cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Dactylonectria torresensis (A. Cabral, Rego & Crous) L. Lombard & Crous 2014

Black foot

Current Pest Rating: Z

Proposed Pest Rating: C

Kingdom: Fungi; Phylum: Ascomycota;

Subphylum: Pezizomycotina; Class: Sordariomycetes;

Subclass: Hypocreomycetidae; Order: Hypocreales; Family: Nectriaceae

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Comment Period: 9/18/2020 through 11/2/2020

Initiating Event:

In May 2019, an agricultural official in Santa Barbara County submitted strawberry plants (*Fragaria* x *ananassa*) from a commercial fruiting field. The plants were decaying with root and crown rot. CDFA plant pathologist Suzanne Rooney-Latham identified the pathogen *Dactylonectria torresensis* (syn. *Ilyonectria torresensis*) in culture from the roots. This is a known root pathogen of many hosts in California, including grapevines (*Vitis* spp.) and pistachio (*Pistacia vera*). It is a recorded pathogen of strawberries in Europe. It is one of many related fungi that causes 'black foot' disease. It was given a temporary Z-rating. The risk to California from *Dactylonectria torresensis* is described herein and a permanent rating is proposed.

History & Status:

Background:

Dactylonectria is a recently described fungal genus with cylindrocarpon-like asexual morphs (Lombard et al., 2014). "Dactylo" as prefix means finger or toe, which was chosen because members of this genus cause "black foot" diseases of woody and herbaceous plants. They are closely related to *Ilyonectria* and *Nectria* and are assumed to be cosmopolitan (Farr and Rossman, 2020). They are isolated from soils as saprobes (colonizing dead or dying plant material), as latent pathogens (having a delay in symptoms),

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as endophytes (asymptomatic), or as pathogens causing cankers and root rots. *Dactylonectria* differs morphologically from other cylindrocarpon-like fungi by producing abundant macro- and microconidia with chlamydospores found rarely in culture. *Dactylonectria torresensis* is one of at least 24 similar species associated with black foot disease of grapevine throughout the world (Agusti-Brisach and Armengol, 2013; Urbez-Torres et al., 2014).

Hosts: Abies normanniana (Nordmann fir)*, Arbutus unedo* (strawberry tree), *Cistus albidus* (grey-leaved cistus)*, Eriobotrya japonica* (loquat)*, Fragaria x ananassa* (strawberry)*, Fragaria* sp.*, Juglans regia* Persian walnut)*, Olea europaea* (olive)*, Pinus halepensis* (Aleppo pine)*, Pistacia vera* (pistachio)*, Protea* spp., *Quercus ilex* (holly oak), *Quercus* spp.*, Rosmarinus officinalis* (rosemary), *Rubus idaeus* (raspberry), *Vitis* spp., *Vitis vinifera* (grapevine), *Viburnum tinus* (viburnum) (Farr and Rossman, 2020; Weber and Entrop, 2017).

Symptoms: Symptoms of black foot disease on grapevines include necrotic root crowns, reduced root biomass, root rot, sunken root lesions, xylem necrosis, vascular streaking, and general decline of the vine canopy. Fruit yield may be reduced. Infected vines are often stunted with short internodes and leaves that appear scorched by water stress; eventually the entire vine is killed (Scheck et al., 1998). In many instances, black foot disease is found in plants suffering stress conditions in the root system including poor planting (J rooting) and poor soil conditions such as poor water drainage (Petit and Gubler, 2013). Strawberries and raspberries show extensive root rots with roots that are black and breaking apart (Weber and Entrop, 2017). Viburnum and loquat show crown rot, root rot, and stem rot (Aiello et al., 2015; Agustí-Brisach et al., 2016).

Transmission: The source of inoculum for new infections can come from nurseries or be present in vineyard or orchard soils. Plants can become infected during the grafting process or from infected rootstock mother vines, and *Dactylonectria* spp. are frequently isolated from roots, rootstocks, and graft unions of young vineyards. Some species of *Dactylonectria* produce chlamydospores, which are thick walled, fungal resting structures, but these have not been obsevered with *D. torresensis*. It produces large numbers of micro and macro conidia that move in infest soil, on tools and equipment, and with infected planting stock (Hallen et al., 2005).

Damage Potential: Black-foot disease caused by *D. torresensis* and other species causes substantial economic losses in young grape vineyards because diseased plants must be removed and replanted (Agusti-Brisach and Armengol, 2013). Infected vineyards can show a high percentage of declining plants with slow growth, reduced vigor and sprouting, shortened internodes, and sparse and chlorotic foliage (Rego et al., 2000). Growth of apple rootstock plantlets was studied from symptomatic trees with infected with *D. torresensis*, and it was significantly lower than in those from asymptomatic trees (Manici et al. 2018). Secondary metabolites are implicated in pathogenicity; both phytotoxins (tentoxin, HC toxin, and zearalenone) and cytotoxic compounds (rabelomycin and nidulin) may be involved. Findings suggest that these extracellular compounds may have contributed to the severe growth reduction associated with black foot replant disease symptoms (Manici et al. 2018).

The prevalence of *D. torresensis* in small fruit nursery plants was correlated with visible disease symptoms for strawberries and raspberries and *D. torresensis* was isolated at high frequencies in

northern Germany nurseries. This nursery infection was considered a major source of contamination of production fields and the cause of the ongoing black root rot epidemic in strawberry and raspberry production (Weber and Entrop, 2017).

Quercus ilex and *Pinus halopensis* seedlings in Spain were damaged or killed in forest nurseries by black foot pathogens including *D. torresensis*, which causes damping-off, root rot, or bark necrosis in young trees (Mora-Sala et al., 2018).

Worldwide Distribution: Australia, Austria, Canada, Czech Republic, France, Germany, Italy, New Zealand, Portugal, South Africa, Spain, Turkey, United States (California, North Carolina) (Farr and Rossman, 2020).

Official Control: none

California Distribution: Official samples have been submitted from Santa Barbara (see initiating event) and Orange counties. There are University of California reports of detections in Fresno County on grapes and pistachios (Lawrence et al., 2019).

California Interceptions: none

The risk *Dactylonectria torresensis* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** This pathogen is likely be able to establish in most agricultural regions of California, possibly excluding the desert as its usually associated with cool, wet soils.

   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 host range for this pathogen is large, including many herbaceous and woody hosts.

   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:** This pathogen does not have chlamydospores which other species have. It uses two types of asexual spores to infect new hosts.

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:** Infected herbaceous and woody plants may grow poorly with low yields or even die. Replanting costs for perennial crops such as grapes, loquats, and raspberries can be important.

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 but given the host range of this and other related species, it is likely that native plants can be infected and suffer similar black foot symptoms. It impacts cultural practices as affected plantings must be removed and replaced.

Environmental Impact: A, 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 *Dactylonectria torresensis:* Medium

Add up the total score and include it here. **12**
-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 have been detections in multiple counties along the south coast (Orange and Santa Barbara counties and in the central valley (Fresno County).

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* **= 10**

Uncertainty:

Black foot pathogens are an emerging group under study. It is likely they will continue to be disseminated around the world on planting material, either as latent pathogens or as endophytes. It should be assumed that the host list for *D. torresensis* will increase and could include native plants in the future.

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Dactylonectria torresensis* is C.

References:

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Responsible Party:

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*Comment Period: 9/18/2020 through 11/2/2020

*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[@]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