^7 colony-forming units per gram of fresh leaf) have been detected on apparently healthy leaves (Gardan et al., 1972; Luisetti et al., 1981). During early summer, fruit and leaf spots can develop after a rainy period (Vigouroux, 1970). In summer, when the leaf surface is dry, the epiphytic population decreases. In autumn, population levels on leaves increase and reach the highest population densities at leaf fall (Gardan et al., 1972; Luisetti et al., 1984). The bacteria can be spread via splash dispersal and wind-driven rain from leaves to spurs, branches and leaf scars. Infection of branches and trunks can result in cankers, and if the trunks are girdled as a result of bacterial invasion, the trees will die.

Symptom expression is dependent on the age of the trees, in that trees younger than six years old are more susceptible. There is an association among disease severity, plant dormancy and early hard frost in autumn and winter (Young, 1987b, 1988). Symptom expression after a period of frost seems not to be dependent on ice nucleation activity, as inoculation after freezing also results in severe symptoms on peach twigs (Vigouroux, 1991). As a result of frost damage the host tissue becomes an important entry point and source of nutrients for the pathogen's multiplication (Sule and Seemuller, 1987). Symptom expression may be dependent on the texture of the soil, as more symptoms are found on coarse-textured than fine-textured soils (Vigouroux, 1999; Vigouroux et al., 2000). High water content in the stems will increase disease severity.

It is likely that long-distance spread occurs mainly via planting material, although evidence is lacking. Fruit without symptoms are not considered to present a risk (EPPO, 1997). This may be concluded from the observation that in summer epiphytic populations are not detectable.

For short-distance dissemination of *P. s.* pv. *syringae* ,several means of dispersal have been considered (Lindemann et al., 1982). Plants can serve as a source of airborne inoculum. The authors also demonstrated that mechanical shearing of colonized plant tissue can generate aerosols of the pathogen. It has been reported that pruning can provide infection sites (Vigouroux, 1970; Luisetti et al., 1976) but that has not been confirmed by others (Young, 1987b). Possibly, the risks for infection at pruning may be dependent on the physiological condition of the plant, as has been found for *P. s.* pv. *syringae* (Kennelly et al., 2007).There are no data on seed-borne infections with *P. s.* pv. *persicae*.

<u>Symptomatology</u>

During winter, *P. s.* pv. *persicae* causes an olive-green discoloration on shoots and branches, rapidly browning, appearing around dormant buds on young shoots of peach and nectarine (Young, 1987b; Young 1988; EPPO, 1997). Symptoms can also be confused with those caused by other *Pseudomonas* pathogens, i.e. *P. s.* pv. *syringae*, *P. s.* pv. *mors-prunorum* and *P. viridiflava*), by leucostoma canker or frost injury (Scortichini and Morone, 1997; EPPO, 2005). Infection can spread rapidly to reach older shoots. Elliptical lesions can occur on young internodes. In spring, die-back may be limited to some buds or shoots, but, in severe cases, if branches are girdled, wilting and death of main branches and even the entire tree may occur. Affected tissues on the trunk appear brownish red. During warmer periods, reddish water can soak from symptomatic branches colouring bark and soil around trees (Trandafirescu and Botu, 2009). In some cases cankers are seen on less susceptible varieties, which may be a result of a defence reaction (Young, 1987a). During bloom, wilting of flowers and a dark brown gumming can be observed. In wilting trees, roots and rootstocks can show a faint browning of vascular tissue. The symptoms described above are found in both nectarine and peach.

On young leaves of nectarine the bacterium causes first angular, water-soaked and later necrotic spots, 1-2 mm in diameter, surrounded by a chlorotic halo. The necrotic tissue may disappear, resulting in a shot-hole effect. Leaves can wilt and in the case of severe infections, leaves fall prematurely.

On young nectarine fruits, characteristic superficial round, dark olive-coloured oily spots of 1-2 mm may be seen (Young, 1987b). If the spots enlarge or merge, the pathogen can cause sunken necrosis often covered by mass of transparent gum. Fruit infections result in rusted areas or deformation of the fruit.

In Japanese plum, infections rarely cause symptoms other than tip die-back. Occasionally, death of shoots or leaf spotting is observed. No symptoms are described for myrobalan (cherry plum).

