cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Colletotrichum coccodes (Wallroth) S.J. Hughes 1958
Black dot of potato
Tomato anthracnose

Current Pest Rating: Z

Proposed Pest Rating: C

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

Comment Period: 04/04/2024 through 05/19/2024

Initiating Event:

This pathogen has not been through the pest rating process. The risk to California from *Colletotrichum coccodes* is described herein and a permanent rating is proposed.

History & Status:

Background:

Colletotrichum Corda is the causal agent of anthracnose and other diseases on leaves, stems, and fruits of many important crops (Hyde et al., 2009 a,b). *Colletotrichum coccodes* is a well-studied and important pathogen responsible for black dot disease on potatoes and anthracnose disease on many plants, including tomatoes and hemp. It is called black dot disease of potato because of the small but visible black microsclerotia that it forms on senescent and dead plant tissue, on decaying roots and stems, and on stolons and daughter tubers (Chesters and Hornby, 1965).

This fungus was first described as *Chaetomium coccodes* by Wallroth from potatoes in Germany in 1833 and was later renamed *Colletotrichum coccodes* by Hughes (1958). It has been known by multiple synonyms on its different hosts. There are 49 synonyms of *C. coccodes* listed in Index Fungorum (http://www.speciesfungorum.org/Names/SynSpecies.asp?RecordID=295323); however, the treatment of most of the synonyms was based on morphology. Current taxonomy based on multilocus

phylogenetic studies places this fungus in the sub-class Hypocreomycetidae, order Glomerellales and family Glomerellaceae (Zhang et al., 2006; Réblová et al., 2011). Morphologically, it is similar to *C. gloeosporioides* but it differs in producing conidia that are slightly constricted in the central part and taper abruptly at both ends (Sutton, 1992). Phylogenetic analysis shows that *C. coccodesis* is distant from the *C. gloeosporioides* complex but has a close relationship with a few curved spored species, such as *C. liriopes, C. verruculosum,* and C*. spaethianum*. Neotypification of *Colletotrichum coccodes* was done by Liu et al. (2011).

Hosts: The host range of *C. coccodes* is wide. This species is reported to infect humans and over 100 different plant species (Hyde et al., 2009b; Farr and Rossman, 2024). It affects plants from 17 plant families, with the majority in Cucurbitaceae, Leguminosae, and Solanaceae (CABI, 2024). The most economically important hosts are Solanaceous crops such as potato (*Solanum tuberosum*), tomato (*Solanum lycopersicum*), litchi tomato (*Solanum sisymbriifolium*) and pepper (*Capsicum annuum*).

Symptoms: Tomato stems, leaves, and roots can all become infected by *C. coccodes*. Ripe and overripe fruit are the primary infection sites. On ripe fruit, depressed, circular tan lesions with a diameter of 0.5 inches (1.2 cm) are visible. On the surface of the lesion, masses of sausage-shaped, salmon-colored spores may grow when the weather is damp. Microsclerotia, which look like small black dots visible without magnification, speckle the lesions as they age. Root infections lead to “black dot root rot”, which becomes noticeable as dark microsclerotia associated with root lesions. Often the cortex of diseased roots is degraded (CABI, 2024; Davis et al., 2013).

On potatoes, the pathogen affects roots, stems, and tubers, and microsclerotia form on these as well as on stolons. Plants begin to yellow and wilt in the mid- to late-season. These symptoms of black dot can be mistaken for potato early dying, a disease linked to bacterial soft rot, or Verticillium wilt. Unlike wilting caused by *Verticillium*, wilting caused by black dot occurs quickly. Root cortical tissue can suffer greatly from the black dot infection. When removed from the ground, affected roots may seem stringy. Lesions on belowground stems and stolons can occasionally be mistaken for Rhizoctonia stem and stolon canker; however, black dot lesions are darker. The woody vascular tissue of mature potatoes, which is exposed as the cortical tissue peels away, gives the diseased roots an amethyst-colored, stringy, wet appearance. Near the soil's surface, advanced stem lesions will be heavily populated with microsclerotia and spore-forming conidiophores with setae. The presence of microsclerotia helps distinguish black dot apart from silver scurf, which causes similar symptoms on the surface of tubers. Blisters on tubers are easily visible, especially when the tubers are damp. The adhesion of stolons to the tuber stem ends is another typical feature of black dot (CABI, 2024; Nunez and Aegerter, 2019).

