

California Pest Rating Proposal for

Colletotrichum gloeosporioides (Penzig) Penzig & Saccardo 1882

Current Pest Rating: C

Proposed Pest Rating: C

Comment Period: **1/22/2020 through 3/7/2020**

Initiating Event:

On August 9, 2019, USDA-APHIS published a list of “Native and Naturalized Plant Pests Permitted by Regulation”. Interstate movement of these plant pests is no longer federally regulated within the 48 contiguous United States. There are 49 plant pathogens (bacteria, fungi, viruses, and nematodes) on this list. California may choose to continue to regulate movement of some or all these pathogens into and within the state. In order to assess the needs and potential requirements to issue a state permit, a formal risk analysis for *Colletotrichum gloeosporioides* is given herein and a permanent pest rating is proposed.

History & Status:

Background:

The name *Colletotrichum gloeosporioides* was first proposed by Penzig in 1882 for a pathogen collected from citrus in Italy. Over time, plant pathologists noticed morphological similarity between the fungus described by Penzig and *Colletotrichum* infecting other hosts. Species, subspecies, and forma speciales of *Colletotrichum* were subsequently described based on the host they were first found on, and on features that can be variable or subjective such as conidial size and shape, appressoria shape, growth rate in culture, color of cultures, presence or absence of setae, and whether or not the teleomorph (sexual stage) develops. About 750 names exist in the literature for either a teleomorph or anamorph synonymized with *C. gloeosporoides* (Small, 1921; Arx, 1970; Sutton, 1992) and many are now believed to be distinct species. Recent and ongoing molecular studies have resulted in a much better understanding of the taxonomic relationships amongst all these *Colletotrichum gloeosporioides* isolates. Weir et al. (2012) performed DNA- phylogenetic analysis using genes from eight nuclear gene

regions, the ribosomal ITS, glutamine synthetase, manganese-superoxide dismutase, and β -tubulin 2 to classify isolates as *C. gloeosporioides* in its currently defined sense.

Today the name *C. gloeosporioides* is in common use in two ways; one way is a biologically broad sense forming a “species complex” that does not distinguish between closely related isolates, the other in a strict sense, encompassing only those specimens genetically matching the epitype selected for the name *Colletotrichum gloeosporioides* by Cannon et al. (2008) and Hyde et al. (2009). For this pest rating proposal, I am using *C. gloeosporioides* sensu stricto (in the strict sense) and linked taxonomically to the teleomorph *Glomerella cingulata* (Stonem.) Spauld. & Schrenk after Weir et al. (2012). This decision was made on the assumption that in the future, many new species will be separated out of the *C. geosporoides* species complex.

Hosts: *Citrus*, *Ficus* (fig), *Mangifera* (mango), *Pueraria* (kwao krua), *Broussonetia papyifera* (paper mulberry), and *Vitis* (grape) (Cannon et al., 2008; Yan et al., 2011).

Symptoms: *Colletotrichum gloeosporioides* can be acting either as a primary disease-causing organism or isolated from deteriorated plant parts. It is found commonly in the tropics but has been recorded from a wide range of temperate and subtropical habitats. The species is well known as a latent pathogen causing post-harvest problems, and endophytic strains can be isolated from symptomless plant parts. A common name for diseases caused by *C. gloeosporioides* is “anthracnose”, which means black. Anthracnose is a general term applied to a disease symptom and is also used for other plant diseases caused by other genera of fungi.

Symptoms: On citrus, symptoms can be typical of an anthracnose disease with dark staining on fruit and postharvest fruit decay. The fungus blemishes the rind tissue of mature Valencia and navel oranges, grapefruit, and occasionally lemon and is referred to as anthracnose tear staining (Adaskaveg, 2008). *Colletotrichum gloeosporioides* and *C. karstii* have recently been shown to be causing citrus shoot dieback and gummosis symptoms. These symptoms include leaf chlorosis, crown thinning, gumming on twigs, shoot dieback, and in severe cases, death of young trees. The most characteristic symptom is the formation the gum pockets, which appear on young shoots either alone or in clusters and the dieback of twigs and shoots (Mayorquin et al., 2018).