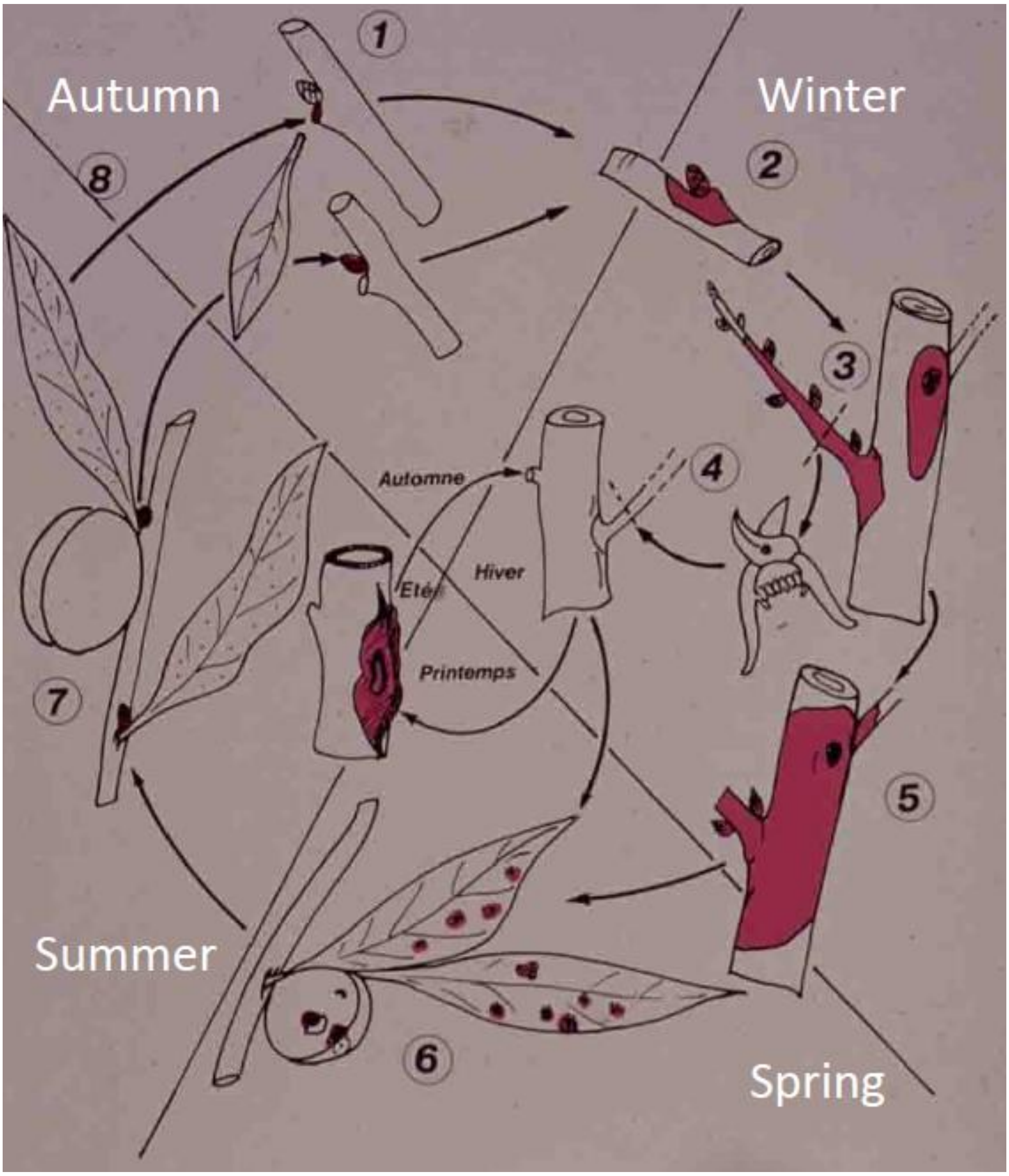

Figure 1: Disease cycle of *Pseudomonas syringae* pv. *persicae* (Luisetti et al., 1984). (1) *P. s.* pv. *persicae* cells enter the plant tissue through the leaf scar in autumn. (2) Olive-green discoloration on shoots and branches, rapidly browning, appearing around dormant buds on young shoots. (3) Infection progresses along the shoot during winter. (4) Pruning infected shoots can cause transmission to other trees with contaminated tools. (5, 6) Infected twigs and branches serve as inoculum sources for leaf and fruit infection and epiphytic leaf contamination during spring. (7) *P. s.* pv. *persicae* infection is blocked in plant tissue during the summer. (8) Epiphytic populations increase in autumn and serve as inoculum sources for infection of new leaf scars.

