

## California Pest Rating Proposal for

*Xanthomonas hortorum* pv. *hederae* (Arnaud 1920) Vauterin et al. 1995

Ivy leaf spot

Current Pest Rating: C

Proposed Pest Rating: C

Domain: Bacteria, Phylum: Proteobacteria,  
Class: Gammaproteobacteria, Order: Lysobacterales,  
Family: Lysobacteraceae

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Comment Period: **11/09/2022 through 12/24/2022**

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### Initiating Event:

This pathogen has not been through the current pest rating process. The risk to California from *Xanthomonas hortorum* pv. *hederae* is described herein and a permanent rating is proposed.

### History & Status:

#### Background:

*Xanthomonas* is a genus of phytopathogenic bacteria with many species that cause diseases such as citrus canker, vascular wilts, leaf and fruit spots, and blights of annual and perennial plants. Unlike other genera of phytopathogenic bacteria that typically occupy a diversity of ecological niches, almost all *Xanthomonas* species are plant pathogens and are found only in association with plants or plant materials. Some begin their plant host associations as epiphytes, using surface polysaccharides and forming biofilms, then transition to a pathogenic lifestyle under favorable conditions. *Xanthomonas* spp. produce xanthomonadins, pigments that protect them from natural light and can give them yellow colors in axenic culture. Most *Xanthomonas* species are limited in their range and subspecific pathovar designations have been assigned to some to reflect that specificity (Agrios, 2005).

In the past, bacterial taxonomists worked from what they thought were the most important phenotypic characteristics of their strains. The taxonomy of xanthomonads was based on a single feature, host specificity, and this was used to name species. This method, over time, resulted in an

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unreasonable number of nomenclatures. Dye et al. (1980) drastically reduced this into one species, *X. campestris*, and developed a special use classification system below species with pathovar names for phytopathological variants. In 1995, Vauterin et al. created a new taxonomic system based on DNA homology data that considered both the genomic relationships among strains and the needs of plant pathologists to have a rational nomenclature for practical daily use.

The earliest reports of diseases caused by *Xanthomonas hortorum* (first called *Bacterium hederæ*) date back to the 1890s, with the reports describing a bacterial leaf spot and blight disease of English ivy (*Hedera helix*) in Germany (Lindau, 1894). Vauterin et al. (1995) described and separated *X. hortorum* sp. nov. from *X. campestris* with *X. hortorum* pv. *hederæ* designated as the species' type strain. *Xanthomonas hortorum* was determined to be monophyletic by Morinière et al., (2020) by combining the pathovars of *X. hortorum* with *X. cynaræ* (which is now *X. hortorum* pv. *cynaræ* and *X. hortorum* pv. *gardneri*).

Each *X. hortorum* pathovar has its own natural host range and the experimental host ranges of multiple pathovars have been studied. Most of the reported natural hosts of *X. hortorum* belong to the Geraniaceae, Araliaceae, and Asteraceae families. *Xanthomonas hortorum* pv. *hederæ* is primarily known as a pathogen of English ivy (*Hedera helix*) (Trantas et al., 2016), but has also been isolated from other diseased *Hedera* spp., and some strains are pathogenic on other plants in the Araliaceae family (e.g., *Schefflera* spp.) (Norman et al., 1999; Dia et al., 2021).

*Hosts:* *Brassica actinophylla*, *Hedera canariensis*, *H. colchica*, *H. helix*, *H. hibernica*, *H. nepalensis* var. *sinensis*, *H. rhombea*, *Schefflera arbuticola*, *S. arboricola*, *Fatsia japonica*, *Polyscias balfouriana*, *P. chinensis*, *P. guilfoylei*, *P. scutellaria*, *Polyscias* sp., and *Pterandra elegantissima* (Norman et al., 1999; Dia et al., 2021).

*Symptoms:* The disease primarily affects leaves, and initial symptoms are round, water-soaked lesions on the undersides of the leaves. There is often a yellow halo around the lesions, depending on the strains and host species. As the disease progresses, these leaf spots expand and coalesce, forming bigger inverted V-shaped necrotic zones. Lesions and spots usually turn dark in color (brown to black). In final infection stages, leaves usually harden and dry; a red-purple margin might appear on their upper surface. *X. hortorum* pv. *hederæ* occasionally affects stems and petioles and bacteria may ooze from the stems under warm, moist conditions, (Suzuki et al., 2002).