On mango, anthracnose symptoms occur on leaves, twigs, petioles, flower panicles, and fruits. Lesions start as small, angular, brown to black spots on leaves that can enlarge to form extensive dead areas. Flower panicles develop small black or dark-brown spots, which can enlarge, coalesce, and kill the flowers. Immature fruit can also be infected and may drop from trees prematurely. Ripe fruits can develop sunken, prominent, dark brown to black decay spots pre-or post-harvest resulting in extensive fruit rotting. A second symptom on fruits is a “tear stain”, in which are linear necrotic regions on the fruit and can be associated with cracking of the epidermis (Nelson, 2008).

On paper mulberry, infection by *C. gloeosporoides* causes brown-to-black leaf spots (Yan et al., 2011). Figs develop fruit with small, slightly sunken, water-soaked and circular spots. As the spots increase in size, they become depressed with darkened central portions (Choi et al., 2013).

Transmission: During active growth, the pathogen produces masses of hyphae (stromata) on the plant surface that bear conidiophores. Conidia (spores) are produced at the tips of the conidiophores and disseminated by wind, rain, cultivation tools, equipment, and field workers. On citrus, dying leaves and twigs become covered with fungal conidiospores which can become airborne. On mangos during humid or moist conditions, abundant orange-brown to salmon-colored conidia spore masses form in lesions and are dispersed passively by splashing rain or irrigation water. *Colletotrichum gloeosporioides* survives between crops during winter as mycelium on plant residue in soil, on infected plants, and on seeds.

After the conidia are transmitted to host plants, they germinate, penetrate host tissue by means of specialized hyphae (appresoria), and ramify throughout the host tissue. Humid, wet, rainy weather is necessary for infection to occur (Agris, 2005). These requirements in particular may limit the occurrence of the pathogen in California fields and subsequently, the pathogen may be more of a problem under controlled environments inside greenhouses.

Damage Potential: On citrus, the disease affects mainly fruit on stressed trees with old, dead wood. On mango, anthracnose is the most important and destructive disease worldwide (Arauz, 2000). It kills the flowers and under wet and humid conditions; fruit infection can reach 100%, directly reducing yield. On paper mulberry, the disease can kill stem cuttings and saplings in addition to causing leaf spots and defoliation (Yan et al., 2011). Figs experience premature fruit drop and fruit rot (Choi et al., 2013).

Worldwide Distribution: The distribution is cosmopolitan in tropical and subtropical countries, especially in citrus growing areas, although there is considerable uncertainty in the records of detections due to the “questionable taxonomy of this group” (Farr and Rossman, 2019).

Official Control: *Colletotrichum gloeosporioides* is on the harmful organisms list for Cambodia, Colombia, Egypt, French Polynesia, Syrian Arab Republic, and Uganda (USDA-PCIT)

California Distribution: Widespread on *Citrus* spp. (Adaskaveg, 2008).

California Interceptions: *Colletotrichum gloeosporioides* has been intercepted multiple times on citrus fruit from Florida and Texas.

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

Consequences of Introduction:

- 1) Climate/Host Interaction:** Although favored by humid and wet weather, *Colletotrichum gloeosporioides* has been found statewide on citrus.
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Evaluate if the pest would have suitable hosts and climate to establish in California. **High**

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: for *Colletotrichum gloeosporioides* sensu stricto, the host range is moderate.

Evaluate the host range of the pest. **Medium**

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: *Colletotrichum gloeosporioides* reproduces with airborne conidia that can also move with rain and splashing water. It can survive as a pathogen, endophyte, or saprophyte and on multiple types of plant parts. It can latently infect fruit and is not always visible at harvest, increasing the chance of long distance transport to distant markets.

Evaluate the natural and artificial dispersal potential of the pest. **High**

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: *Colletotrichum gloeosporioides* is a very serious disease of citrus and mangos in the tropics and a significant post-harvest problem on citrus in California. It is on the harmful organism list for multiple countries.

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

Economic Impact: A, B, 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: 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.**
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- 5) **Environmental Impact:** Preventing blemishes on citrus fruit, especially for export, may require fungicide applications (Adaskaveg, 2008)

Environmental Impact: D

- 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 gloeosporioides*:

Add up the total score and include it here. **13**

- 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 'High'. Citrus is the most important host of *Colletotrichum gloeosporioides* in California and detections have been made in multiple counties

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.**
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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 = 13-3=10*

Uncertainty:

As the taxonomy of this species continues to be studied, the host range may be expanded or contracted, changing the distribution and or impact.

Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for *Colletotrichum gloeosporioides* is C.**

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Responsible Party:

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***Comment Period: 1/22/2020 through 3/7/2020**

*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[[@](mailto:permits@cdfa.ca.gov)]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