3.1.3. Intraspecific diversity

P. s. pv. *persicae* is genetically and biochemically a diverse group of organisms, although no races or biovars have been described. In a study with 31 strains from France, New Zealand and the United Kingdom, restriction fragment length polymorphism analysis displayed considerable variation (Young et al., 1996). In a comparison of biochemical characters, strains from New Zealand differed in three characters from those from France (Young, 1987b). Nevertheless, different strains caused largely the same symptoms, although a variation in virulence was observed (Young, 1987b).

3.1.4. Detection and identification

Isolation

The pathogen can be readily isolated from symptomatic tissues in winter and spring but less easily in summer. For this the border between necrotic and symptomless tissue should be taken and shaken in a diluent (EPPO, 2005). The pathogen cannot be isolated from old desiccated lesions (Young, 1987b). For isolation, several growth media are described on which colonies grow out in 48-72 hours at 24 °C (Young, 1987b).

Identification

P. s. pv. *persicae* can be distinguished from other stone fruit pathovars of *P. syringae* on the basis of different biochemical assays (EPPO, 2005). In contrast to *P. s.* pv. *syringae* and pv. *mors-prunorum* it does not hydrolyse gelatine and aesculin and is negative for acid production from inositol. The pathogen is Gram-negative, motile, non- or weakly fluorescent, and in contrast to many other *P. syringae* pathovars, does not produce diffusible fluorescent pigments on King's medium. The pigment may be observed on CSGA (Luisetti et al., 1972) or CSGM (Lelliot and Stead, 1987), but on CSGA medium 20 % of the strains still failed to produce it (Luisetti, 1988). *P. s.* pv. *persicae* shows a hypersensitive response on tobacco (Burkowicz and Rudolph, 1994).

Pathogenicity assays have been described on shoots of host plants that are inoculated in autumn or winter with a drop of the bacterial suspension on an incision in the shoot made with a scalpel. Necrosis is observed in the following spring.

There are currently no validated molecular methods available for specific detection and identification of *P. s.* pv. *persicae*. Studies have comprised only *P. s.* pv. *persicae* strains (Young et al., 1996) or only one strain of *P. s.* pv. *persicae* was compared with strains of other *P. syringae* pathovars (Pelludat et al., 2009; Bull et al., 2011; Parkinson et al., 2011; Gašić et al, 2012). There are unpublished data showing that 36 *P. s* pv. *persicae* strains, including strains from France and New Zealand, displayed identical *rpoD* sequences, different from most other *P. syringae* pathovars (Fischer-Le Saux, Institut National de la Recherche Agronomique, personal communication, July 2014; see Appendix A). This indicates that the pathogen forms a distinct clade.

3.2. Current distribution of *Pseudomonas syringae* pv. *persicae*

3.2.1. Global distribution

According to the EPPO PQR system (EPPO, online), as accessed on September 2014, *P. s.* pv. *persicae* is widespread in New Zealand and present with restricted distribution in Croatia, France and United Kingdom.

The pathogen may be more widespread than is suggested by the data provided. The limited availability of molecular detection and identification tools complicates recognition of the pathogen.

3.2.2. Distribution in the EU

P. s. pv. *persicae* has a restricted distribution in the EU and has been reported to be found only sporadically in France, Germany and Portugal (Table 2). Strains isolated once from myrobalan plums in the United Kingdom were first identified as *P. cerasifera* by Garrett et al. (1966) and proposed to be identified to *P. s.* pv. *persicae* by Young et al. (1996). Finally, there are unconfirmed reports that *P. s.* pv. *persicae* is present in Yugoslavia (EPPO, 1997). New outbreaks caused by *P. s.* pv. *persicae* have not been reported in any EU MSs recently. The last strain of *P. s.* pv. *persicae* introduced into the French collection of plant-associated bacteria was isolated in 1984.

