

California Pest Rating Proposal for

Diaporthe rudis (Fr. : Fr.) Nitschke 1870

Current Pest Rating: Z

Proposed Pest Rating: C

Kingdom: Fungi, Phylum: Ascomycota,
Subphylum: Pezizomycotina, Class: Sordariomycetes,
Subclass: Sordariomycetidae, Order: Diaporthales,
Family: Diaporthaceae

Comment Period: 05/19/2021 through 07/03/2021

Initiating Event:

In July 2019, an unofficial sample of *Arctostaphylos franciscana* was submitted to CDFA's Plant Pest Diagnostics Center by a native plant nursery in San Francisco County. CDFA plant pathologist Suzanne Rooney-Latham isolated *Diaporthe rudis* in culture from the stems. She confirmed her diagnosis with PCR and DNA sequencing and gave it a temporary Z-rating. *Diaporthe faginea* (Curr.) Sacc., (1882) and *Diaporthe medusaea* Nitschke, (1870) are both junior synonyms of *D. rudis*, and both have previously been reported in California (French, 1989). The risk to California from *Diaporthe rudis* is described herein and a permanent rating is proposed.

History & Status:

The genus *Diaporthe* contains economically important plant pathogens that cause diseases on a wide range of crops, ornamentals, and forest trees, with some endophytes and saprobes. Traditionally, *Diaporthe* species have been identified with a combination of morphology and host association. This is problematic because multiple species of *Diaporthe* can often be found on a single host, and a single species of *Diaporthe* can be associated with many different hosts. Using molecular data and modern systematics has been helpful in identifying and characterizing pathogens, especially for regulatory work.

Diaporthe spp. can cause cankers, diebacks, root rots, fruit rots, leaf spots, blights, decay, and wilts. They are hemibiotrophs with both a biotrophic (requiring living plants as a source of nutrients) phase and a necrotrophic (killing parts of their host and living off the dead tissues) phase. When susceptible

hosts are infected, they may be asymptomatic during the biotrophic phase but can suffer severe effects during the necrotrophic phase. Following death of the host, the pathogen can continue to survive as a saprobe.

The asexual states of *Diaporthe* are usually *Phomopsis*, and the *Phomopsis* form is the one most often detected in the field. As nomenclature transitions to one genus name for both sexual and asexual states of fungi (Wingfield et al., 2012), *Diaporthe* has nomenclatural priority by date over *Phomopsis*.

In 2014, Udayanga et al. published a molecular reassessment of *D. citri*, *D. cytospora*, *D. foeniculina* and *D. rudis*. The name *D. rudis* is based on the oldest epithet and there are many synonyms for this species including *D. medusaea*, originally described from *Laburnum anagyroides* in Germany. The *D. medusaea* name has been used for the pathogen causing melanose and stem end rot of *Citrus* spp. in North America. Wehmeyer (1933) listed the synonyms for *D. medusaea* as *D. citri*, *D. citrincola*, *D. faginea*, *D. rudis* and *D. viticola*. *Diaporthe faginea* was established as a legitimate name, however, no type specimen as *D. faginea* exists. Based on an ITS sequence, this name is accepted as a synonym of *D. rudis*. Although *D. viticola* was recognized as a distinct taxon and characterized and epitypified using a specimen on *Vitis* by van Niekerk et al. (2005), Udayanga et al. (2014) determined it to also be a synonym of *D. rudis*. *Diaporthe* pathogens of citrus are usually identified as *D. citri*. *Diaporthe citri* was considered a synonym of *D. medusaea* by Wehmeyer (1933), who also listed *D. californica*, *Phomopsis citri* and *P. citrincola* as ecological forms of *D. medusaea*. The name *D. medusaea* is used in several articles as the fungus causing melanose and stem end rot, and *D. medusaea* has been synonymized with *D. rudis* by Udayanga et al. (2014), but citrus-infecting strains have been reclassified as *D. citri*.

Background:

