CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Phytophthora acerina Ginetti, T. Jung, D.E.L. Cooke & Moricca (2014)

Current Pest Rating: Z

Proposed Pest Rating: B

Domain: Eukaryota, Kingdom: Chromista,
Phylum: Oomycota, Class: Oomycetes,
Order: Peronosporales, Family: Peronosporaceae

Comment Period: 11/08/2022 through 12/23/2022

Initiating Event:

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

History & Status:

Background:

Phytophthoras are filamentous, osmotrophic eukaryotes that resemble fungi morphologically, but belong to the class Oomycota in the kingdom Stramenopila. The genus *Phytophthora* include some of the most destructive plant pathogens of agricultural crops, ornamental plants, and forests. The number of recognized *Phytophthora* species is rapidly increasing and currently includes more than 180 provisionally named species (Yang et al., 2017).

In 2008, a severe decline and dieback of *A. pseudoplatanus* trees was observed in several planted forest stands in northern Italy. Affected trees showed thinning and dieback of the crown and bleeding cankers at the stem base and along the stem, with tongue-shaped, orange-brown lesions of the inner bark and brown to greenish staining of the cambium and adjacent xylem tissue. *Phytophthora* spp. were isolated that were homothallic, with persistent semipapillate sporangia. The isolates resembled species from the *P. citricola* complex. Detailed morphological and physiological studies and a phylogenetic analysis of ITS, cox1 and b-tubulin sequence data revealed that all isolates belonged to an unknown unique taxon of the *P. citricola* complex which was described and named *Phytophthora acerina* sp. nov by Ginetti et al., in 2014.

With DNA sequencing, the taxonomic concept for the genus has evolved from morphologically to molecular phylogeny-based and has increased our understanding of *Phytophthora* evolution and pathology. The genus is currently organized into clades and subclades based on genetic relationships. *Phytophthora acerina* is in clade 2c with some very well-known species, including *P. citricola, P. plurivora, P. pini* and *P. multivora*. Today sequence-based molecular "barcodes" are used to identify *Phytophthora* species (Abad et al. 2019). Surveys of nurseries, landscapes, forests, and restoration sites in California are showing that the diversity of *Phytophthora* spp. have been underestimated, and many of these species have been inadvertently moved great distances before they were known to plant pathologists (Rooney-Latham et al., 2018; Scott et al., 2019; Bourret et al., 2020).

Hosts: Acer pseudoplatanus (sycamore), *Alnus glutinosa* (common alder), *Alnus* sp., *Metasequoia glyptostroboides* (Chinese redwood), *Olea europaea* (olive) (Ginetti et al., 2014; Seddaiu and Lindaldeddu, 2020; Linaldeddu et al., 2020; Bregant et al., 2020, Lui et al., 2022)).

Symptoms: On olives growing in Italy, Linaldeddu et al. (2020) reported severe decline symptoms including partial or complete crown dieback, reddening of drying foliage, loss of rootlets, and collar rot. Common alders in Sardinia show partial or complete canopy dieback, reddening of the foliage, and bleeding cankers at the collar and lower stem (Seddaiu and Linaldeddu, 2022). Chinese redwoods show symptoms of decline and death associated with branch dieback and root and collar rot (Liu et al., 2021).

Transmission: Species of *Phytophthora* like *P. acerina* that cause root, collar, and stem rots survive cold winters or hot and dry summers as mycelium in infected roots or stems or in soil. During spring or fall, sporangia are produced. The sporangia can be infective, or under favorable environmental conditions, the sporangia produce motile spores (zoospores). They are attracted to the exudates from roots of susceptible hosts and can move towards the roots with their flagella. Infected soils, plants, planting stock, and seedlings, rain and irrigation water, and cultivation equipment and tools may spread contaminated soil and plant materials to non-infected plants and to new sites. Inoculum levels can increase exponentially under wet conditions (Agrios, 2005).

This species produces asexual sporangia but does not seem to produce resting chlamydospores. It is homothallic, meaning having a haploid phase that produces two kinds of gametes capable of fusing to form a zygote, and produces oogonia and oospores (Abad, 2022, https://idtools.org/id/phytophthora/factsheet.php?name=16119).

Damage Potential: Currently, there are no reports on quantitative economic losses in plant production caused specifically by *P. acerina* in California. However, infestations may result in significant damage and loss in production and stands of host plants by causing root and collar rots of infected plants. In Italy and China, there are descriptions of serious decline in forest trees and olive groves from this pathogen. Nursery ornamentals and plants grown for outplanting at restoration sites could be particularly affected. It is common for multiple species of *Phytophthora* to co-occur in contaminated nursery blocks. Generally, infected stock cannot be rehabilitated and is instead destroyed (Rooney-Latham et al., 2019).

Worldwide Distribution: China, Italy, United States (California).

Official Control: none

California Distribution: There have been three official detections by CDFA plant pathologists. In 2018 and 2021 in San Francisco County, *P. acerina* was collected from nursery irrigation water with pear baits as part of nursery surveys. Detections have been made from Santa Clara County, also made with pear baits from soil and roots, and from a survey of a restoration area with *Populus fremontii* (Fremont cottonwood) (Bourret et al., 2022).

California Interceptions: none

The risk *Phytophthora acerina* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** This species is likely to be able to establish wherever its hosts can grow.

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 host range of *P. acerina* includes several trees in different families

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:** *Phytophthora acerina* reproduces with multiple types of spores and is moved with water, contaminated soil, and infested nursery stock.

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: *Phytophthora acerina* is documented cause serious decline to host species. There are few fungicide treatments, and none are consistently curative. Strict adherence to best management practices and sanitation are necessary to keep nursery stock free from *Phytophthora* spp. Detections in nurseries and restoration sites show phytosanitary protocols are inadequate.

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

Economic Impact: A, 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: This species has the potential to cause damage to native plant landscapes and possibly to the native forests of California, as this has been observed with other Phytophthoras in this clade.

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

Environmental Impact: A, B, C, 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 *Phytophthora acerina:* 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 'low'.

Score: -1
-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* ***= 11***

Uncertainty:

All official California detections to date have been from water baiting with pears, so direct connections with a host have not been made. In Europe, *P. acerina* often co-occurs with other *Phytophthora* species, including *P. plurivora*, which is closely related. Co-occurrence can make damage assessments more difficult.

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Phytophthora acerina* is B.

References:

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***Comment Period: 11/08/2022 through 12/23/2022**

***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.

Proposed Pest Rating: B