Table 2: Current distribution of *Pseudomonas syringae* pv. *persicae* in the 28 EU MSs, Iceland and Norway, based on the answers received via email from the NPPOs or, in absence of reply, on information from EPPO PQR.

Country	NPPO answer
Austria	**Absent**, no pest records
Belgium	**Absent**, no pest records
Bulgaria	**Absent**, invalid report
Croatia	**Absent** (it is planned for conduct survey in 2014)
Cyprus	—
Czech Republic	**Absent**, confirmed by survey
Denmark	**Not known to occur**
Estonia	**Absent,** no pest records
Finland	**Absent**, no pest records
France	**Present**, restricted distribution
Germany	**Present**, only in some parts, at low prevalence
Greece[(a)]	—
Hungary	**Absent**, no pest records
Ireland	**Absent**, no pest records
Italy	**Absent**
Latvia[(a)]	—
Lithuania[(a)]	—
Luxembourg[(a)]	—
Malta	**Absent**, no pest records
Poland	**Absent**
Portugal	**Present**, restricted distribution, confirmed by survey
Romania[(a)]	—
Slovak Republic	**Absent**, no pest record
Slovenia	**Absent**, no pest records on *Prunus persica*, *Prunus persica* var. *nectarina*
Spain	**Absent**
Sweden	**Absent**, not known to occur
The Netherlands	**Absent**, no pest records
United Kingdom	**Absent**
Iceland[(a)]	**—**
Norway[(a)]	—

(a): When no information was made available to EFSA, the pest status in the EPPO PQR (2012) was used.
–: No information available.
EPPO PQR, European and Mediterranean Plant Protection Organization Plant Quarantine Data Retrieval System; NPPO, National Plant Protection Organisation.

3.2.3. Vectors and their distribution in the EU

No vectors have been described for *P. s.* pv. *persicae*.

3.3. Regulatory status

3.3.1. Council Directive 2000/29/EC

Pseudomonas syringae* pv. *persicae:

P. syringae pv. *persicae* is a regulated harmful organisms in the EU and listed in Council Directive 2000/29/EC in Annex II, Part A, Section II, point 6 (see Table 3).

Table 3: *Pseudomonas syringae* pv. *persicae* in Council Directive 2000/29/EC.

Annex II, Part A	Harmful organisms whose introduction into, and spread within, all Member States shall be banned if they are present on certain plants or plant products	
Section II	Harmful organisms known to occur in the Community and relevant for the entire Community	
(b)	Bacteria	
	Species	**Subject of contamination**
6	*Pseudomonas syringae* pv. *persicae* (Prunier *et al*.) Young *et al*.	Plants of *Prunus persica* (L.) Batsch and *Prunus persica* var. *nectarina* (Ait.) Maxim, intended for planting, other than seeds

Regulated hosts for *P. syringae* pv. *persicae*:

In the Council Directive 2000/29/EC, there are special requirements under Annex III, Annex IV and Annex V regarding the hosts of *P. syringae* pv. *persicae* as presented below in the Table 4.

Table 4: *Pseudomonas syringae* pv. *persicae* host plants in Council Directive 2000/29/EC.

Annex III, Part A	Plants, plant products and other objects the introduction of which shall be prohibited in all Member States	
	Description	**Country of origin**
9	Plants of […..] *Prunus* L. […..] intended for planting, other than dormant plants free from leaves, flowers and fruit	Non-European countries
18	Plants of […..] *Prunus* L. and their hybrids […..] intended for planting, other than seeds	Without prejudice to the prohibitions applicable to the plants listed in Annex III A (9), where appropriate, non-European countries, other than Mediterranean countries, Australia, New Zealand, Canada, the continental states of the USA
Annex IV, Part A	Special requirements which must be laid down by all Member States for the introduction and movement of plants, plant products and other objects into and within all Member States	
Section I	Plants, plant products and other objects originating outside the Community	
	Plants, plant products and other objects	**Special requirements**
19.2.	Plants of […..] *Prunus* L. […..] intended for planting, other than seeds, originating in countries where the relevant harmful organisms are known	Without prejudice to the provisions applicable to the plants where appropriate listed in Annex III(A)(9) and (18), and Annex IV(A)(I)(15) and (17), official statement that no symptoms of

