CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Colletotrichum lindemuthianum (Saccardo & Magnus) Briosi & Cavara
bean anthracnose

Current Pest Rating: none

Proposed Pest Rating: B

Kingdom: Fungi, Phylum: Ascomycota,
Subphylum: Pezizomycotina, Class: Sordariomycetes,
Subclass: Hypocreomycetidae, Order: Glomerellales,
Family: Glomerellaceae

Comment Period: 07/17/2025 through 08/31/2025

Initiating Event:

This pathogen has not yet been evaluated through the pest rating process. It is considered a pest of concern for California's export seed programs. This document assesses the risk posed by *Colletotrichum lindemuthianum* to California and proposes a permanent rating.

History & Status:

Background:

The genus *Colletotrichum* contains many species, often causing leaf spots and postharvest fruit rots, mainly in tropical and subtropical regions (Cai et al., 2011). Species of *Colletotrichum* are also important because of their use as model organisms for research (Dean et al., 2012). Species-level identification of this genus is complex and challenging. In the past, species were often named for the hosts on which they were first identified. Species cannot reliably be separated using morphological traits, and they can have tremendous variation in pathogenicity depending on the host. Some hosts may be infected by multiple species of *Colletotrichum*, and some species of *Colletotrichum* are known to have dozens of hosts (Cannon et al., 2012). *Colletotrichum* species can behave as endophytes, saprophytes, or necrotrophs. However, they most commonly act as hemi-biotrophs, becoming pathogenic under favorable conditions.

Colletotrichum lindemuthianum was discovered by Lindemuth in 1875 (Tiffany and Gilman, 1954) and first described by Saccardo (1878). *Colletotrichum lindemuthianum* belongs to the *C. orbiculare* species

complex (Damm et al., 2013; Liu et al., 2013). The disease has been reported on *Phaseolus vulgaris* and on other diverse host species in different parts of the world (Sicard et al., 1997). It is a serious seed-borne pathogen of beans. Infection of susceptible cultivars in cool and humid environmental conditions can result in yield losses as high as 100% (Padder et al., 2007)

Colletotrichum lindemuthianum has high genetic variability and at least 182 physiological races have been identified in different world regions (Padder et al., 2017). A sexual form (teleomorph) of the pathogen was described and named *Glomerella lindemuthiana* (Shear and Wood, 1913) from laboratory cultures. A teleomorph stage has very rarely been observed under field conditions. Barcelos et al. (2014) studied *Glomerella* species isolated from anthracnose-infected bean lesions. These authors reject the idea that *Glomerella* is the perfect stage of *C. lindemuthianum*. Instead, they proposed that *Glomerella* species present in the lesions were epiphytes that can grow opportunistically or as weak pathogens, taking advantage of lesions produced by *C. lindemuthianum*. At later stages of pathogenesis, it becomes difficult to distinguish between *C. lindemuthianum* and *Glomerella* spp. based on the symptoms.

Dozens of hosts across 15 plant genera have been reported worldwide for *C. lindemuthianum* (Farr and Rossman, 2025). However, most of the reports from hosts other than *Phaseolus* spp. were made before the epitypification and revision of the species by Liu et al. (2013) and are therefore doubtful. Based on multi-locus sequence data (ITS act, tub2, chs-1, gapdh), Liu et al. (2013) only lists *Phaseolus coccineus* and *P. vulgaris* as hosts of *C. lindemuthianum*. Later molecular taxonomy studies added more host species (Gao et al. 2018; Sangpueak et al. 2018).

Hosts: The major host of *C. lindemuthianum* is *Phaseolus vulgaris* (bean), however, it can infect related species and varieties such as *P. vulgaris* var. *aborigineus* (a South American ancestral wild form of the common bean), *P. acutifolius* var. *acutifolius* (cultivated tepary bean), *P. coccineus* (scarlet runner bean), *P. lunatus* (lima bean), *P. lunatus* var. *macrocarpus* (big lima bean), *Vigna mungo* (urd bean), V. *radiata* var. *radiata* (cultivated mung bean), *V. unguiculata* (cowpea), *Lablab purpureus* (hyacinth bean), and *Vicia faba* (broad bean) (Farr and Rossman, 2025; CABI, 2025).

Symptoms: This anthracnose pathogen infects leaves, stems, pods, and seeds of common bean plants. Lesions can appear very early on the hypocotyls as discoloration of the leaf veins of seedlings. Red-brown spots and streaks develop on all above-ground plant parts. When viewed from the underside, infected leaves show veins that first turn brick-red, purple, and eventually black. More advanced stages of disease can result in wilting and flagging of leaves. Stem girdling can lead to the death of the plant.

