CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Colletotrichum tropicale Rojas, Rehner & Samuels 2010

Current Pest Rating: Q

Proposed Pest Rating: B

Kingdom: Fungi; Division: Ascomycota

Class: Sordariomycetes; Order: Glomerellales

Family: Glomerellaceae

Comment Period: 10/05/2020 through 11/19/2020

Initiating Event:

On July 24, 2020, a San Diego County agricultural inspector submitted a sample of leaves from *Dracaena reflexa* 'Song of India' cuttings. The cuttings were an incoming quarantine nursery shipment from Costa Rica heading to a wholesale nursery for propagation. On August 28, 2020, CDFA plant pathologist Albre Brown diagnosed anthracnose, caused by the fungus *Colletotricum*. With multigene analysis, she identified two species of *Colletotricum* from the cuttings; *C. fructicola* (B-rated) and *C. tropicale*. This is the first detection of *C. tropicale* in California and the first detection on *Dracaena reflexa*. The only other US detections of *C. tropicale* have been causing pod rot of cacao in Puerto Rico (Serrato-Diaz et al., 2020). It was assigned a temporary Q-rating. The risk to California from *C. tropicale* is described herein and a permanent rating is proposed.

History & Status:

Background: Anthracnose diseases caused by *Colletotrichum* spp. can cause devastating losses in many economically important crops, including tree fruits, small fruits, vegetables, cassava, and sorghum, as well as ornamental foliage plants (Agrios, 2005). *Colletotrichum* is the sole genus in the fungus family Glomerellaceae. There are approximately 200 accepted *Colletotrichum* species in eleven species complexes and 23 singleton species (Jayawardena et al., 2016 a, b). Many pathogenic *Colletotrichum* species can also be present as symptomless, cryptic endophytes in living plant tissues, and many appear to be non-pathogenic (Cannon et al., 2012).

The *gloeosporioides* species complex includes 37 species, including *C. gloeosporioides*. Most of these species are plant pathogens (Weir et al., 2012), but some species have been isolated as endophytes (Liu et al., 2015). Conidia of this species complex are cylindrical with rounded ends tapering slightly towards the base (Weir et al., 2012). Utilizing a multigene phylogenetic analysis, Weir et al. (2012) designated subclades within the species complex.

Rojas et al. (2010) studied a collection of *C. gloeosporoides* s. l. isolates associated with *Theobroma cacao* and other plants in Panama. From among these *C. tropicale* sp. nov., an endophyte of cacao associated with fruit rot on soursop (*Annona muricata*), was described. This species can be pathogenic or endophytic and infects the leaves and fruits, causing lesions and rots respectively. Subsequently, it has been found in Asia and North and South America.

Hosts: Anacardium occidentale (cashew)*, Annona cherimola* (cherimoya)*, Annona muricata* (soursop)*, Areca catechu* (areca palm), *Azadirachta indica* (neem)*, Bauhinia variegata* (purple orchid tree), *Bougainvillea* sp. (bougainvilla), *Capsicum annuum* (chili pepper), *Catharanthus roseus* (periwinkle)*, Cattleya labiata* (crimson cattleya), *Cattleya* sp. *(cattyla), Coffea canephora* var. *robusta* (coffee), *Copernicia prunifera* (carnaúba palm), *Cordia aliodora* (Spanish elm)*, Curcuma longa* (turmeric)*, Dracaena reflexa* (song of India), *Ficus binnendijkii* (narrow leaf fig)*, Licania tomentosa* (oiti), *Litchi chinensis* (lychee), *Mangifera indica* (mango)*, Manihot dichotoma* (cassava), *Manihot epruinosa* (cassava)*, Morinda citrifolia* (noni), *Myrciaria cauliflora* (jaboticaba), *Myrciaria dubia* (camu-camu), *Nelumbo nucifera* (sacred lotus)*, Origanum vulgare* (oregano), *Pennisetum purpureum* (elephant grass)*, Psidium guajava* (common guava), *Punica granatum* (pomegranate)*, Sauropus androgynus* (katuk), *Theobroma cacao* (cocoa), *Trichilia tuberculata,* and *Viola surinamensis* (baboonwood) (Farr and Rossman, 2020; Matos et al., 2020)

