cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

COLLETOTRICHUM ORCHIDOPHILUM (Damm, P. F. Cannon & Crous 2012)

Current Pest Rating: Q

Proposed Pest Rating: B

Comment Period: 7/11/2019 through 8/25/2019

Initiating Event:

On May 19, 2017, diseased leaves of Venus Slipper orchids (*Paphiopedium* spp.), exhibiting leaf spotting symptoms, were collected from a commercial nursery in Arroyo Grande, California, by San Luis Obispo County inspectors and sent to the CDFA Plant Pathology Laboratory for diagnosis. A second sample was sent from the same nursery on June 23, 2017. On July 25, 2017, Suzanne Latham, CDFA plant pathologist, identified the pathogen *Colletotrichum orchidophilum*, as the cause for the disease. The determination was made by fungal morphology in culture and confirmed by PCR analysis. The USDA National Identification Services in Beltsville, Maryland confirmed the identification and deposited the specimen in the USDA Herbarium, recording it as the first continental United States detection of this fungus. The pathogen was assigned a temporary "Q" rating. Consequently, the infected plants were cut back removing all symptomatic tissues, and the nursery is applying two different fungicides in alternation as the leaves grow. They will be released from quarantine hold when there is enough new plant growth to ensure the plants are disease-free. The risk of the introduction and establishment of *C. orchidophilum* is evaluated here and a permanent rating is proposed.

History & Status:

Background: *Colletotrichum orchidophilum* causes anthracnose disease in multiple plant species belonging to the family Orchidaceae. This pathogen was first described in 2012 (Damm et al.) and has been reported in the United States, the United Kingdom, Reunion Island, Panama, Thailand, and China. In the United States, it has been reported from orchids on the Hawaiian islands of Oahu and Hawaii and recently from a commercial orchid nursery in California (see "initiating events"). In addition to causing disease on orchids grown as ornamentals, *C. orchidophilum* is also the causal agent of black spot disease of the vanilla orchid, *Vanilla planifolia*. Infected plants exhibit dark spots on flowers, pods, leaves, and stems, and the pathogen reduces in vanilla pod production by 10-30% (Charron et al., 2018).

Colletotrichum orchidophilum does not belong to any major clade or species complex of the genus *Colletotrichum* (Cannon et al., 2012, Marin-Felix et al., 2017). The whole-genome sequence of *C. orchidophilum* was analyzed by Baroncelli et al. in 2018 due to its usefulness in evolutional studies and because it represents the closest-related species to the *C. acutatum* species complex, which contains many important plant pathogens.

Hosts: Orchids- *Paphiopedium* spp. (venus slipper orchid) (CDFA Pest and Damage Records, 2017; see 'Initiating Event'), *Cycnoches aureum* (golden Cycnoches), *Dendrobium* sp.(Dendrobium orchid), *Phalaenopsis* sp.(moth orchid), *Ascocenda* sp. (Singapore Orchid) (Dumm et al., 2012; Farr & Rossman, 2019), *Vanilla planifolia* (Vanilla orchid) (Charron et al., 2018).

Symptoms: Generally, *Colletotrichum* infects the aerial portion of the plant with the leaves being the part most often attacked. Leaf tips turn brown beginning at the apex and proceeding toward the base. There can also be stem and fruit spots, and wilting of leaves, which often result in dieback and reduction in plant quality. Dark brown or light gray patches of fungal growth develop, sometimes as concentric rings or as numerous dark bands across the leaf. The affected area is usually sharply defined and somewhat sunken, while the remainder of the leaf appears normal (Chase, 2011). On *Vanilla*, the disease is characterized by dark spots that appear in slight depressions on flowers, pods, leaves, and stems. The spots then develop into broad, clearly depressed necrotic plaques (Charron et al., 2018).

Transmission: Colletotrichum diseases spread by spores that can disperse via wind, splashing irrigation water, and are easy to spread with irrigation water or rainfall, movement of infected nursery stock and cultivation tools (Agrios, 2005). It is likely that *C. orchidophilum* has a very similar life cycle to that of other *Colletotrichum* species and survives between crops as mycelium on plant residue in soil, on infected plants, and on seeds. During active growth, the pathogen produces masses of hyphae (stromata) which bear conidiophores on the plant surface. Conidia (spores) are produced at the tips of the conidiophores and are disseminated by wind, rain, cultivation tools, equipment, and field workers. Conidia in mass may appear pink or salmon-colored. Conidia germinate, penetrate host tissue by means of specialized hyphae (appressoria) and invade host tissue. Humid, wet, rainy weather is necessary for infection to occur. These requirements may limit the occurrence of the pathogen in arid climates of California and subsequently, the pathogen may be more of a problem under controlled environments of greenhouses.

Damage Potential: Anthracnose disease caused by *C. orchidophilum* can result in reduced plant quality and growth, reduced pod production, and reduced marketability due to discoloration of flowers and leaves. Estimates of yield/crop loss due to this pathogen on ornamental orchids have not been reported. However, in California, nursery, and greenhouse production of orchids are particularly at risk as nursery conditions are often conducive to infection by *Colletotrichum* pathogens. In outdoor situations, including nurseries and ornamental plantings, disease development may be sporadic as it is affected by levels of pathogen inoculum and environmental conditions. Losses to vanilla crops have reached 30% on Reunion Island (Charron et al., 2018).

Worldwide Distribution: *Asia:* China, Thailand; *North America:* United States (Hawaii and California); *Central America*: Panama; *Africa:* Reunion Island; *Europe:* United Kingdom (Yang et al., Ma et al., 2018, Farr and Rossman, 2019)

Official Control: In California, *C. orchidophilum* is a quarantine-actionable, Q-rated pathogen.

California Distribution: San Luis Obispo County (see "Initiating Event")

California Interceptions: None

The risk *Colletotrichum orchidophilum* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** Similar to other species of *Colletotrichum*, *C. orchidophilum* requires humid, wet, rainy weather for conidia to infect host plants. This environmental requirement may limit the ability of the pathogen to fully establish and spread under dry field conditions in California but suitable conditions may be found inside production greenhouses.

   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:** Presently, the host range of *Colletotrichum orchidophilum* is limited to plant species in the family Orchidaceae

   Evaluate the host range of the pest.

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

3) **Pest Dispersal Potential:** The pathogen has high reproductive potential and conidia are produced successively. They are transmitted by wind, wind-driven rain, cultivation tools, and human contact however conidial germination and plant infection require long, wet periods.

   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:** Under suitable, wet climates, the pathogen could lower plant growth, flower production and value, and trigger the loss of markets. Nursery-grown orchids could be negatively affected as could orchids in landscapes.

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

Economic Impact: A, B, D

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:** The pathogen could trigger official or private fungicide treatments and significantly impact cultural practices or home garden plantings.

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 *Colletotrichum orchidophilum is Medium (12)*

-Low = 5-8 points
-Medium = 9-12 points
-High = 13-15 points

6) **Post Entry Distribution and Survey Information**: The pathogen is only known to be in one county, San Luis Obispo.
***Evaluation is 'Low'* (-1)**

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:

Final Score: *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information* ***= 11***

Uncertainty:

As it is a newly described species, the host range of *Colletotrichum orchidophilum* may expand to other species of orchids. Since the California detection was itself on a new genus of orchid,further host range studies are warranted. Also, positive results of detection surveys for *C. orchidophilum* in nursery, commercial, and natural environments within California may alter its rating.

Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for *Colletotrichum orchidophilum is B*.**

References:

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Responsible Party:

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*Comment Period: 7/11/2019 through 8/25/2019

*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 plant.health[@]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
