

California Pest Rating Proposal for
***Colletotrichum circinans* (Berk.) Voglino 1921**

onion smudge

Current Pest Rating: None

Proposed Pest Rating: C

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

Comment Period: 03/16/2021 through 04/30/2021

Initiating Event:

County agricultural inspectors have requested that the pest rating website be updated to include all *Colletotrichum* species, that have been given temporary rating determinations by plant pathologists at CDFA's Plant Pest Diagnostics Center. This requires each species to receive a pest rating proposal. The risk to California from *Colletotrichum circinans* is described herein and a permanent rating is proposed.

History & Status:

Background: Onion smudge disease was first described in 1851 by Berkeley in England, where it was found on the outer scales of a white onion. Smudge is a common disease of onions worldwide, occurring in the field and in post-harvest crop storage or transportation. It is primarily a disease of the bulbs and can damage the appearance and market value of the crop. In general, onion smudge is a weak pathogen. Actively growing portions of the plant are not attacked, except for young seedlings grown under highly favorable, warm, and wet conditions. In the field, *Colletotrichum circinans* survives on the outer leaves or scales. This plant tissue is already dead or essentially functionless except to protect the inner portions. Following harvest, there can be a gradual invasion of dormant cells of the fleshy scales of the bulbs. The disease progress is usually slow, but in a moist, warm environment there may be a more rapid onset, resulting in decay of the resting central bud of the onion set.

Colletotrichum circinans was previously known as *Colletotrichum dematium* (Pers.) Grove f. sp. *circinans* (Berk.) Arx, which is specific to *Allium* species. In 1992, Sutton described *C. circinans* as a distinct species from *C. dematium*.

Hosts: *Allium ampeloprasum* (wild leek), *Allium ascalonicum* (shallot), *Allium cepa* (garden onion), *Allium cepa* var. *aggregatum* (potato onion), *Allium chinense* (Chinese onion), *Allium fistulosum* (Welsh onion), *Allium odorum* (fragrant garlic), *Allium porrum* (leek), *Allium sativum* (garlic), *Allium sphaerocephalum* (round-headed garlic), *Allium schoenoprasum* (chives), *Allium* sp., *Allium tricoccum* (ramps), *Allium tuberosum* (garlic chives), *Allium vineale* (wild garlic), *Anthriscus sylvestris* (cow parsley), *Beta vulgaris* (beet), *Colchicum autumnale* (autumn crocus), *Hemerocallis middendorffii* (amur daylily), *Ipomoea batatas* (sweet potato), *Iris* sp., *Nolina macrocarpa* (palmella), *Nothoscordum bivalve* (false garlic), *Solanum melongena* (eggplant), and *Viola hirta* (viola) (Farr and Rossman, 2021).

Symptoms: Seedlings that are infected under warm and wet conditions can suffer damping-off diseases. Symptoms of this disease include rotting of stem and root tissues at and below the soil surface. Infected plants may germinate and emerge, but within a few days, become water-soaked and mushy, falling over at the base, leading to death. Infected leaves initially show purplish elongated spots. Fungal fruiting structures form within the lesions. The small fruiting bodies are dark green at first but turn black when mature. They characteristically occur in groups or in concentric rings near the bulb neck, and on the outer scales of the bulb. A leaf blight is possible in warm, wet climates (Howard et al., 1996; Jackson, 2017, Kim et al., 2008).

Smudge appears on maturing bulbs in the field, usually just before harvest, and on bulbs in storage. The pathogen will infect one or two outer wrapper scales (dry leaves of the bulb), especially near the basal plate. Smudge also affects the neck of the bulb. Small, round dark spots develop which may be scattered over the surface of the bulb in diffuse patches or more frequently in concentric rings 1-2 cm in diameter. The spots contain cream-colored spore masses and black setae. More extensive rots develop in the inner fleshy scales, especially if the onions are harvested during wet weather and stored above 20°C. When infected onions are stored under moist conditions, small yellow lesions form on the inner layers of the bulb. The infected bulbs shrink, and the scales become susceptible to rots caused by secondary fungi, bacteria, and yeasts (Jackson, 2017).

