

## California Pest Rating Proposal for

### *Colletotrichum acutatum* Simmonds ex Simmonds 1968

#### Black spot of strawberry

Kingdom: Fungi, Phylum: Ascomycota  
Subphylum: Pezizomycotina, Class: Sordariomycetes  
Subclass: Sordariomycetidae, Family: Glomerellaceae

**Current Pest Rating: C**

**Proposed Pest Rating: C**

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**Comment Period: 02/01/2021 through 03/18/2021**

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#### Initiating Event:

There was a request from county agricultural inspectors for the pest rating website to be updated to include all *Colletotrichum* species that have been given rating determinations by the CDFA lab. This requires each species to receive a pest rating proposal. The risk to California from *Colletotrichum acutatum* is described herein and a permanent rating is proposed.

#### History & Status:

**Background:** *Colletotrichum acutatum* was first described by Simmonds from a range of different hosts from Australia. The name was validated with designation of a holotype from *Carica papaya* and paratypes from *Capsicum frutescens* and a *Delphinium* sp. Over the next 50 years, *C. acutatum* became one of the most frequently reported species in the genus *Colletotrichum* after *C. gloeosporioides*, listed as causing diseases called “anthracnose” on numerous host plants worldwide (Farr and Rossman 2020).

Most identifications of *C. acutatum* (sensu lato or in the broad sense) were made on fungal morphology, specifically the shape of its conidia, which have acute ends. Differentiation between *C. acutatum* (s. lat.), *C. gloeosporioides* (s. lat.) and other *Colletotrichum* species is difficult because many intermediate conidial shapes exist, and the host ranges can overlap. Additional taxonomic work has

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shown that *C. acutatum* is a species complex containing many constituent taxa, but there was reluctance to elevate these clades as independent species, due to the lack of differential morphological and cultural characters. In 2012, Damm et al. published a comprehensive revision of the *C. acutatum* species complex, dividing it into 5 main clades and 29 subclades. In this review, I will be using their work to describe *C. acutatum* sensu stricto (in the strict sense). These strains are especially destructive on fruits including strawberry, citrus, apple, olive, cranberry, papaya, and blueberry. Additionally, they are known to cause “terminal crook” disease on Pinaceae (Lundquist, 1984).

*Colletotrichum acutatum* can act as a primary disease-causing organism capable of infecting an otherwise healthy or undamaged host. *C. acutatum* can also act as a secondary pathogen which exploits a weakened or wounded host to exacerbate disease development. This plant pathogen is endemic to the tropics but has been recorded from a wide range of temperate and subtropical habitats. *C. acutatum* 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 the disease caused by this fungus is “anthracnose”, which means black. Anthracnose is a general term applied to a disease symptom that is also used for other plant diseases caused by other genera of fungi.

*Hosts:* *Colletotrichum acutatum* s. str. causes disease symptoms on a wide range of plants including multiple genera in multiple families. Confirmed genera are *Anemone*, *Arbutus*, *Boronia*, *Carica*, *Citrus*, *Fragaria*, *Hakea*, *Leucadendron*, *Mangifera*, *Pistacia*, *Ranunculus*, *Olea*, *Phlox*, *Pinus*, *Protea*, and *Statice* (Damm et al., 2012).

*Symptoms:* *Colletotrichum acutatum* can infect any portion of the strawberry plant, the resulting disease depends on what stage development and host tissue the infection occurs. Fully open flowers are the most susceptible to Flower blight which also affects flower buds, pedicels and peduncles. Anthracnose is a disease of the petiole, runner, and fruit lesions, occasionally with stunting and yellowing of plants. Wilting and collapse of plants is possible but uncommon. Diseased petioles and runners have dark brown or black, lens-shaped, sunken spots. When crown tissue is infected it decays, which causes the entire plant to wilt and die. Strawberry crown infections caused by *Colletotrichum* will be cinnamon to red in color, which is different from *Phytophthora* crown disease, which causes chocolate brown tissue discoloration. Anthracnose fruit rot is another disease caused by *C. acutatum* in production areas with warm, rainy weather. Fruit at any stage of development can be affected. Small, sunken, oval-to-round brown spots (on green fruit) or black spots (red fruit) develop and expand. Under high humidity, salmon or orange-colored spores can form on the lesions of the fruit, petioles, and runners. Decayed fruit tissue becomes firm and dry overtime (Koike et al., 2018).

On pine, *C. acutatum* causes terminal crook disease. The symptoms include severe stunting, abnormally thick stems, dead and brown terminal needle clusters, and crooked or multiple stems on seedlings (Lundquist, 1984).

