CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Merlinius spp. (Allen 1955) Siddiqi, 1970

Current Pest Rating: D

Proposed Pest Rating: C

Comment Period: 09/04/2019 through 10/19/2019

Initiating Event:

During the 1950s and 1960s, several species of plant parasitic nematodes were given a 'D' rating as they were considered to be parasites, predators, or organisms of little or no economic importance that did not require State enforced regulatory action. However, these nematode species were incorrectly assigned a D rating as most, if not all, are plant parasitic and therefore, capable of damaging plant production and causing significant economic losses especially at the county and local residential/grower level. Furthermore, the detection of plant parasitic nematodes in nursery stock may be an indication of contamination in violation of the State's standard of pest cleanliness required for nurseries. Among these nematodes, originally rated D, are *Merlinius* spp. The risk of infestation and permanent rating of this genus are re-assessed here.

History & Status:

Background: Generally, pest risk assessments and assignment of pest ratings are conducted for individual pest species and not for an entire genus, primarily to account for differing pest biologies, geographical distributions, host ranges, damage potentials, and risk mitigating requirements. However, an exception to this rule is made here for the genus *Merlinius* largely because of historical practice. Over the past several decades, the genus, *Merlinius* was seldom differentiated to species level by CDFA nematologists mainly due to i) *Merlinius* spp. are considered mild pathogens of plants ii) the common occurrence and wide distribution of member species within California, iii) no state enforced regulatory action was required subsequent to their detection, and iv) prioritizing diagnosis of nematodes considered to be of greater economic importance than those belonging to *Merlinius*. Certain newly discovered and described species, may in the future be assessed and rated individually as they can be more economically damaging to crop production and trade markets than other species in the genus (Chitambar et al., 2018).

Members of the genus *Merlinius* are commonly known as "stunt nematodes". The key characters to differentiate *Merlinius* from other common *Tylenchorhynchus* species is the present of deirids and the six incisures in the lateral fields. Males are uncommon and probably not essential for reproduction (Handoo et al., 2008; Siddiqi, 1970). These nematodes usually inhabit the soil-root region of plants and feed as obligate migratory ectoparasites of roots using a stylet to feed on epidermal cells. All motile juvenile and adult stages feed (Mai et al., 1996; Maggenti, 1981).

Hosts: Merlinius spp. have an extensive host range. The main hosts of *Merlinius* spp. are cereals and grasses (CABI, 2019). They have also been found associated with the roots of a wide range of California native plants including manzanita, California bay, and ceanothus. They attack tobacco, cotton, oats, and corn as well as other agricultural crops, fruit trees, ornamentals, nursery stock, forest trees and shrubs, desert shrubs, grasses, and weeds. The host status of associated plants is not always known (Siddiqi et al., 1973).

Symptoms: General plant damage associated with *Merlinius* spp. includes stunting of the root system which is expressed aboveground by yellowing of foliage, stunted top growth, and sometimes wilt and defoliation (Maggenti, 1981).

Transmission: Long and short distance spread is mainly accomplished through artificial means, including movement of nematode-contaminated soil, cultivation tools, or equipment, run-off, and irrigation water.

Damage Potential: Generally, *Merlinius* spp. are considered mild pathogens and are common associates of plants (Handoo et al. 2007; Siddiqi et al., 1973). However, plant damage caused by high populations of stunt nematodes may be more significant in small-area plant production and/or containerized crops in nursery, residential and local situations than in large acreages and environments such as, pastures, parks, and cultivated fields. Crop losses under field conditions have been reported for certain species. For example, *M. brevidens* on wheat contributes to significant yield loss in a small percentage of fields (Todd et al., 2014), *M. communicus and M. pistaciei* have been associated with significant damage on pomegranate (Bajestani et al., 2016), and *M. microdorus* causes economic damage on faba beans (Azimi et al., 2016). Crop damage under field conditions may be difficult to assess as *Merlinius* spp. are often mixed with other genera and/or two or more stunt (or other type) of parasitic nematodes occurring together.

Worldwide Distribution: *Merlinius* spp. are distributed worldwide (CABI, 2019)

Official Control: Currently, *Merlinius* spp. are D rated pests in California (see 'Initiating Event'). *Merlinius brevidens* is on the 'Harmful Organism Lists" for Ecuador and *Merlinius* spp. are listed for Australia and Nauru (USDA-PCIT, 2019).

California Distribution: *Merlinius* spp. are widespread in California (Siddiqi et al., 1973).

California Interceptions: For the past several decades, *Merlinius* spp. have been detected in imported plant and soil shipments intercepted in California.

The risk *Merlinius* spp. would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** *Merlinius* spp. are able to tolerate a wide range of climates and are presumed to be highly polyphagous. They are likely to establish a widespread distribution within the state.

   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:** *Merlinius* spp. are known to be associated with several diverse plant species, however, the host status of associated plants is not always known.

   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 Dispersal Potential:** The main mode of long and short distance spread through artificial means, including movement of nematode-infested soil that may accompany roots of planting stock and contaminate cultivation tools and equipment. These nematodes can also be spread through movement of irrigation water.

   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:** Generally, *Merlinius* spp. are considered mild pathogens of plants. However, under high population levels in residential, nurseries and other small-area plantings, *Merlinius* spp. infections could result in lowered crop yield.

   Economic Impact: A

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 impact of *Merlinius* spp. on natural environments is most likely not significant as the species is already widespread without causing apparent detriment to ecological balances and processes.

Environmental Impact: None
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 *Merlinius spp*. is Medium

Add up the total score and include it here.
-Low = 5-8 points
-Medium = 9-12 points
-High = 13-15 points

6) **Post Entry Distribution and Survey Information**:

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 introduction score minus the post entry distribution and survey information score:

Final Score: *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information* ***=10-3= 7***

Uncertainty: none

Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for *Merlinius* spp. is C.**

References:

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Responsible Party:

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*Comment Period: 09/04/2019 through 10/19/2019*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 plant.health[@]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