	to occur on the genera concerned The relevant harmful organisms are — on *Prunus persica* (L.) Batsch: — *Pseudomonas syringae* pv. *persicae* (Prunier *et al*.) Young *et al*.;	diseases caused by the relevant harmful organisms have been observed on the plants at the place of production since the beginning of the last complete cycle of vegetation.
Section II	Plants, plant products and other objects originating in the Community	
	Plants, plant products and other objects	**Special requirements**
12	Plants of [.....] *Prunus* L. [.....] intended for planting, other than seeds	Official statement that: (a) the plants originate in areas known to be free from the relevant harmful organisms; or (b) no symptoms of diseases caused by the relevant harmful organisms have been observed on plants at the place of production since the beginning of the last complete cycle of vegetation. The relevant harmful organisms are: — on *Prunus persica* (L.) Batsch: *Pseudomonas syringae* pv. *persicae* (Prunier *et al*.) Young *et al*.
Annex V	Plants, plant products and other objects which must be subject to a plant health inspection (at the place of production if originating in the Community, before being moved within the Community—in the country of origin or the consignor country—if originating outside the Community) before being permitted to enter the Community	
Part A	Plants, plant products and other objects originating in the Community	
Section I	Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for the entire Community and which must be accompanied by a plant passport	
1	Plants and plant products	
1.1	Plants, intended for planting, other than seeds, of *Prunus* L., other than *Prunus laurocerasus* L. and *Prunus lusitanica* L.,	
Part B	Plants, plant products and other objects originating outside the Community	
Section I	Plants, plant products and other objects which are potential carriers of harmful organisms of relevance for the entire Community	
1	Plants, intended for planting, other than seeds, but including seeds of [.....], *Prunus* L., [.....].	
3	Fruits of: — [.....] *Prunus* L. [.....] originating in non-European countries.	

3.3.2. Marketing directives

Host plants of *P. syringae* pv. *persicae* that are regulated in Annex IIAII of Council Directive 2000/29/EC are explicitly mentioned in the following Marketing Directive:

- Council Directive 2008/90/EC[6] of 29 September 2008 on the marketing of fruit plant propagating material and fruit plants intended for fruit production

[6] Council Directive 2008/90/EC of 29 September 2008 on the marketing of fruit plant propagating material and fruit plants intended for fruit production. OJ L 267, 8.10.2008, p. 8 - 22.

3.4. Elements to assess the potential for establishment and spread in the EU

3.4.1. Host range

Peach (*Prunus persica*), nectarine (*Prunus persica* var. *nucipersica*), and Japanese plum (*Prunus salicina* Lindl.) are considered as natural hosts of *P. s.* pv. *persicae*, although Japanese plum is less susceptible (Young, 1987a). Young et al. (1996) characterized strains from myrobalan plum (*Prunus cerasifera*), isolated in 1966 by Garrett et al. (1966) in the UK as *P. s.* pv. *persicae*. However, they did not perform a pathogenicity test to support this identification. So, the host range of *P. s.* pv. *persicae* is limited to peach, nectarine and Japanese plum.

3.4.2. EU distribution of main host plants

In only a limited number of EU countries is the production of peaches and nectarines of economic importance. These countries include Bulgaria, Portugal, and in particular, France, Italy, Greece and Spain (Table 5). However, in most EU countries some production takes place and disease caused by *P. s.* pv. *persicae* can be therefore be expected to occur. No detailed data on the distribution of Japanese plum in the EU are available. According to Ruiz et al. (2011), 18.500 ha are cultivated in Spain, mainly in the regions of Murcia, Comunidad Valenciana, Extremadura and Andalucia.

Table 5: Areas of production in 1 000 ha for peach and nectarine. (Source: Hucorne, 2012. Data on production areas have been retrieved from the EUROSTAT database. The mean of the years 2006-2010 has been calculated for each crop/country.)