Symptoms: Anthracnose symptoms on mango can develop on leaves, twigs, petioles, panicles, and fruits. On leaves, lesions start as small, angular, brown to black spots that can enlarge to form extensive dead areas. The lesions may drop out of leaves during dry weather. Many green fruit infections remain latent and quiescent until ripening. Thus, fruits can appear healthy at harvest but develop significant anthracnose symptoms rapidly upon ripening. Infected fruits may drop from trees prematurely. Ripe fruits develop sunken, prominent, dark brown to black decay spots. The fruit spots usually coalesce and can eventually penetrate deep into the fruit, resulting in extensive fruit rotting. A second fruit symptom is a “tear stain”, which consists of linear necrotic regions on the fruit that may or may not be associated with superficial cracking of the epidermis. Infection can cause fruits to develop wide, deep cracks in the epidermis that extend into the pulp (Nelson, 2008). At least four *Colletotrichum* species in addition to *C. tropicale* can cause mango anthracnose.

On the leaves of *Sauropus androgynus*, initial symptoms include water-soaked spots 0.2 to 0.3 mm in diameter, which develop into circular or irregular-shaped lesions with a grayish white center and dark-brown margin (Liu et al., 2018). Lesions on oregano leaves are irregular, brown, and yellow-haloed (Ayvar-Serna et al., 2020). Similar to mangos, fruits of infected pomegranate show dark, circular, and necrotic lesions (Silva-Cabral et al., 2019). On leaves of *F. binnendijkii* var. *variegata*, lesions appear along the margin of the leaves and are subcircular or irregularly shaped, brown to black, water-soaked,

and sunken. The black lesions enlarge and coalesce into large necrotic areas. Later, the middle parts of the lesions become grayish white and often has irregular fine wrinkles (Kong et al., 2019).

Transmission: Wet, humid, warm weather conditions favor anthracnose infections in the field and warm, humid temperatures also favor postharvest anthracnose development. Lesions on stems and fruits may produce conspicuous, pinkish-orange spore masses under wet conditions that are moved by wind, wind-driven rain, cultivation tools, and human contact.

Damage Potential: Worldwide, anthracnose is one of the most important and destructive diseases of mango. A 65% incidence of infection caused by *Colletotrichum* spp. was reported on *Sauropus* in China. (Liu et al., 2018). Disease incidences on oregano have resulted in significant (25%) crop loss in Mexico (Ayvar-Serna et al., 2020). On *Ficus binnendijkii* var. *variegata*, a horticultural cultivar, like *Dracaena reflexa* 'Song of India', grown throughout tropical and subtropical regions, anthracnose is known to have affected up 96% of the total crop; resulting in the complete loss of yield (Kong et al., 2019).

Worldwide Distribution: Brazil, China, Cuba, India, Indonesia, Japan, Mexico, Panama, Taiwan, Thailand, and the United States (California and Puerto Rico) (Farr and Rossman, 2020).

Official Control: In California *C. tropicale* is an actionable, Q-rated pathogen and incoming infected plant material is subject to rejection for return to the origin shipper or destruction.

California Distribution: There has been one detection of this pathogen in San Diego County on Song of India (*Dracaena reflexa*) cuttings that entered California from Costa Rica as a nursery shipment subject to state exterior quarantine.

California Interceptions: none

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

Consequences of Introduction:

1) **Climate/Host Interaction:** Like other species of *Colletotrichum*, *C. tropicale* 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. The pathogen could establish within limited regions under conducive climates or in greenhouse plant production.

   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:** Although many of the plants on the host list are tropical, some are subtropical and grown in warmer parts of California for fruit or as ornamentals

Evaluate the host range of the pest.

Score: 3

- 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:** 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:** Fruit production in particular, can be limited by its susceptibility to anthracnose fungi under wet conditions. Therefore, under suitable climates, the pathogen could lower plant growth, fruit production and value.

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:** Fruit trees cultivated and growing in open environments in California are not expected to be significantly affected by *Colletotrichum tropicale* due to the high moisture conditions required for the development of the pathogen. However, under humid and moist environments, the pathogen may be more of a problem particularly in ornamental plantings in home/urban and private/public settings. This pathogen could cause significant damage in greenhouse conditions.

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.
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 *Colletotrichum tropicale:* 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 'not established'. *Colletotrichum tropicale* has been found only in one incoming shipment from Costa Rica and is transient, actionable, and under eradication.

Score: -0
-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* **= 12**

Uncertainty:

As this is a species that has been separated out from a larger species complex, it is likely that more hosts will be described in the future.

Conclusion and Rating Justification:

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

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Responsible Party:

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***Comment Period: 10/05/2020 through 11/19/2020**

***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
