cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Xiphinema chambersi Thorne, 1939
Chambers' dagger nematode

Current Pest Rating: Q

Proposed Pest Rating: B

Domain: Eukaryota, Kingdom: Metazoa,
Phylum: Nematoda, Class: Adenophorea,
Order: Dorylaimida, Family: Xiphinematidae

Comment Period: 02/25/2022 through 04/11/2022

Initiating Event:

This pathogen has not been through the pest rating system. The risk to California from *Xiphinema chambersi* is described herein and a permanent rating is proposed.

History & Status:

Background: The genus *Xiphinema* Cobb, 1913, called Dagger nematodes, has around 265 species of plant-ectoparasitic nematodes. Dagger nematodes are polyphagous, damaging a wide range of wild and cultivated plants through direct feeding on root cells, and with a small minority of species capable of transmitting of plant pathogenic nepoviruses (Taylor and Brown, 1997). They are distributed throughout the world. *Xiphinema chambersi* Thorne, 1939 was originally described from specimens collected from around the roots of oaks in Virginia. A more complete description was made by Cohn and Sher (1972) based on lectotypes.

Dagger nematodes inhabits the rhizosphere soils of host plants while feeding on roots. Eggs are laid singly in the soil and hatch in approximately one week. A population may be founded by a single individual. Once hatched, each juvenile stage must feed to molt and develop to the next stage. Juveniles and adults feed by means of a long stylet that is used to penetrate the vascular tissue of roots. Males are very rare, and reproduction is apparently by parthenogenesis. The life cycles can take years to complete (Chitambar et al., 2018).

The symptoms of plants in response to the feeding by *X. chambersi* is like those caused by other migratory ectoparasitic nematodes of roots: Poor growth and/or stunting of the plant, yellowing, or

wilting of the foliage, and damaged/reduced root systems, including root necrosis, lack of feeder or secondary roots, and occasional tufts of stubby rootlets. *Xiphinema chambersi* can be found feeding on woody plants and grasses, including forest trees where, at high densities, they can cause an economically significant level of damage (Ruehle, 1971; CABI CPC, 2022).

Morphological, molecular characterization of *Xiphinema chambersi* was done by Yu et al. in 2010. Phylogenetic relationships of *X. chambersi* with other *Xiphinema* species from the Clade I of non-*X. americanum* group was described by Gutiérrez-Gutiérrez et al., 2013. This species formed a highly supported clade with *Xiphinema naturale*. Handoo et al., 2016, used sequence data from the 28SrRNA molecule to show the relatedness of specimens collected in Georgia, Alabama, and Florida, while assessing the diagnostic value of both morphological and molecular characters.

Hosts: Liquidambar styraciflua (sweetgum), *Fagus grandifolia* (American beech), *Fraxinus americana* (white ash), *Prunus virginiana* (chokecherry), *Quercus palustris* (pin oak), *Quercus rubra* (red oak), *Quercus virginiana* (live oak)

Symptoms: The symptoms of plants in response to the feeding by *Xiphinema* spp. is like those of other migratory ectoparasitic nematodes: Poor overall growth and/or stunting of the plant, yellowing, or wilting of the foliage, and damaged/reduced root systems, including root necrosis, lack of feeder or secondary roots, and occasional tufts of stubby rootlets (Chitambar et al., 2018). *Xiphinema chambersi* is not known to transmit any plant viruses.

Transmission: Infected rooted plants and soil, cultural practices that result in the movement of infected soil to clean, non-infected sites, infected nursery stock, and contaminated irrigation water.

Damage Potential: Xiphinema chambersi was reported on golf courses in North and South Carolina. The study found 29 species of nematodes that collectively were significant limiting factors to the growth and maintenance of the turf, but this species was not delimited as to its contribution to the nematode issues (Zeng et al., 2012). Ruehle (1972) associated *X. chambersi* with sweetgum trees in a forest in Georgia. Greenhouse studies showed the injury to young trees was moderate to severe, depending on the amount of inoculum, with roots that were darkened, swollen, irregular and twisted. This species has been associated with multiple species of oaks, but without specific reports of damage (Lamberti et al., 2002; Handoo et al., 2016).

Worldwide Distribution: Canada, Japan, Korea, United States (Arkansas, Florida, Georgia, Louisiana, New Jersey, North Carolina, South Carolina). Yu et al., (2010) says it is found in 16 states but does not list them. (CABI-CPC, 2022).

Official Control: None

California Distribution: None

California Interceptions: This nematode has been intercepted multiple times at the border and on incoming nursery shipments from Florida, North Carolina, and Louisiana (CDFA PDR Database, 2022).

The risk *Xiphinema chambersi* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** Similar to other dagger nematodes, this species is likely to establish in cool to warm climates in a variety of soils from light to heavy

   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:** *Xiphinema chambersi* has a moderate host range (Nemaplex, 2010).

   Evaluate the host range of the pest.

   Score: 2
   - 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 nematode's life cycle and increase are dependent on soil temperature and plant host. Long and short distance spread is mainly through infested soils accompanying plant stock, machinery, runoff and splash contaminated irrigation water, human and animal activity, and soil-contaminated clothing.

   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: There are limited reports of damage to forest hardwood trees. It can be moved with irrigation water.

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

Economic Impact: A, 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: **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.

4) Environmental Impact: The impact of *Xiphinema chambersi* on natural environments is not known. However, the infestations of the pest could affect cultural practices, home gardening, and ornamental plantings.

Evaluate the environmental impact of the pest to California using the criteria below

Environmental Impact: 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: 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 *Xiphinema chambersi:* Medium

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

5) 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.

This nematode has been occasionally intercepted at the border. There are no known established populations in California.

Evaluation is 'not established'.

Score: 0

-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* ***= 12***

Uncertainty:

It is not currently known if *X. chambersi* is capable of transmitting nepoviruses. Other species of the X. non-americanum-group are vectors important viruses including Arabic mosaic virus (ArMV), grapevine fanleaf virus (GFLV), strawberry latent ringspot virus (SLRV), and cherry leaf roll virus (CLRV). The ability to act as a virus vector would increase the pest risk score.

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Xiphinema chambersi* is B.

References:

CABI Crop Production Compendium 2022. *Xiphinema chambersi*. https://www.cabi.org/cpc/datasheet/118742 Accessed 2/1/2022.

Chitambar, J. J., Westerdahl, B. B., and Subbotin, S. A. 2018. Plant Parasitic Nematodes in California Agriculture. In Subbotin, S., Chitambar J., (eds) Plant Parasitic Nematodes in Sustainable Agriculture of North America. Sustainability in Plant and Crop Protection. Springer, Cham.

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Responsible Party:

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***Comment Period: 02/25/2022 through 04/11/2022**

***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: B