Country	Peach (*Prunus persica*)	Nectarine (*P. persica* var. *nucipersica*)
Austria	0.2	0.0
Belgium	0.0	0.0
Bulgaria	5.7	0.0
Croatia	1.3	0.2
Cyprus	0.4	0.3
Czech Republic	1.1	0.0
Denmark	0.0	0.0
Estonia	0.0	0.0
Finland	0.0	0.0
France	8.4	6.5
Germany	0.0	0.0
Greece	35.6	5.8
Hungary	7.6	0.0
Ireland	0.0	0.0
Italy	59.8	32.7
Latvia	0.0	0.0
Lithuania	0.0	0.0
Luxembourg	0.0	0.0
Malta	0.0	0.0
Netherlands	0.0	0.0
Poland	3.3	0.0
Portugal	5.0	0.0
Romania	1.8	0.1
Slovakia	0.7	0.0
Slovenia	0.6	0.0
Spain	51.9	25.7
Sweden	0.0	0.0

Country	Peach (*Prunus persica*)	Nectarine (*P. persica* var. *nucipersica*)
United Kingdom	0.0	0.0
EU 28	183.4	71.5

3.4.3. Analysis of the potential *Pseudomonas syringae* pv. *persicae* distribution in the EU

P. s. pv. *persicae* has been detected in France, Germany and Portugal (see Table 2). It may have been isolated from myrobalan plum in the United Kingdom, but there is uncertainty about the identity of the strains. Bacterial die-back of peach is still sporadically observed in the Ardèche region in France, indicating that *P. s.* pv. *persicae* is still present. In France and Portugal, the production of peaches and nectarines is of economic importance. In both countries the environment is suitable for disease expression, as demonstrated by outbreaks in the past.

3.4.4. Spread capacity

Short-distance dispersal of epiphytic populations of *P. s*. pv. *persicae* may occur via splash dispersal and in wind-driven rain, in particular during autumn when population densities on leaves are high (Gardan et al., 1972; Luisetti et al., 1984). It is likely that short-distance spread can occur during pruning (Vigouroux, 1970; Luisetti et al., 1976).

Long-distance spread is expected to occur via infected planting material, although there is little evidence for this means of dissemination in the literature.

3.5. Elements to assess the potential for consequences in the EU

3.5.1. Potential effects of *Pseudomonas syringae* pv. *persicae*

In New Zealand, serious losses have been reported on stone fruit as a result of bacterial blast caused by *P. s.* pv. *syringae*. Infrequently, *P. s.* pv. *persicae* has been isolated from identical symptoms on Japanese plum and nectarine (Young 1987b). There is no information available on the environmental consequences of infection with *P. s.* pv. *persicae*.

3.5.2. Observed impact of *Pseudomonas syringae* pv. *persicae* in the EU

Under specific conditions, the impact of infections with *P. s.* pv. *persicae* can be high (EPPO, 1997). Many trees were destroyed in the central Rhône valley in France in 1985. Moore (1988) cited Luisetti, who, while visiting his laboratory in 1985, found that *P. s.* pv. *persicae* had killed more than one million peach trees in France that were under five years of age. To date, no stone fruit orchards have been planted in the Ardèche region where the disease had occurred in 1969-1984. Die-back has been regularly observed on peach and apricot in the Rhône valley, but the causal agent of this syndrome was generally not identified as *P. s.* pv. *persicae* but as *P. s.* pv. *syringae.* The current impact of *P. s.* pv. *persicae* on peach production in France is low. It is probably due to the absence of peach orchards where the environmental conditions (climatic and pedological conditions) were extremely favourable to the disease. There is no information available on the susceptibility of new varieties cultivated in EU to *P. s.* pv. *persicae*.

3.6. Currently applied control methods in the EU

Young (1988) indicated that no effective methods of control have been developed but some measures are recommended to reduce disease severity and incidence. Planting material should be obtained from areas in which the disease does not occur. The use of less susceptible cultivars may restrict dissemination (Young, 1987a; EPPO, 1997) but the susceptibility to *P. s.* pv. *persicae* is no more taken into consideration for the choice of varieties to be planted because this trait is not included in the current breeding programmes. Waterlogging of soils, which can impair plant defences as result of oxygen depletion, should be avoided, e.g. by deep ploughing or settling of shallow soils (Young, 1987a). Irrigation late in the growing season, when frost can occur, should be avoided (Young, 1987a).

It is likely, but as yet unproven, that sprinkler irrigation can result in spread of the disease. Vigouroux et al. (1987) reported irrigation at well-spaced intervals with calcareous water results in a clear-cut decrease in the susceptibility of peach trees. Frost control by warming the air or the use of overhead sprinklers will prevent frost damage and consequently reduce disease severity (Young, 1987a). Disinfection of tools and materials, in particular pruning tools, may help to prevent the introduction of disease (Weaver, 1978; Canfield et al., 1986).

