CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Profile for

Erwinia persicina corrig. Hao et al. 1990

= [Erwinia nulandii Schuster et al. 1981] Brenner et al (1994)

Pest Rating: C

Comment Period: 05/24/2023 through 07/08/2023

Initiating Event:

On June 20, 2019, honeydew melon (*Cucumis melo*) plants showing symptoms of leaf spotting were collected in a net-house during a phytosanitary field inspection in San Joaquin County by county agricultural officials and sent to CDFA's Plant Pathology Laboratory for diagnosis. On August 6, 2019, Sebastian Albu, CDFA plant pathologist, identified the pathogen *Erwinia persicina* from the diseased leaves. His identification was made by PCR testing of pure cultures using 16S and *Erwinia*-specific rpoB primers. The PCR amplicons were of the expected size for *Erwinia* spp. and were sequenced. The sequences were used to generate a phylogenetic tree that included type strains of every species within the genus *Erwinia*. The melon isolates fell within the *E. persicina* clade with 97% support and were clearly distinguishable from *E. aphidicola* and *E. rhapontici*, closely related species already known to be in California. As this was a first detection of *E. persicina* in California, it was assigned a temporary 'Q' rating.

The risk of introduction and establishment of this pathogen was assessed, and following a 45-day comment period, a B-rating was finalized on October 18, 2019. Since then, multiple detections have been made in seven additional counties covering multiple climatic zones in the state. This proposal is to change the rating to a C.

History & Status:

Background: *Erwinia persicinus* (Enterobacteriaceae) was originally described as a new species by Hao et al., 1990, after it was isolated from healthy tomato, banana and cucumber. The name *'persicinus'* recognizes the pinkish or peach-colored pigments it produces. In 1994, Brenner et al. recognized that *Erwinia* isolates known as '*E. nulandii*', a name that was never validated by publication in the

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International Journal of Systematic Bacteriology, matched the description of *E. persicinus*. They were first to recognize *E. persicinus* as a plant pathogen for its ability to infect and cause necrotic symptoms on bean pods, and to discolor bean seeds. In 1998, Euzéby renamed *E. persicinus* as *E. persicina* because the generic epithet 'persicinus' did not match the feminine gender of 'peach-coloured'.

This pathogen (under the name *Erwinia nulandii*) was isolated and described in 1981 in Nebraska by Schuster et al. from symptomatic bean seeds. Their inoculation studies found that it caused yellow leaf spots on beans that later became irregular necrotic lesions. However, the isolates were not pathogenic on cucumbers. In 2009, Diánez et al. were able to cause disease on tomato, pepper, melon and cucumber grown in greenhouses that were inoculated with *E. persicina*.

Hosts: Soybean (*Gylcine max*), common bean (*Phaseolus vulgaris*), pea (*Pisum sativum*), cucumber (*Cucumis sativus*), tomato (*Solanum lycopersicum*), melon (*Cucumis melo*), pepper (*Capsicum annuum*) alfalfa (*Medicago sativa*), adzuki bean *(Vigna angularis),* cowpea *(Vigna unguiculata),* mung bean *(Vigna radiata),* hyacinth bean *(Dolichos lablab),* lentil *(Lens culinaris),* peanut *(Arachis hypogaea),* Lima bean *(Phaseolus lunatus),* sainfoin *(Onobrychis viciaefolia),* milkvetch *(Astragalus adsurgen),* white clover *(Trifolium repens),* red clover *(Trifolium pretense),* fava bean *(Vicia faba),* common vetch *(Vicia sativa),* bush vetch *(Vicia sepium),* two-leaf vetch *(Vicia unijuga),* bush clover *(Lespedeza bicolor),* bird's-foot trefoil *(Lotus corniculatus),* white sweetclover *(Melilotus albus),* yellow sweetclover *(Melilotus officinalis),* garlic *(Allum sativum),* and enoki mushrooms *(Flammulina velutipes),* parsley root (*Petroselinum crispum* var. *tuberosum*), and onion (*Allium sativum*) (Brenner et al., 1994; Gálvez et al., 2015; Diánez et al., 2007; Zhang and Nan, 2012; 2014; Cho et al., 2019; Nechwatal and Theil, 2018; Yan et al., 2019). The current detection of *E. persicina* (see 'Initiating Event') indicates natural infection of melons in a net-house environment.