*Transmission:* Bacteria are spread by splashing water. The pathogen enters plants through stomates, hydathodes, or small wounds on leaf surfaces. Vegetatively propagated cultivars of ivy and other foliage plants are most affected, because the pathogen inhabits the vascular tissue of infected mother plants and systemically infects the cuttings. *Xanthomonas hortorum* pv. *hederæ* is not known to be internally seedborne, although seedlings are susceptible to infection. The pathogen can survive in contaminated soil. Infected stock plants may initially be symptomless. Cutting knives can be contaminated and can spread the bacteria to clean plants when vegetative cuttings are taken from infected mother plants. Even with strict sanitation efforts, bacteria can still enter nursery production facilities through infected propagative materials, aerosols, wind, and with people (Daughtrey et al.,

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1995). Once introduced, bacteria become established and spread rapidly through contact or through irrigation (Daughtrey and Benson, 2005).

**Damage Potential:** Dense foliage, closely spaced plants, and overhead irrigation favor disease development in nurseries and landscapes. Foliage plants with any noticeable level of black leaf spots are generally unacceptable to consumers. Disease incidences as high as 100% in some greenhouses have been reported for *H. helix*, and most hedgerow plantings of *Polyscias* spp. in Hawaii are heavily infected with the pathogen (Norman et al., 1999).

**Worldwide Distribution:** Asia: *China, Taiwan, Turkey.* Europe: *Denmark, France, Germany, Greece, Portugal, Slovenia, United Kingdom.* North America: *Canada, United States (California, Florida, Georgia, Hawaii, Illinois, Maryland, Missouri, New Jersey, New York, Ohio, Oregon, Virginia, Washington).* Oceania: *New Zealand (CABI ISC, 2021).*

**Official Control:** *Xanthomonas hortorum* pv. *hederae* is on the USDA PCIT's harmful organism list for Colombia, French Polynesia, Guatemala, Jordan, and Mexico (USDA, 2022). It is on the EPPO's A2 list for Jordan and a quarantine pest in Mexico (EPPO, 2022).

**California Distribution:** This pathogen is known to occur statewide with records going back to the 1970s (French, 1989; CDFA PDR database, 2022).

**California Interceptions:** none

The risk *Xanthomonas hortorum* pv. *hederae* would pose to California is evaluated below.

## Consequences of Introduction:

- 1) Climate/Host Interaction:** The pathogen can live internally in the vascular system of its hosts. It is likely to occur wherever the hosts can grow, with larger epidemics under conditions of prolonged leaf wetness.

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

**Score: 3**

- 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 natural host range includes plants in multiple genera with an even larger experimental host range.

Evaluate the host range of the pest.

**Score: 2**

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- 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:** This pathogen is mostly limited to its hosts without significant long-term survival being observed in soil or water. It is mostly moved with infected cuttings can also spread inside a greenhouse or landscape planting with water splash, aerosols, and handling of infected plants.

Evaluate the natural and artificial dispersal potential of the pest.

**Score: 2**

- 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:** This is a common problem on English Ivy and any black leaf spots reduce their ornamental value. It is also a problem on foliage plants for the same reason. It is a quarantine pest in several countries and is spread by water.

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

**Economic Impact: A, B, C, D, G**

- 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: 3**

- 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:**

Evaluate the environmental impact of the pest to California using the criteria below

**Environmental Impact: E**

- 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.
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- 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: 2**

- 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 *Xanthomonas hortorum* pv. *hederae*: Medium**

Add up the total score and include it here. **12**

- 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 'high'.**

**Score: -3**

- 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: (Score)**

**Final Score:** *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information = 9*

**Uncertainty:**

The taxonomy of *X. hortorum* is under revision and strains that attack ivy could be re-assigned to new or different pathovars.

**Conclusion and Rating Justification:**

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Based on the evidence provided above, the proposed rating for *Xanthomonas hortorum* pv. *hederae* is **C**.

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### Responsible Party:

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**\*Comment Period: 11/09/2022 through 12/24/2022**

### \*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](mailto:permits[@]cdfa.ca.gov).

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### 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.]

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- ❖ 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.

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**Proposed Pest Rating: C**

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