There are no clear indications that the use of copper-based products or streptomycin during leaf-fall may reduce losses (Luisetti et al., 1976; Young, 1987a). The compounds do not work systemically, and their use might lead to the emergence of resistant strains. Copper compounds also have their limitations owing to phytotoxicity.

3.7. Uncertainty

On the basis of sequences of a single housekeeping gene, there are indications that strains isolated from bacterial die-back disease of peach and nectarine form a distinct genetic group. However, there are also reports on the (biochemical and genetic) diversity of its causative agent. Validated discriminative detection methods are not easy to handle, and polymerase chain reaction methods are lacking. Consequently, there is a moderate uncertainty of the identity of the causative agents of bacterial die-back of peach.

Information on the host range of *P. s.* pv. *persicae* is limited. There have been no large-scale surveys of either occurrence of *P. s.* pv. *persicae* on weeds that can be present in peach and nectarine orchards or of (symptomless) carry-over by other crops.

No systematic research has been conducted to identify the climatic conditions favouring symptom expression, and therefore it is not certain whether disease expression can occur in all climate zones in which peach and nectarine can be grown. Initial infections may be due to dissemination via plants for planting but may also originate from host plants in the environment

There is a moderate uncertainty about the distribution of *P. s.* pv. *persicae* in the EU. The lack of rapid, validated detection methods has hampered the conduct of surveys. It may be that the low incidence of outbreaks of bacterial die-back worldwide has restricted the necessity to develop detection methods and also limited the possibility of surveys. As far as is known, in recent years there have been no records of outbreaks of bacterial die-back. The reason is unknown, but this may be the result of changes in the varieties or production systems used. There is a moderate uncertainty about the risks for outbreaks in current production systems in Europe.

CONCLUSIONS

Table 6 summarises the Panel's conclusions on the key elements addressed in this scientific opinion in consideration of the pest categorisation criteria defined in ISPM 11 and ISPM 21 and on the additional questions formulated in the terms of reference.

Table 6: The Panel's conclusions on the pest categorisation criteria defined in International Standards for Phytosanitary Measures (ISPM) No 11 and No 21 and on the additional questions formulated in the terms of reference.

Criterion of pest categorisation	Panel's conclusions on ISPM 11 criterion	Panel's conclusions on ISPM 21 criterion	Uncertainties
Identity of the pest	*Is the identity of the pest clearly defined? Do clearly discriminative detection methods exist for the pest?* The identity of *P. s.* pv. *persicae* is clearly defined. On the basis of sequences of a single housekeeping gene there are indications that strains isolated from bacterial die-back disease outbreaks form a		Moderate uncertainty on the identity of the causative agent of bacterial die-

	distinct genetic group. *P. s.* pv. *persicae* can be distinguished from other stone fruit pathovars of *P. syringae* on the basis of different biochemical assays, but there are currently no validated molecular methods available for specific detection and identification of *P. s.* pv. *persicae*.		back in peach, nectarine and Japanese plum because similar symptoms can be caused by *P. s.* pv. *syringae* and *P. s.* pv. *mors-prunorum*., .
Absence/ presence of the pest in the risk assessment area	*Is the pest absent from all or a defined part of the risk assessment area?* *P. s.* pv. *persicae* is only occasionally found in some MSs.	*Is the pest present in the risk assessment area?* *P. s.* pv. *persicae* is present in the risk assessment area.	Some uncertainty on the extent of *P. s.* pv. *persicae* presence in the EU because of the limited number of surveys and the lack of rapid detection tools.
Regulatory status	*In consideration that the pest under scrutiny is already regulated just mention in which annexes of 2000/29/EC and the marketing directives the pest and associated hosts are listed without further analysis Indicate also whether the hosts and/or commodities for which the pest is regulated in AIIAI or II are comprehensive of the host range.* *P. s.* pv. *persicae* is currently regulated in the Council Directive 2000/29/EC under the Annex IIAII and specific requirements for its hosts are defined in Annex III, Annex IV and Annex V. Host plants of *P. s.* pv. *persicae* are explicitly mentioned in Council Directive 2008/90/EC.		–
Potential establishment and spread	*Does the PRA area have ecological conditions (including climate and those in protected conditions) suitable for the establishment and spread of the pest?* *Indicate whether the host plants are also grown in areas of the EU where the pest is absent.* *And, where relevant, are host species (or near relatives), alternate hosts and vectors present in the risk assessment area?* Peach and nectarine are present in many MSs and, in areas of large-scale production of these commodities, conditions are favourable for disease expression by *P. s.* pv. *persicae*. However, the optimum conditions in terms of soil texture and climatic environment are met in only some places.	*Are plants for planting a pathway for introduction and spread of the pest?* *P. s.* pv. *persicae* can be transmitted by vegetative propagation of infected host plants.	Low uncertainty because outbreaks of *P. s.* pv. *persicae* already occur.

