cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Tubakia californica Rooney-Latham & U. Braun 2018

Tubakia leaf spot of oaks

Current Pest Rating: Z

Proposed Pest Rating: C

Kingdom: Fungi; Division: Ascomycota

Subdivision: Pezizomycotina; Class: Sordariomycetes

Subclass: Sordariomycetidae; Order: Diaporthales

Family: Tubakiaceae

Comment Period: 5/5/2020 through 6/19/2020

Initiating Event:

On April 3, 2012, San Luis Obispo County agricultural inspectors inspecting a nursery submitted coast live oak (*Quercus agrifolia*) branches with cankers to the CDFA plant pest diagnostics center at Meadowview. On June 12, 2012, plant pathologist Suzanne Rooney-Latham diagnosed the cause of the cankers to be a *Tubakia* sp. She recognized it as a new, unnamed species and gave it a temporary Q rating. Other *Tubakia* spp., including *T. dryina*, cause leaf spots and twig blights of members of the red oak group in the Eastern United States. The distribution in California of the new species was unknown at the time of its detection. Subsequently, samples of this novel *Tubakia* sp. were submitted from multiple counties, causing twig and branch cankers, on multiple tree species in the family Fagaceae. Samples came from coastal California, from the northern coast to the San Francisco Bay Area and the central coast, and the Sierra Nevada. The rating was changed to a temporary Z at the end of 2017 because the number of samples from different counties showed it was not restricted to one area. In a 2018 paper, Rooney-Latham and Braun named this new species as *T. californica* based on isolates collected in California and Mexico.

History & Status:

Background: The diversity of the genus *Tubakia* in North America is not well known, although it likely consists of a heterogeneous complex of cryptic species that were previously all classified as *T. dryina* (Harrington et al., 2012). *Tubakia* samples collected in Mexico on endemic oaks were morphologically similar to *T. dryina but* were suspected to be undescribed species. A *Tubakia* causing serious oak diseases in California also represented a possible additional undescribed species. In a 2018 study by Braun et al., including a comprehensive examination and revision of *Tubakia* in North America and worldwide based on *in vivo* and *in vitro* morphological analyses as well as phylogenetic data, *T. californica* s. lat. was described and the new family Tubakiaceae was designated. This family consists of saprobic endophytes in leaves and twigs as well as plant pathogens causing leaf spots and twig diebacks of oaks and additional trees.

No sexual morph is known for *T. californica*. The asexual morphs consist of sporodochia and pycnothyria that produce conidia. Pycnothyria are characteristic and used in the diagnosis. In addition, sporodochial conidiomata composed of clusters of conidiogenous cells may be developed and in *T. californica*, they are crustose or pustulate. These are mostly formed on petioles and leaf blades (often on and close to leaf veins). The leaves can stay attached to the trees or shed as litter.

Hosts: Chrysolepis chrysophylla (golden chinquapin), *Lithocarpus densiflorus* (syn. *Notholithocarpus densiflorus*) (tanoak), *Quercus agrifolia* (coast live oak), *Quercus canbyi* (Chisos oak), *Quercus kelloggii* (California black oak), and *Quercus wislizeni* (interior live oak) (Farr and Rossman, 2020).

Symptoms: In California, *Tubakia californica* causes a foliar disease on mature oaks of several species. Growth can appear healthy months after infection until late August, when small brown lesions develop on the leaves, predominantly on the underside. Lesions will enlarge and by early September, the lateral leaf veins become brownish-black and vein discoloration extends to the midrib. By October, many of the affected leaves become dry and uniformly brown with black veins (Lee and Frankel, 2018).

Transmission: Small black *Tubakia* spore-bearing structures develop in late September on leaf veins, blades, and petioles. The spores are released in the spring or summer to infect new leaves, either from leaves that have stayed attached to the trees, or from fallen leaf litter.

Damage Potential: Infected leaves from the previous season's growth do not fully defoliate and can remain attached to the branches in the spring. On tanoak, *T. californica* causes progressive defoliation from the bottom of the crown upward into the higher canopy. Symptoms seem to develop later in the season in the cooler locations like the Sierra Nevada foothills (Tuolumne and El Dorado counties) than in lower elevation counties. The most severe symptoms occur on California black oak. Trees that are in low-lying areas pockets with less direct sunlight and higher humidity appear to be more susceptible. In at least some cases, defoliation has led to tree mortality in black oak and tanoak. This mortality can create a hazardous situation and require tree removal (Lee and Frankel, 2018). Leaf spots and twig dieback can be cosmetic problems in plant nurseries.

Worldwide Distribution: Mexico, United States (California) (Farr and Rossman, 2020).

Official Control: None

California Distribution: *Tubakia californica* has been detected in Del Norte, El Dorado, Humboldt, Mariposa, Marin, Shasta, and San Luis Obispo counties and it appears to be a native foliar pathogen on members of the Fagaceae.

California Interceptions: None

The risk *Tubakia californica* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** The pathogen is likely to be found throughout the native range of its hosts.

   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:** The host range is limited to one plant family.

   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 Dispersal Potential:** Not much is known about the epidemiology of this pathogen. It spreads locally with spores. It could spread with infected nursery stock.

   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:** There have been some reports of tree mortality from this pathogen in some species and select sites, but those reports are not widespread. It could be a cosmetic problem in nurseries.

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

Economic Impact: 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: **1**

- **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: The hosts of *T. californica* are native trees and shrubs. It is likely that this pathogen is native to California and has co-evolved with its host. Although there is some tree mortality, Although it has not been reported to have a significant impact on natural communities and seems to be a part of the oak ecosystem, this possiblity is a concern.

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: 2

- 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 *Tubakia californica:* 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 'high'. This pathogen has been found in multiple counties representing diverse climates of California including on the north and the central coast, and in the Sierra Nevada.

   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 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* **= 6**

Uncertainty:

As this is a recently named and described species, its host range and geographic distribution could be larger than is currently known.

Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for *Tubakia californica* is C.**

References:

Braun, U., Nakashima, C., Crous, P.W., Groenewald, J. Z., Moreno-Rico, O., Rooney-Latham, S., Blomquist, C. L., Haas, J., and Marmolejo, J. 2018. Phylogeny and taxonomy of the genus *Tubakia* s. lat. FUSE 1: 41-99.

Farr, D. F., and Rossman, A. Y. Fungal Databases, U.S. National Fungus Collections, ARS, USDA. Retrieved March 26, 2020, from https://nt.ars-grin.gov/fungaldatabases/

Harrington, T. C., and McNew, D. M. 2018. A re-evaluation of *Tubakia*, including three new species on *Quercus* and six new combinations. Antonie van Leeuwenhoek doi.org/10.1007/s10482-017-1001-9.

Lee, C., and Frankel, S. 2018. Tubakia: A Newly Recognized Foliar Pathogen of Oak, Chinkapin, and Tanoak in California. California Forest Pest Newsletter April 2018,

Responsible Party:

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***Comment Period: 5/5/2020 through 06/19/2020**

***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