*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 transmitted by wind, rain, cultivation tools, equipment, and people. On citrus, dying leaves and twigs

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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 acutatum* 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 (appressoria), and ramify throughout the host tissue. Humid, wet, rainy weather is necessary for infection to occur (Agrios, 2005). These requirements may limit the occurrence of the pathogen in California fields and therefore the pathogen may be more of a problem under controlled environments inside greenhouses.

*Colletotrichum acutatum* can survive in infected plant debris and soil for at least 9 months in the absence of a host. Fumigation reduces field borne inoculum sources, but the planting of infected strawberry nursery stock is also a source of disease. Transplants may appear healthy but can have quiescent infections that become active only under environmental conditions that favor disease such as elevated temperatures and increased humidity (Eastburn and Gubler, 1990).

On stone fruit, almond blossoms and immature or mature fruit can be affected. On peach, the disease has been observed only on mature fruit. Typical symptoms include sunken circular or angular lesions that produce erumpent, mucilaginous, pink spore masses under conducive environments (Adaskaveg and Hartin, 1997).

**Damage Potential:** Anthracnose is a major disease of strawberry in California nursery and fruit production. All parts of the plant are affected by infection, resulting in significant yield loss from any of the different phases of the disease, including crown rot, root rot, flower blight, fruit rot (i.e., black spot), petiole lesions, and leaf spots (Daugovish et al., 2009). Crown infections can cause the entire plant to wilt and die during early establishment of fruit production fields (Eastburn and Gubler, 1990).

Infection of almond blossoms causes direct crop loss while infection of almond or peach fruit can cause direct loss or reduction in quality (Adaskaveg and Hartin, 1997).

**Worldwide Distribution:** *Colletotrichum acutatum* s. lat. is distributed worldwide throughout tropical and temperate areas (Farr and Rossman, 2020; CABI-CPC, 2020).

**Official Control:** *Colletotrichum acutatum* is on the EPPO's A1 list in Chile and Kazakhstan and is a quarantine pest in Israel and Tunisia. It is also on the USDA PCIT harmful organisms list for Albania, Australia, Canada, Chile, Eurasian Customs Union, Israel, Mexico and Nauru.

**California Distribution:** This pathogen has been observed statewide, mainly in strawberries and other fruits (CDFA PDR database).

**California Interceptions:** none.

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

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## Consequences of Introduction:

- 1) **Climate/Host Interaction:** Although favored by humid and wet weather, *Colletotrichum acutatum* has been found statewide on strawberries. Detections on almond and peach have mostly been in Northern California.

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:** For *Colletotrichum acutatum* s. str., the host range is moderate.

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:** *Colletotrichum acutatum* 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 and within the soil on plant debris. 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.

**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 acutatum* is a damaging disease of strawberry, almond and peach 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.

**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.
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- 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:** Preventing blemishes on fruit, especially for export, may require fungicide applications. Cultural practices such as keeping plants dry are important for preventing infection.

**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 *Colletotricum acutatum*: High**

Add up the total score and include it here. 14

- 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'**. There are official records and publications from the University of California and others showing this pathogen is already widespread in California (French, 1989).

**Score: -3**

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- 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:**

In the past, classification of species of the genus *Colletotrichum* based mostly on morphology. Modern studies additionally utilizing genetic data and characterizations have shown that *C. acutatum* is a species complex with a variable host range. These differences are especially important when countries have quarantines.

### **Conclusion and Rating Justification:**

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

### **References:**

Adaskaveg, J. E., and Hartin, R. J. 1997. Characterization of *Colletotrichum acutatum* isolates causing anthracnose of almond and peach in California. *Phytopathology* 87:979-987

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EPPO Global Database. 2020. <https://gd.eppo.int/taxon/CORLVE>. Accessed 6/29/2020

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Koike, S. T., Browne, G. T., Gordon, T. R. and Bolda, M. P. 2018. Agriculture: Strawberry Pest Management Guidelines: Anthracnose *Colletotrichum acutatum*. UC IPM Pest Management Guidelines: Strawberry UC ANR Publication 3468

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USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PEXD) Harmful Organisms Database Report. *Colletotrichum acutaum*. Accessed 12/11/2020

### Responsible Party:

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**\*Comment Period: 02/01/2021 through 03/18/2021**

### \*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).

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### Comment Format:

- ❖ Comments should refer to the appropriate California Pest Rating Proposal Form subsection(s) being commented on, as shown below.

#### Example Comment:

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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.

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**Proposed Pest Rating: C**

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