Hosts: From Udayanga et al. (2014) the host range for *D. rudis* (= syn. *D. faginea*, *D. macrostoma*, *D. medusaea*, *D. viticola* and *D. silvestris*) includes *Acer*, *Asphodelus albus*, *Aucuba japonica*, *Brugmansia*, *Castanea*, *Corylus*, *Dipsacus fullonum*, *Epilobium*, *Eucalyptus*, *Fagus*, *Fraxinus*, *Holcus*, *Hydrangea*, *Ileostylis*, *Laburnum*, *Lupinus*, *Malus*, *Protea*, *Pyrus*, *Rosa*, *Sambucus*, *Salix*, *Vaccinium* and *Vitis vinifera*. Farr and Rossman (2021) give a more extensive host list that includes many *Citrus* sp. Udayanga et al. (2014) have moved all citrus infecting strains to *D. citri*. Publications after Udayanga et al. (2014) have added *Persea americana* (Torres et al., 2016), *Actinidia deliciosa* (Diaz et al., 2017), *Glycine max* (Petrovic et al., 2016), and *Pinus pinaster* (Lopes et al., 2021), as well as *Acacia*, *Arctostaphylos franciscana*, *Azalea*, *Garrya elliptica*, *Pelargonium graveolens*, *Pelargonium zonale*, and *Eucalyptus globulus* as hosts (California Department of Food and Agriculture, Pest Damage Records).

Symptoms: Species in the genus *Diaporthe* cause a variety of disease including cankers, leaf spots, blights, dieback of stems and woody branches, fruit rot (pre- and post-harvest) and seed decays. They can be pathogens, endophytes or saprophytes. *Diaporthe rudis* has an anamorph in the genus *Phomopsis*.

Transmission: *Diaporthe* spp. overwinter in infected plant debris. In the spring, spores are dispersed from pycnidia (Phomopsis state) embedded in diseased tissue by rain splash and irrigation water. Infection occurs through flower buds from budbreak to bloom and the disease spreads from flowers into shoots and twigs. The pycnidia may contain only β -conidia, which are usually sterile and noninfective, or α -conidia, which usually are infective, or both. Production of the sexual reproductive spores in the perithecia (*Diaporthe* state) could occur during the autumn and early winter. The fungus can also infect through injuries such as wounds from pruning, harvest equipment, frost cracks, and herbicide injury and produces girdling cankers.

Damage Potential: Most reports of *Diaporthe rudis* are as the causal agent of fruit rots in grapes, pears, avocado, kiwi, and seed decays of soybean, walnuts and hazelnut (CABI- CPC, 2021). It is common for *D. rudis* to be identified as part of group of pathogens associated with post-harvest decays, and its individual contribution is not separated out. Infected avocados develop a stem-end rot, a dark brown color in the peel, necrosis in the vascular strands, and light brown discoloration in the flesh (Torres et al., 2016). On woody hosts, *Diaporthe* cankers appear as dark, necrotized wood, and are accompanied by shoot dieback (Baumgartner et al., 2013).

Worldwide Distribution: Australia, Canada, Chile, Europe (Austria, Germany, Italy, Latvia, Portugal, Spain, Sweden, Switzerland), New Zealand, South Africa, United States (California) (Udayanga et al., 2014; CDFFA PDR database).

Official Control: *Diaporthe rudis* is a quarantine pest in Morocco (EPPO, 2021), and on the USDA PCIT harmful organism list for Colombia.

California Distribution: There are official state records dating from 2000 onward from Sacramento, Santa Cruz, San Francisco, and San Mateo counties. There are older state records that indicated that this species is generally distributed in California. Torres et al. (2016) reports the interception of *D. rudis* in Chile on Hass avocados imported from California. Avocados are grown commercially in southern California in San Diego, Riverside, Orange, Los Angeles, Ventura, Santa Barbara, and San Luis Obispo counties.

California Interceptions: None.

The risk *Diaporthe rudis* would pose to California is evaluated below.

Consequences of Introduction:

- 1) Climate/Host Interaction:** This pathogen has an extensive host list and its hosts are grown throughout California, in multiple climates from sub-tropical to temperate.

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 host range includes many of species of woody plants and some herbaceous hosts.

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: *Diaporthe rudis* has a high reproductive potential with an abundant production of spores. However, the spores are dependent on splashing water or movement of contaminated planting material for dispersal.

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: *Diaporthe rudis* damages woody plants and causes damaging fruit infections and is a quarantine pest in Morocco.

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

Economic Impact: A, C

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:

The host range of this pathogen includes many plants that are California natives (i.e. *Arctostaphylos* spp.) or are naturalized in California (i.e. *Acacia* spp.). It seems likely that it is endophytic, non-pathogenic or saprophytic on the bark or wounds of some hosts, but if they are stressed or weakened, it may become more pathogenic.

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 *Diaporthe rudis*: 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.

Official records and published reports show this pathogen is the nursery trade and in commercial fruit, in multiple counties and likely is generally distributed statewide.

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).
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-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:

Taxonomy of this group is likely to undergo additional revisions. More research is needed to better understand the importance of endophytic infections.

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Diaporthe rudis* is C.

References:

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Responsible Party:

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***Comment Period: 05/19/2021 through 07/03/2021**

*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).

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:
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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: C
