CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Xiphinema basiri Siddiqi, 1959

dagger nematode

Current Pest Rating: Q

Proposed Pest Rating: A

Domain: Eukaryota, Kingdom: Metazoa
Phylum: Nematoda, Class: Adenophorea
Order: Dorylaimida, Family: Longidoridae
Subfamily: Xiphinematinae

Comment Period: 07/18/2022 through 09/01/2022

Initiating Event:

In September 2015, San Diego County agricultural inspectors sampled roots and soil from *Ficus benjamina* plants from a certified Florida shipper under CDFA's high-risk pest exclusion protocols for burrowing and reniform nematodes. CDFA Nematologist Sergei Subbotin extracted and identified a dagger nematode, *Xiphinema basiri,* from the sample and assigned a temporary Q-rating. A second detection was made in October 2015, also from *F. benjamina,* from a different Florida shipper, by San Mateo County agricultural inspectors. A third detection was made by Yolo County inspectors in April 2022, from an incoming shipment of a *Mangifera* spp. (mango) plant from Puerto Rico destined for Placer County. The risk to California from *Xiphinema basiri* is described herein and a permanent rating is proposed.

History & Status:

Background: The genus *Xiphinema* Cobb, 1913, 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 species. Females lay eggs in 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 remains outside the root but inserts the long stylet deep into it. The stylet punctures cell walls and during feeding, enzymes such as cellulases, pectinases, hemi-cellulases, and chitinases are secreted to digest plant cell contents. This destroys the root cells, resulting in malformed root tissues (Heve et al., 2018).

There are over 250 species within the genus, and these have been divided into various groups and/or subgenera based mainly on morphological affinities. *Xiphinema* is a migratory ectoparasite of roots adapted to feeding on woody plants. They are primarily problematic in biennial and permanent crops. *Xiphinema* species are spread worldwide; some can vector nepoviruses, which are directly damaging to important orchard, soft fruit, and vine crops (Decraemer and Robbins, 2007; Taylor and Brown, 1997). Important dagger nematodes in California include *Xiphinema index, X. americanum, X. pachtaicum, X. rivesi, X. insigne* and *X. vuittenezi* (Chitambar et al., 2018).

Hosts: Achras zapota (sapodilla), *Anona squamosa* (sugar apple), *Carica papaya* (papaya), *Cicer arietinum* (chickpea), *Citrus aurantium* (sour orange), *C. limonia* (Rangpur lime), *C. X paradisi* (grapefruit), *C. reticulata* (mandarin), *C. sinensis* (sweet orange), *Cocos nucifera* (coconut palm), *Eriobotrya japonica* (loquat), *Ficus carica* (fig), *Gossypium* sp. (cotton), *Hibiscus esculentum* (okra), *Litchi chinensis* (litchi), *Solanum lycopsericum* (tomato), *Mangifera indica* (mango), *Morus alba* (white mulberry), *M. rubra* (red mulberry), *Musa paradisiaca* (plantain), *Pennisetum purpureum* (Napier grass), Phoenix dactylifera (date palm),*Phyllanthus emblica* (gooseberry tree), *Prunus persica* (peach), *Psidium guajava* (guava), *Punica granatum* (pomegranate), *Pyrus communis* (pear), *Rosa indica* (rose), *Sabal palmetto* (cabbage palm), *Saccharum officinarum* (sugarcane), *Solanum melongena* (eggplant), *Vitis vinifera* (grape), *Zingiber officinale* (common ginger), *Zizyphus jujuba* (jujube) (Lehman, 1981; Gill and Firoza, 2014).

Symptoms: Symptoms: *Xiphinema* spp. can be found feeding on many types of woody and herbaceous plants, including fruit trees and turf where, at high densities, they can cause considerable economic damage (Chitambar et al., 2018; Nemaplex, 2010; CABI CPC, 2022). The symptoms of plants in response to the feeding by *X. basiri* include poor growth and/or stunting of the plant, yellowing, or wilting of the foliage, and damaged or reduced root systems, including root necrosis, lack of feeder or secondary roots, and occasional tufts of stubby rootlets. *Xiphinema basiri* is known to transmit Cowpea mosaic virus (Caveness et al., 1975).

Transmission: Movement of infected rooted plants and soil (including nursery stock), cultural practices that result in the movement of infected soil to clean, non-infected sites, and contaminated irrigation water can all transmit dagger nematodes to new areas (Chitambar et al., 2018).

Damage Potential: In Sudan, *X. basiri* caused swollen and stubby roots, and severely reduced the total root size of citrus. In the field, high populations of this nematode were associated with grapefruit, which showed decline symptoms and stubby roots (Yassin, 1974). In pot experiments, *X. basiri* seriously affected the grown of tomato and eggplant with mean shoot lengths reduced over 50% and root length up to 80% (Babu and Murthukrishnan, 1990).

Worldwide Distribution: Cuba (Antunez and Basterrechea, 2011), India (Siddiqi, 1959), Martinique (Swart and Quénéhervé, 1998), Nigeria, Sri Lanka, Puerto Rico, Mexico, and Zimbabwe (Cohn and Sher, 1972), Pakistan (Gill and Firoza, 2014), Sudan (Loof and Yassin, 1971), United States (Florida) (Esser, 1978).

Official Control: *Xiphinema basiri* is a USDA regulated pest. *Xiphinema* spp. are on the USDA's harmful organism list for Australia, Canada, China, Jordan, Nauru, and Tunisia (USDA PCIT, 2022).

California Distribution: None

California Interceptions: There have been three interceptions with nursery stock, two from Florida and one from Puerto Rico, both places where this nematode is known to occur.

The risk *Xiphinema basiri* 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 a range of climates in a variety of soils from light to heavy 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 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 basiri has a moderate host range including hosts that are grown agronomically in California including tomatoes, grapes, date palms, citrus, and cotton.

   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:

This nematode is a significant pathogen of citrus, tomato, and other California crops. It can move with irrigation water. It is also a known virus vector.

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

Economic Impact: A, B, E, 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: 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 basiri* on natural environments in California 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 basiri:*
High

Add up the total score and include it here. **13**
-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 '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* ***= 13***

Uncertainty:

None

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Xiphinema basiri* is A.

References:

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*Comment Period: 07/18/2022 through 09/01/2022

*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: A