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. During humid or moist conditions, abundant conidia spore masses form in lesions and are dispersed passively by splashing rain or irrigation water. *Colletotrichum coccodes* survives between crops during winter as mycelium on plant residue in soil and as long-lived microsclerotia (Dillard and Cobb, 1998). The long-distance

transportation of this pathogen has been with infected as well as latently infected seed potatoes (Tsror et al, 1999).

Damage Potential: Black dot occurs most frequently on plants grown in coarse-textured soils under conditions of low or excessively high nitrogen, high temperature, or poor soil drainage. Black dot infections are increased by windblown sand, which can cause abrasions that give the pathogen easy access (Johnson and Miliczky, 1993; Nunez and Aegerter, 2019). After the conidia are transmitted to host plants, they germinate, penetrate host tissue using specialized hyphae (appressoria), and ramify throughout the host tissue. Humid, wet, rainy weather is necessary for infection to occur (Agrios, 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.

The fungus causes substantial losses in the yield and quality of potato production and is increasingly regarded as a severe disease in need of control (Tsror et al., 1999). Disease levels increase in fields with a short cropping history between susceptible crops. The black dot pathogen often invades plants that are weakened by other diseases, and it may accelerate early death of potatoes infected with *Verticillium, Pectobacterium* (*Erwinia*), and possibly *Phytophthora*. For tomatoes, *C. coccodes* is more often a weak parasite and generally infects ripe or overripe fruit and roots of mature plants. In California, anthracnose on fruit occurs infrequently because of our dry weather. Root rot, however, is not uncommon, especially where tomatoes are grown year after year in the same soils. The effect of black dot root rot on tomato yields in California is not known (Davis et al., 2013).

Worldwide Distribution: Africa: *Ethiopia, Kenya, Malawi, Mauritius, Morocco, Nigeria, South Africa, Sudan, Tanzania, Uganda, Zimbabwe.* Asia: *Afghanistan, Azerbaijan, Brunei, China, Hong Kong, India, Indonesia, Iran, Israel, Japan, Jordan, Lebanon, Malaysia, Myanmar, Nepal, Pakistan, South Korea, Sri Lanka, Syria, Taiwan, Turkey, Vietnam*. Europe: *Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Malta, Netherlands, North Macedonia, Poland, Portugal, Romania, Russia, Serbia, Spain, Sweden, Switzerland, United Kingdom*. North America: *Barbados, Bermuda, Canada, Costa Rica, El Salvador, Guatemala, Jamaica, Mexico, Puerto Rico, U.S. Virgin Islands, United States* (California, Colorado, Florida, Idaho, Illinois, Indiana, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming). Oceania: *American Samoa, Australia, Federated States of Micronesia, New Caledonia, and New Zealand*. South America: *Argentina, Brazil, Chile, Guyana, Peru,* and *Venezuela.*

Official Control: *Colletotrichum coccodes* is on the USDA PCIT's Harmful organism list for Colombia, Costa Rica, Ecuador, Honduras, Madagascar, Taiwan, and Yemen. *Colletotrichum* spp. are US-regulated plant pests, but the species specifically is not listed (USDA, 2024).

California Distribution: Widespread in tomato and potato production areas (Davis et al., 2013; Nunez and Aegerter, 2019; French, 1989; CDFA PDR Database, 2024).

California Interceptions: None

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

Consequences of Introduction:

1) **Climate/Host Interaction:** Dissemination and infection are both restricted by California's relatively dry summer climates.

   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 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 is very wide with plants in many families.

   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 fungus uses multiple spore types, some that are airborne, and rain splashed to spread over shorter distances. Long-distance spread is with infected potato tubers.

   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:** Serious disease outbreaks on solanaceous crops have been reported.

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

   Economic Impact: A, 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: **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: None have been reported.

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

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

Consequences of Introduction to California for *Colletotrichum coccodes:* Medium

Add up the total score and include it here. **11**
-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'.

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.

7) **The final score is** the consequences 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* ***= 8***

Uncertainty: None

Conclusion and Rating Justification:

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

References:

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Responsible Party:

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***Comment Period: 04/04/2024 through 05/19/2024**

***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: C
