California Pest Rating Proposal for

Acidovorax cattleyae (Pavarino 1911) Schaad et al. 2009

Bacterial brown spot of orchid

Pest Rating: C

Kingdom: Bacteria, Phylum: Proteobacteria,
Class: Betaproteobacteria, Order: Burkholderiales,
Family: Comamonadaceae

Comment Period: 12/13/2021 through 01/27/2022

Initiating Event:

A pest risk assessment of *Acidovorax cattleyae* and a re-evaluation of its current pest rating in California is presented here.

History & Status:

Background:

A bacterial disease causing a brown spot on *Cattleya* orchids was named *Bacterium cattleyae* by Pavarino in 1911. It has also been called *Pseudomonas avenae*, *Pseudomonas avenae* subsp. *avenae*, and *Pseudomonas cattleyae*. In 1992, Willems et al., proposed that several generically misnamed phytopathogenic pseudomonads be transferred a the newly formed genus named *Acidovorax*, based on DNA/DNA and DNA–rRNA homologies and phenotypic assays. Following this work, *Pseudomonas cattleyae* was renamed as *Acidovorax avenae* subsp. *cattleyae*.

Bacteria in the genus *Acidovorax* cause diseases of a wide range of economically important crops including corn, rice, watermelon, anthurium, and orchids. In 2008, Schaad et al. analyzed genotypic and phenotypic relatedness among strains and subspecies of *A. avenae.* This analysis of 16S rDNA sequences and the 16S–23S rDNA internal transcribed spacer region revealed four (A, B, C, and D) distinct genotypes: subsp. *avenae* in taxon A with strains from corn, subsp. *avenae* strains from rice in taxon B, subsp. *citrulli* strains from cucurbits in taxon C, and subsp. *cattleyae* strains from orchids in taxon D. All four taxa were easily differentiated phenotypically from each other and from all other

recognized *Acidovorax* species. From this work, Schaad et al. (2008) proposed an emendation of the species *A. avenae*, with subsp. *citrulli* and subsp. *cattleyae* being elevated to species rank as *A. citrulli* comb. nov., and *A. cattleyae* comb. nov., respectively.

There are other bacteria found in California that infect orchids, causing soft and brown rots including *Burkholderia cepacia*, *Dickeya chrysanthemi*, *D. fangzhongdai*, *Pectobacterium carotovorum*, and *Pantoea cypripedii* (CDFA PDR database, 2021).

Hosts: All in the family Orchidaceae: *Catasetum* spp., *Cattleya* spp., *Cymbidium* spp., *Cypripedium* spp., *Dendrobium* spp., *Doritaenopsis* spp., *Epidendrum* spp., *Epiphronitis* spp., *Ionopsis* spp., *Miltonia* spp., *Odontoglossum* spp., *Oncidium* spp., *Ornithocephalus* spp., *Paphiopediulum* spp., *Phalaenopsis spp., Renanthera* spp., *Rodricidium* spp., *Rodriguezia* spp., *Rhynchostylis* spp., *Sophronitis* spp., *Trichocentrum* spp., *Vanda spp., Vanilla spp., Vuylstekeara* spp., and *Zygopetalum* spp. (CABI-CPC, 2021; CDFA PDR database, 2021; Janse, 2018).

Symptoms: Symptoms begin as small, dark-green, water-soaked spots on the leaves. Under high humidity, these spots can enlarge rapidly and turn brown and then black, and often can be surrounded by yellow halos, depending also on the orchid variety. Spots may coalesce, and under severe infection, the whole leaf and plant may die (Janse, 2018). On *Phalaenopsis* seedlings, disease starts as a soft, water-soaked spot that later becomes a brown or black cavity. These spots expand and can consume the entire leaf. On older plants, infection can start anywhere on a leaf, but when it reaches the growing point, a mucilaginous exudate may be produced. On *Cattleya*, disease progresses more slowly and is limited to older leaves, producing clearly delimited, sunken, black spots. Warm, moist conditions and high nitrogen fertility favor disease. (Pscheidt and Ocamb, 2021).

Transmission: Seedlings are infected through stomata, older plants through wounds. Bacteria in exudate spread from orchid to orchid by splashing water, and over distance with infected plants. Contaminated propagation tools also transmit the bacteria.

Damage Potential: Damage depends on the sensitivity of the orchid variety and growth stage. Large losses are reported from *Phalaenopsis* seedlings, and *Phalaenopsis* at all ages are susceptible (Scortichini, et al., 2005). In the Netherlands, *Phalaenopsis* growers report major losses up to 20%, and in Poland, 15% was reported due to this pathogen (Ludeking et al., 2011; Pulawska et al., 2013). Ornamental species are often very sensitive even to cosmetic damage due to any loss of leaves or any leaf spots. In 1946, Ark and Thomas observed that the disease was prevalent in CA greenhouses, where there was high temperature and relative humidity.

Worldwide Distribution: The geographical origin of *Acidovorax cattleyae* is not known, however, the disease has spread to many regions of the world mainly through the passage of contaminated propagative materials. Asia: *China, Korea, Philippines, Taiwan, Thailand*. Europe: *Belgium, Germany, Italy, Netherlands, Poland, Portugal*. North America: *United States* (California, Florida, Oregon) Oceania: *Australia* (CABI-CPC, 2021; Janse, 2018).

Official Control: *Acidovorax cattleyae* is on the USDA PCIT's harmful organism list for Argentina, China, Colombia, Ecuador, Guatemala, Honduras, New Zealand, Panama, and Peru (USDA, 2021).

California Distribution: Older state records show this pathogen has been detected on orchids as Coast North and Coast South. Recent records are from Alameda and San Mateo counties.

California Interceptions: none

The risk *Acidovorax cattleyae* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** Infection rate, disease incidence, and disease severity are all highly dependent on moisture and temperature. Greenhouse conditions under which many of these orchids are cultivated are often highly favorable to this pathogen.

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

   Score: **1**
   - 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 host range is limited to orchids.

   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:** As is common for many bacterial pathogens, inoculum increase can be exponential when conditions are favorable for reproduction and spread. Bacteria are spread easily with water, tools, cuttings, and workers.

   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:** Orchid growers experience economic loss due to plant loss. This pathogen is a quarantine pest in some countries.

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: This pathogen is a quarantine pest in some jurisdictions and bacterial diseases such as this one are very problematic for greenhouse growers and hobbyists.

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

Environmental Impact: D, 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.
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: 3

- 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 *Acidovorax cattleyae:* Medium

Add up the total score and include it here. 11
-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.

This pathogen has been in California for decades according to official state records and from a publication from 1946 (Ark and Thomas). It is not under regulatory control beyond the need for nurseries to meet the standard for commercial cleanliness (French, 1989).

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* ***= 8***

Uncertainty: none

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Acidovorax cattleyae* is C.

References:

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Responsible Party:

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***Comment Period: 12/13/2021 through 01/27/2022**

***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.

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