Potential for consequences in the risk assessment area	*What are the potential for consequences in the risk assessment area?* *Provide a summary of impact in terms of yield and quality losses and environmental consequences.* Outbreaks of bacterial die-back caused by *P. s.* pv. *persicae* occur only sporadically but outbreaks can result in the loss of millions of trees and consequently in considerable economic damage. No environmental impact from *P. s.* pv. *persicae* is identified.	*If applicable is there indication of impact(s) of the pest as a result of the intended use of the plants for planting?* *P. s.* pv. *persicae* can be transmitted via infected plants for planting Outbreaks can result in the loss of millions of trees and consequently in considerable economic damage.	Uncertainty mostly concerns the potential for outbreaks with modern varieties and production systems.
Conclusion on pest categorisation	*P. s.* pv. *persicae* is only occasionally found in some MSs. Severe epidemics were reported only in the south-east of France from 1969 to 1984. Outside the EU the disease has been reported only in New Zealand.	*P. s.* pv. *persicae* can be transmitted by vegetative propagation of infected host plants but there is uncertainty on the distribution of the bacterium within the stone fruit production area in the EU. The pathogen may be more widespread than is suggested by the data provided. Initial infections may be due to dissemination via plants for planting but may also originate from *P. s.* pv. *persicae* present in the natural environments.	Uncertainty mostly concerns the current distribution of *P. s.* pv. *persicae* in the EU because of the absence of specific surveys and the lack of rapid detection tools.
Conclusion on specific ToR questions	*If the pest is already present in the EU, provide a brief summary of* - *the analysis of the present distribution of the organism in comparison with the distribution of the main hosts, and the distribution of hardiness/climate zones, indicating in particular if in the risk assessment area, the pest is absent from areas where host plants are present and where the ecological conditions (including climate and those in protected conditions) are suitable for its establishment,* *P. s.* pv. *persicae* is present in the EU, because sporadic outbreaks occur in some MSs, including France, Portugal and Germany. In particular in France, peach production is of importance and the economic damage can be considerable. *P. s.* pv. *persicae* has the potential to establish wherever peach and nectarine are grown in a suitable environment in the EU. - *the analysis of the observed impacts of the organism in the risk assessment area* The impact of outbreaks can be high, outbreaks cannot be predicted and efficient management systems and control agents are lacking.		Uncertainty mostly concerns the distribution of *P. s.* pv. *persicae* in the EU because of the absence of specific surveys.

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APPENDIX

Appendix A. Personal communication

Marion Fischer-Le Saux, 2014

In July 2014 the Panel contacted Marion Fischer-Le Saux (Institut National de la Recherche Agronomique (INRA), UMR1345 IRHS Institut de Recherche en Horticulture et Semences, 42 rue Georges Morel BP60057, 49071 Beaucouzé cedex, France) in order to obtain information regarding phenotypic and genotypic diversity of *of P. s* pv. *persicae* strains and their relation to genomic species and other pathovars. The information provided is fully used in sections 3.1.1 and 3.1.4.

Marion Fischer-Le Saux has been contacted to verify that she agrees with the presentation of her contribution in this opinion.

ABBREVIATIONS

EFSA	European Food Safety Authority
EPPO	European and Mediterranean Plant Protection Organization
EPPO-PQR	European and Mediterranean Plant Protection Organization Plant Quarantine Retrieval system
EU	European Union
ISPM	International Standard for Phytosanitary Measures
MS	Member State
NPPO	National Plant Protection Organisation
PLH Panel	Plant Health Panel
PRA	Pest Risk Analysis
RNQP	regulated non-quarantine pest