Symptoms: In greenhouse experiments with inoculated beans, necrosis developed on the pods and on the seeds (Brenner et al., 1994). In experimental trials, tomato, pepper, cucumber, and melon inoculated with *E. persicina*, exhibited symptoms of leaf necrosis, adventitious roots, brown coloration along the stems, interveinal chlorosis, and curled and blistered leaves. In cucurbits, a distinctive lesion in some areas of the stem was also exhibited (Diánez et al., 2007). In a study on inoculated forage and grain legumes grown in pots, plant showed symptoms such as stem chlorosis, leaf necrosis, pod necrosis, and appearance of necrotic spots on the leaves and flowers, irregular water-soaked spots on seeds, dropping of leaves, and conspicuous stem lesions, and wilting of the entire plant (Zhang and Nan, 2014). On garlic, symptoms of a pinkish soft rot of cloves were observed postharvest, with cloves showing the pink color along all the flesh (Gálvez et al., 2015*). Erwinia persicina* was isolated from rotten onions in cold-storage facilities by Cho et al. (2019), in Korea. Nechwatal and Theil (2018) identified *E. persicina* as the cause of pink rot of parsley root in Germany. On enoki mushrooms, 0.5% of fruiting bodies were found to be infected by *E. persicina* and showing dark pink patches that extended to the inner tissues (Yan et al., 2019).

Transmission: pathogen-infested plants, seeds, soil, and water (Zhang and Nan, 2014).

Damage Potential: In Nebraska, Schuster et al. (1981) identified *E. persicina* as pathogenic on beans. In Spain, *E. persicina* was reported by Gálvez et al. (2015) to have caused post-harvest symptoms in at least 50% of a crop of garlic with pinkish rot present in at least one clove. In China, only a low level of 0.5% damage was reported on enoki mushrooms (Yan et al. 2019), but as many as 25% of alfalfa sprouts grown as a perennial forage crop wilted and turned brown because of this pathogen (Zhang and Nan, 2012). These researchers, in a separate inoculation experiment showed *E. persicina* could infect and cause serious damage including fatal wilts on 22 species of legume plants (Zhang and Nan, 2014). In Korea, *E. persicina* caused the loss of 15-35% of onions after nine months of cold storage (Cho et al., 2019). On parsley root in Germany under field conditions, feeding insects, other pathogenic microorganisms, and wounding seem to significantly contribute to symptom development (Nechwatal and Theil, 2018). Seed-borne *E. persicina* spreads from alfalfa seeds to the rhizosphere, it can invade alfalfa roots and cause disease (Yao et al., 2022).

Worldwide Distribution: *Europe*: Spain, Germany; *North America*: United States (California, Nebraska); *Asia*: Japan, Korea, China.

Official Control: Presently, *Erwinia persicina* has B rating in California. This pathogen is not known to be under official control in any other state or country.

California Distribution: Official detections have been made in Imperial, Los Angeles, Monterey, Plumas, San Joaquin, Santa Clara, Santa Cruz, and Yolo counties (CDFA PDR Database, 2023).

California Interceptions: None reported.

The risk *Erwinia persicina* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** Similar to southeastern Spain, most of California experiences a Mediterranean climate which is usually characterized by rainy winters and dry, warm to hot summers. Beans, peas and vegetables are commercially cultivated in a similar climate in limited regions within the State and may be at risk of disease caused by *E. persicina*. *Erwinia persicina* is likely to establish in limited parts of California wherever its natural hosts, pea, bean, onion, and garlic are grown. Its current detection in honeydew melon indicates the possible inclusion of an additional host in California. It is capable of surviving under a wide range of environmental conditions including under conditions of vegetables in cold storage.

Evaluate if the pest would have suitable hosts and climate to establish in California.

Score: **2**
- Low (1) Not likely to establish in California; or likely to establish in very limited areas.
- Medium (2) may be able to establish in a larger but limited part of California.

- High (3) likely to establish a widespread distribution in California.

2) **Known Pest Host Range:** The known host range is forage and grain legumes, alfalfa, lettuce, onions, garlic, parsley root, Enoki mushrooms, and melons.

Evaluate the host range of the pest.

Score: 2

- Low (1) has a very limited host range.
- **Medium (2) has a moderate host range.**
- High (3) has a wide host range.

