cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Hirschmanniella belli Sher 1968

Current Pest Rating: D

Proposed Pest Rating: C

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

Initiating Event:

During the 1950-60s, several species of plant parasitic nematodes were given a 'D' rating as they were regarded as parasites, predators, or organisms of little or no economic importance that did not require State-enforced regulatory action. However, these nematode species were inaccurately 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. Until now, *Hirschmanniella belli* has been rated D. The risk posed to California from this species is re-assessed here and a permanent rating is proposed.

History & Status:

Background: *Hirschmanniella* is a nematode genus in the family Pratylenchidae (Nematoda: Tylenchida) that includes 29 species. *Hirschmanniella* are uniquely adapted to aquatic environments (Khun et al., 2015, Jeger et al., 2018). Most are tropical, and their main hosts are monocotyledonous aquatic plants; collectively, they are called rice root nematodes. *Hirschmanniella* spp. are migratory endoparasites, meaning they enter the roots to feed, then leave the roots to lay eggs in the rhizosphere soil. They infest the roots, corms, and rhizomes of their host plants. Hosts include rice field weeds and a few crops such as rice, maize, sugarcane, lotus, and tomato (Bridge et al., 2005; Chong Bin et al. 2001). *Hirschmanniella belli* was isolated from soil around cat-tail (*Typha* sp.) and spike-rush (*Eleocharis* sp.) from the bed of the Santa Ana River in Riverside, California and was described S. A. Sher in 1968 in his revision of the genus (Sher, 1968). Some species in this genus such as *H. oryzae* are important pests of irrigated, lowland, and deepwater rice (Jeger et al., 2018). Although *H. belli* has been found in association with rice roots, it has not been reported to cause economic damage to this crop (Bridge et al., 2005; Koyama et al., 2013; Peng et al., 2018; Nemaplex, 2019; Jeger et al. 2018).

Hosts: Rice (*Oryza sativa*), umbrella sedge (*Cyperus* sp.), sorghum *(Sorghum bicolor*), sudangrass (*Sorghum bicolour* subsp. *drummondii*), cattail (*Typha* sp.) (Siddiqi et al., 1973, Liao et al., 2000).

Symptoms: There are no distinct above-ground symptoms of damage from *Hirschmanniella belli* in the field; symptoms caused by these nematodes may be confused with symptoms of nutrient deficiency or other pathogenic organisms (Jeger et al., 2018). Reduction of plant growth can occur, especially if plants are attacked in the early stages. Yellowing of plants is occasionally observed and flowering can be delayed. Roots invaded by *Hirschmanniella* may turn yellowish brown and rot (Peng et al., 2018).

Transmission: The nematodes are spread with irrigation water and soil attached to tools, shoes, and machinery. Spread can also occur when seedlings are transplanted (Bridge et al., 2005).

Damage Potential: No plant damage has been reported from *H. belli* in California where population numbers are generally low. Damage has been reported in China on rice where populations are higher (Liao et al., 2000).

Worldwide Distribution: *Hirschmanniella belli* is in California (Sher, 1968) and in China (Liau et al., 2000).

Official Control: *Hirschmanniella* spp. are on the harmful organism lists for Albania, Egypt, and the Republic of Moldova (USDA -PExD, 2019) and on the EPPO A1 list for Turkey (added in 2016).

California Distribution: *Hirschmanniella belli* has been detected from these California counties: Colusa, Riverside, Sacramento, Sutter, Yolo, and Yuba.

California Interceptions: None

The risk *Hirschmanniella belli* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** This nematode has been detected in Riverside in Southern California and in the rice growing areas of the Sacramento Valley.

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 is mainly limited to aquatic plants, including rice, cattails, and sedges, as well as sorghum and sudangrass.

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 Reproductive Potential:** It is not known to be seed borne but could spread with movement of infested nursery stock, soil, or 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:** This nematode has an economic impact on rice in China, but similar damage has not been reported in California, perhaps because this nematode is adapted to aquatic environments and fields here experience seasonal drying.

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

Economic Impact: G

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:** None have been observed and none are anticipated as this nematode has been known in California for more than 50 years.

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 *Hirschmanniella belli* is Low (7)

Add up the total score and include it here. **7**
-**Low = 5-8 points**
-Medium = 9-12 points
-High = 13-15 points

6) Post Entry Distribution and Survey Information:

Evaluation is 'Not Established'. There have been incursions from Florida with waterlily nursery stock, but *H. belli* is not known to be established in California.

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* ***= 7-3=4***

Uncertainty: none

Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for *Hirschmanniella belli* 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