Transmission: The fungus survives on plant debris left in the field, producing spores to infect the next crop, or as stromata in infected scales on bulbs that are planted. The stromata of the fungus are capable of withstanding very long periods of desiccation and can survive in soil for several years (Howard et al., 1996). Free moisture from rain or irrigation is needed for spore germination. Spread occurs when spores, either on the outside surface of the bulbs or as infections of the green leaves, are moved by wind-blown rain. Moving infected bulbs spreads the disease to new areas (Jackson, 2017). Infection occurs at or above 10°C, but progress is very slow below 20°C, and the optimum is around 26°C. Conidia are produced abundantly under moist conditions at temperatures between 20° and 30° C (Walker, 1921).

Damage Potential: Disease caused by the infection of onions by *Colletotrichum circinans* is mostly superficial, but the formation of black pathogen fruiting bodies on the outer scales gives the onions a

dirty or “smudged” appearance. Infected bulbs are downgraded or rejected from sale. On welsch onions grown in Korea, disease incidence on leaf sheaths causing blight reached as high as 30% in some fields (Kim et al., 2007).

Worldwide Distribution: Australia, Brazil, Brunei, Bulgaria, Canada, Chile, China, Czechia, Costa Rica, Cuba, Cyprus, Darussalam, Denmark, Dominican Republic, Fiji, Germany, Hong Kong, India, Iran, Italy, Kenya, Korea, Libya, Malaysia, Mauritius, Nepal, Netherlands, New Caledonia, New Zealand, Pakistan, Panama, Papua New Guinea, Panama, Poland, Russia, Samoa, Serbia, South Africa, Spain, Thailand, Tonga, United Kingdom, United States (*Colorado, Florida, Hawaii, Illinois, Iowa, Louisiana, Minnesota, Missouri, Montana, North Carolina, Oklahoma, Washington, Wisconsin*), Venezuela, Zambia, and Zimbabwe (CABI- CPC, 2021).

Official Control: USDA PCIT’s harmful organism list for Ecuador, Egypt, Nicaragua, Peru, and Thailand (USDA-PCIT, 2021).

California Distribution: Alameda, Fresno, and Yolo counties.

California Interceptions: None

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

Consequences of Introduction:

- 1) Climate/Host Interaction:** This pathogen requires warm and wet conditions. It is likely that most of the California growing areas are too dry for epidemics. Coastal areas could be an exception.

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:** The hosts are mostly *Allium* spp., with a few other vegetables and ornamentals on record.

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.
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- 3) Pest Reproductive Potential:** Onion smudge has spread around the world with the movement of infected bulbs. Localized spread occurs with spores that are moved by rain splash.

Evaluate the natural and artificial dispersal potential of the pest.

Score: 2

- 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 disease is controlled with resistant varieties, and post-harvest handling that keeps bulbs cool and dry. In warm climates with wet conditions in the growing season, there can be a damaging leaf blight phase of the disease.

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:** No environmental impacts have been reported.

Environmental Impact:

- 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.
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- High (3) causes two or more of the above to occur.

Consequences of Introduction to California for *Colletotrichum circinans*: 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 'Medium'. There are records in three counties,

Score: -2

-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 = 7*

Uncertainty:

None

Conclusion and Rating Justification:

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

References:

CABI Crop Production Compendium 2021. *Colletotrichum circinans*.
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Howard, R.J., Garland, J.A., Seaman, W.L. and Grafius, E.J., 1996. Diseases and pests of vegetable crops in Canada. <https://phytopath.ca/wp-content/uploads/2015/03/Diseases-and-Pests-of-Vegetable-Crops-in-Canada.pdf>

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Sutton, B. C. 1992. The genus *Glomerella* and its anamorph *Colletotrichum*. In: *Colletotrichum: Biology, Pathology and Control*, pp. 1-26. Eds. J. A. Bailey and M. J. Jeger. CABInternational, Wallingford, Oxon, UK.

USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PEXD) Harmful Organisms Database Report. *Colletotrichum circinans*. Accessed 2/9/2021

Walker, J.C., 1921. Onion smudge. Bureau of Plant Industry, United States Department of Agriculture. US Government Printing Office.

Responsible Party:

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***Comment Period: 03/16/2021 through 04/30/2021**

*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).

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: C