3) **Pest Reproductive Potential:** The bacterial pathogen has a high reproductive capacity and is spread by artificial means through infected planting stock, seeds, soil, and water.

Evaluate the natural and artificial dispersal potential of the pest.

Score: 3

- Low (1) does not have high reproductive or dispersal potential.
- Medium (2) has either high reproductive or dispersal potential.
- **High (3) has both high reproduction and dispersal potential.**

4) **Economic Impact:** The potential impacts to vegetable production include lowered crop yield, and losses to vegetables in cold storage

Evaluate the economic impact of the pest to California using the criteria below.

Economic Impact: A, B

A. The pest could lower crop yield.
B. The pest could lower crop value (includes increasing crop production costs).
C. The pest could trigger the loss of markets (includes quarantines).
D. The pest could negatively change normal cultural practices.
E. The pest can vector, or is vectored, by another pestiferous organism.
F. The organism is injurious or poisonous to agriculturally important animals.
G. The organism can interfere with the delivery or supply of water for agricultural uses.

Economic Impact Score: **2**

- Low (1) causes 0 or 1 of these impacts.
- **Medium (2) causes 2 of these impacts.**
- High (3) causes 3 or more of these impacts.

5) **Environmental Impact:** No impact to the environment is expected from *Erwinia persicina*.

Environmental Impact: None

A. The pest could have a significant environmental impact such as lowering biodiversity, disrupting natural communities, or changing ecosystem processes.
B. The pest could directly affect threatened or endangered species.
C. The pest could impact threatened or endangered species by disrupting critical habitats.
D. The pest could trigger additional official or private treatment programs.
E. The pest significantly impacts cultural practices, home/urban gardening or ornamental plantings.

Environmental Impact Score: 1
- **Low (1) causes none of the above to occur.**
- Medium (2) causes one of the above to occur.
- High (3) causes two or more of the above to occur.

Consequences of Introduction to California for *Erwinia persicina:* Medium (10)

Add up the total score and include it here.
-Low = 5-8 points
-Medium = 9-12 points
-High = 13-15 points

6) **Post Entry Distribution and Survey Information**: Evaluate the known distribution in California. Only official records identified by a taxonomic expert and supported by voucher specimens deposited in natural history collections should be considered. Pest incursions that have been eradicated, are under eradication, or have been delimited with no further detections should not be included.

Evaluation is "medium". To date, *Erwinia persicina* has been detected in eight counties – in the desert, along the coast, in the San Joaquin and Sacramento Valleys.

Score: -2
-Not established (0) Pest never detected in California or known only from incursions.
-Low (-1) Pest has a localized distribution in California or is established in one suitable climate/host area (region).
-Medium (-2) Pest is widespread in California but not fully established in the endangered area, or pest established in two contiguous suitable climate/host areas.
-High (-3) Pest has fully established in the endangered area, or pest is reported in more than two contiguous or non-contiguous suitable climate/host areas.

7) **The final score is** the consequences of introduction score minus the post entry distribution and survey information score:

Final Score: *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information* ***= 10-2= 8***

Uncertainty:

The full host range of *Erwinia persicina*, its epidemiology, and damage caused to hosts under field conditions is not fully known.

Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for *Erwinia persicina* is C.**

References:

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Responsible Party:

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***Comment Period: 05/24/2023 through 07/08/2023**

***NOTE:**

You must be registered and logged in to post a comment. If you have registered and have not received the registration confirmation, please contact us at permits[@]cdfa.ca.gov.

Comment Format:

- Comments should refer to the appropriate California Pest Rating Proposal Form subsection(s) being commented on, as shown below.

  Example Comment:

  Consequences of Introduction: 1. Climate/Host Interaction: [Your comment that relates to "Climate/Host Interaction" here.]

- Posted comments will not be able to be viewed immediately.

- Comments may not be posted if they:

  Contain inappropriate language which is not germane to the pest rating proposal;

  Contains defamatory, false, inaccurate, abusive, obscene, pornographic, sexually oriented, threatening, racially offensive, discriminatory or illegal material;

  Violates agency regulations prohibiting sexual harassment or other forms of discrimination;

  Violates agency regulations prohibiting workplace violence, including threats.

- Comments may be edited prior to posting to ensure they are entirely germane.
- Posted comments shall be those which have been approved in content and posted to the website to be viewed, not just submitted.

Pest Rating: C