Infection of the bean pods begins with rust-colored lesions that develop into sunken cankers with black rings with a red outer border. These lesions can produce pink-colored spores in an ooze from an acervulus that erupts through the epidermis (Frate et al., 2018). Severely infected young pods abort and fall early, while pods that mature produce infected seed with dark cankers. Such seeds should not be harvested and sold (Halvorson et al., 2021).

Transmission: The pathogen overwinters in seed and crop residues left in the field. Water splashes disperse spores and result in the primary and secondary spread of disease. Long-distance spread is through the movement of infected seeds (Ntahimpera et al. 1997).

Damage Potential: Under favorable humidity and temperature, bean anthracnose can cause premature defoliation, flower drop, and pod abortion, and it can lead to plant death in extreme cases (Sharma et al., 2008). It is considered one of the most widespread and economically important diseases in dry bean production areas of the world because it reduces yield by up to 95% (Mordue, 1971; Pastor-Corrales and Tu, 1989) and has a detrimental effect on seed quality (Conner et al., 2004). Any level of infection of seed can disqualify it from export markets.

Worldwide Distribution: Africa: *Angola, Burundi, Democratic Republic of Congo, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Mozambique, Rwanda, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe*. Asia: *Brunei Darussalam, China, Hong Kong, India, Israel, Japan, Malaysia, Myanmar, Nepal, Philippines, South Korea, Sri Lanka, Taiwan, Thailand, and Turkey*. Europe: *Armenia, Bulgaria, France, Germany, Greece, Italy, the Netherlands, Poland, the Russian Federation, Scotland, and the United Kingdom*. North America: *Canada, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago,* and the *United States*. Oceania: Australia, New Caledonia, New Zealand, and Papua New Guinea. South America: *Argentina, Brazil, Chile, Colombia, and Venezuela* (Farr and Rossman, 2025).

Official Control*: Colletotrichum lindemuthianum* is a regulated non-quarantine pest in Egypt (EPPO, 2025). It is on the USDA PCIT's harmful organisms list for Australia, Israel, Nauru, and Paraguay (USDA-PCIT, 2025).

California Distribution: There are no modern records of this pathogen in California. Reports from the 20th century were made based on colony and spore morphology, which is no longer considered sufficiently reliable for species-level identification. There is a description of the disease on the UC IPM website (https://ipm.ucanr.edu/agriculture/dry-beans/bean-anthracnose/#gsc.tab=0).
No distribution information is provided, but according to Frate et al. (2018), this disease is rarely a problem under dry, warm California conditions.

California Interceptions: none

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

Consequences of Introduction:

1) **Climate/Host Interaction:** High levels of disease are associated with cool and wet conditions, with the most serious epidemics occurring when the pods have extended periods with free water in the summer. Most growing regions in California are warmer and drier than ideal for this disease.

Evaluate if the pest would have suitable hosts and climate to establish in California.

Score: **1**

- Low (1) Not likely to establish in California, or likely to establish in very limited areas.

- Medium (2) may be able to be established 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 for *C. lindemuthianum* as determined by DNA sequencing after 2013 is limited to *Phaseolus* and a few additional species (see note on doubtful hosts under Background, above).

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 Reproductive Potential:** *Colletotrichum lindemuthianum* reproduces with repeating cycles of asexual spores. Its success as a worldwide pathogen is due to its ability to infect seeds.

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:** This is a very damaging disease of *Phaseolus* spp., harming the plant growth and the beans directly.

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

Economic Impact: A, B, C

A. The pest could lower crop yield.
B. The pest could lower crop value (including increasing crop production costs).
C. The pest could trigger the loss of markets (including 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:** This disease could affect home/urban gardens

Evaluate the environmental impact of the pest on California using the criteria below.

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: 1
- 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 lindemuthianum:* Medium

Add up the total score and include it here. **9**
-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".

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 consequence of the 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:

Several other species of *Colletotrichum* have been isolated and identified from beans worldwide based on multi-locus sequence data, e.g., *C. incanum, C. nymphaeae, C. phaseolorum, C. plurivorum, C. sojae*, and *C. truncatum* (syn. *C. capsici*) (Gupta et al., 2022). Some of these could be present in California. Separating *Colletotrichum* species requires an expert diagnostician as the determination has quarantine significance to export programs.

Conclusion and Rating Justification:

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

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Responsible Party:

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***Comment Period: 07/17/2025 through 08/31/2025**

***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