California Pest Rating Proposal for

Xiphinema bakeri Williams, 1961
Baker's dagger nematode

Current Pest Rating: C

Proposed Pest Rating: C

Kingdom: Animalia, Phylum: Nematoda, Class: Enoplea,
Order: Dorylaimida, Superfamily: Dorylaimoidea,
Family: Longidoridae, Subfamily: Xiphineminae

Comment Period: 03/05/2024 through 04/19/2024

Initiating Event:

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

History & Status:

Background: *Xiphinema* is an important genus of longidorid nematodes, recognized by a long slender body and a long spear-like feeding apparatus called an odontostylet. The odontostylet has no stylet knobs but rather has flanges, which support and anchor the base. There is a guiding ring in the middle that holds the long stylet in position. Dagger nematodes have six life stages, and the life cycle is like other ectoparasitic, vermiform nematodes. Parthenogenesis, a form of reproduction that does not require males, is common in many, but not all species. Females lay eggs in the soil. Juveniles hatch from eggs and molt four times, increasing in size with each molt until they become adults. All stages, except eggs, attack, and feed on the roots of the host plants. The nematode inserts the long stylet deep into the root while the body remains outside. The stylet punctures cell walls during feeding, and this feeding may affect the metabolic activities of the cells in the root tips (Leone et al., 1999). Often the root tips progressively swell and gradually transform into a terminal gall. Galls are strongly attractive to feeding nematodes which often aggregate at these sites (Weischer and Wyss, 1976).

There are over 250 species within the genus, and these have been divided into various groups and/or subfamilies based mainly on morphological affinities (Coomans et al., 2001). *Xiphinema* is a migratory ectoparasite of roots, adapted to feeding on woody plants. They are primarily problematic in biennial and permanent crops. The species are spread worldwide; some can vector nepoviruses which are

directly damaging to important orchard, soft fruit, and vine crops (Decraemer and Robbins, 2007; Chitambar et al., 2018; Nemaplex, 2010).

Xiphinema bakeri was first described as a new species by Williams (1961) associated with raspberry plants in British Columbia. The description includes a measurement and drawing of a male specimen, so this could be a sexually reproducing species. It was found to be widespread in light soils and assumed to be native to the Fraser Valley. Its ability to damage raspberry plant growth, reducing root and top growth was demonstrated by McElroy (1972), and it was implicated in damaging 1.5M Douglas-fir trees in forest seedling nurseries (Sluggett, 1972). It is not known to be a virus vector.

Hosts: Acer negundo (boxelder), *Cerastium vulgatum* (mouse-ear chickweed), *Chenopodium album* (lambsquarters), *Chenopodium amaranticolor* (goosefoot), *Dactylis glomerata* (orchardgrass), *Echinochloa crus-galli* (barnyardgrass), *Fragaria vesca* (woodland strawberry), *Fragaria* X *ananassa* (strawberry), *Liquidambar* sp. (sweet gum), *Plantago lanceolata* (narrow-leaved plantain), *Plantago major* (plantago), *Pinus ponderosa* (ponderosa pine), *Populus fremontii* (Fremont cottonwood), *Populus tremuloides* (quaking aspen), *Pseudotsuga menziesii* (Douglas fir), *Rubus idaeus* (raspberry), *Rumex crispus* (curly dock), *Secale cereale* (cereal rye), *Sequoia sempervirens* (coast redwood), *Solanum lycopersicum* (tomato), *Solanum tuberosum* (potato), *Spergula arvensis* (spurry), and *Stellaria media* (chickweed) (Cho and Robbins. 1991; McElroy, 1972; Siddiqui et al., 1973; Lownsbery and Lownsbery, 1985).

Symptoms: Above-ground symptoms caused by this nematode are general symptoms of an impaired root system, they are not diagnostic, and they may not be present at all. The damage dagger nematodes cause to root systems is similar to that of other plant ectoparasitic nematodes. *Xiphinema* may feed at the plant root tip but more often in the root hair zone where nematodes may aggregate. The feeding at the meristematic root tips destroys root cells and reduces root volume. Attacked root tips may become hook-shaped or swell to form terminal galls, and this is more common in woody plants. The above-ground effects of damaged roots are stunted growth of crops and patchy fields. Poor overall growth and/or stunting of the plant, yellowing or wilting of the foliage, and damaged/reduced root systems, including root necrosis have been observed. Root tissues darken with cortical hyperplasia and lateral root proliferation; secondary and feeder roots are often lost (Agrios, 2005; Chitambar et al., 2018).

Transmission: Nematodes are moved with infected rooted plants and soil, and the cultural practices that result in the movement of infected soil to clean, non-infected sites. Movement can also occur with contaminated irrigation water (Agrios, 2005; Chitambar et al., 2018).

Damage Potential: Xiphinema bakeri was observed to cause damage to raspberry and forest nursery trees, and under greenhouse conditions caused severe damage to the Rosaceous and Solanaceous plants tested by McElroy (1972). Forest tree seedlings grown in nurseries, including spruce, western hemlock, Douglas-fir, and noble fir suffered significant damage from nematode feeding. The greatest damage occurred on Douglas-fir, and damage can be greater for conifers when weeds are present because nematode densities may be high under the weeds, and weed competition further weakens the conifers (McElroy, 1990). *Xiphinema* spp. are best adapted to sandy soils. These soils tend to have a

low nutrient-holding capacity and, in combination with nematode damage and the fungus *Cylindrocarpon*, are conducive to the development of corky root diseases in many woody plants (Bloomberg and Sutherland, 1971).

Worldwide Distribution: Canada, United States.

Official Control: *Xiphinema bakeri* is on the EPPO's A1 list for Chile (EPPO, 2023), and it is on the USDA PCIT's harmful organisms list for Chile and Peru (USDA, 2023).

California Distribution: There are historical records from CDFA (Siddiqui et al., 1973) and a detection in the PDR database from 1982 from apple trees in Mendocino County. Lownsbery and Lownsbery (1985) report detections from multiple forest sites in California. It is categorized as widely prevalent in California by the Society of Nematology (https://www.prevalentnematodes.org/about.cfm).

California Interceptions: none

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

Consequences of Introduction:

1) **Climate/Host Interaction:** *Xiphinema bakeri* can survive in cool to warm climates and is likely to establish wherever its hosts can grow.

   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 be established 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 large, including herbaceous and woody plants in multiple families.

   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:** 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, farm 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:** Infestations of *Xiphinema bakeri* could result in lowered crop yield and value, loss in markets, and change in cultural practices to mitigate the risk of spread to non-infested sites.

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

Economic Impact: A, B, C, G

A. The pest could lower crop yield.
B. The pest could lower crop value (including increasing crop production costs).
C. The pest could trigger the loss of markets (including 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: **3**

- 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 *Xiphinema bakeri* on forest trees is documented.

Evaluate the environmental impact of the pest on California using the criteria below.

Environmental Impact: A

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 bakeri:* High

Add up the total score and include it here. **14**
-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.

   This nematode is considered to be widely prevalent in California.

   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 the 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* ***= 11***

Uncertainty:

None

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for ***Xiphinema bakeri*** **is C.**

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***Comment Period: xx/xx/2024 through xx/xx/2024**

***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