CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Pratylenchus vulnus Allen & Jensen, 1951
walnut root lesion nematode

Current Pest Rating: C

Proposed Pest Rating: C

Domain: Eukaryota, Kingdom: Metazoa,
Phylum: Nematoda, Class: Chromadorea,
Order: Rhabditida, Family: Pratylenchidae

Comment Period: 02/22/2022 through 04/08/2022

Initiating Event:

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

History & Status:

Background: *Pratylenchus* (Filipjev, 1936) were originally described as Tylenchus by De Man in 1880 from a meadow in England. By 1927 they had been discovered in California. Their importance as pathogens was realized in the 1930s and 1940s as they were shown to damage the roots of walnut, fig, and cherry trees. The group was revised by Sher and Allen (1953) and by 1959, *P. brachyurus, P. penetrans, P. vulnus, P. scribneri* and *P. hexincisus* were recognized as important root lesion nematodes for the state (Allen and Maggenti, 1959).

Pratylenchus vulnus was first reported in 1951 in California as a new species and important plant parasite of various trees and vines, namely walnut, grape, fig, citrus, apricot, avocado, weeping willow, cherry, olive, peach, almond, plum, raspberry and boysenberry (Allen and Jensen, 1951). *Pratylenchus vulnus* is the most common root lesion nematode found associated with almonds in the Sacramento Valley (McKenry and Kretsch, 1987) and is commonly distributed in California vineyards, where it can seriously affect grape yields (Raski et al., 1973).

Like other *Pratylenchus* species, *P. vulnus* has six life stages: egg, four juvenile stages and adult. Reproduction is by parthenogenesis (without fertilization). First stage juveniles develop within the egg, followed by a first molt to the second stage juvenile that hatches from the egg. Each stage develops

into the next via a molt of its cuticle (outer body covering). All juvenile and adult stages are worm-shaped (vermiform). All post-hatch stages are motile and can infect plants. Generally, root lesion nematodes have a life cycle 45-65 days. *Pratylenchus* spp. survive the winter in infected roots or soil as eggs, juveniles, or adults. During spring, when plant growth is active, eggs hatch, nematodes are attracted to the plant roots and begin to feed and continue their life cycle within roots or in rhizosphere soil. Within the root, the nematode feeds on cortical tissue causing necrosis of cortical cells, cell breakdown, and formation of cavities. Necrosis is apparent as lesions that expand as the nematodes move lengthwise within the infected roots. Some nematodes may leave the root, enter soil, and re-enter the root at a different site causing a new infection (Chitambar et al., 2018).

Hosts: This nematode has a large host range of woody perennial plants including roses, grapevines, boxwood, and many fruit trees, especially in warmer parts of the state. Originally it was described by Allen and Jensen (1951) from roots of black walnut, *Juglans hindsii*, from California. Other frequently recorded hosts in California include stone fruit (almond, apricot, cherry, peach, plum), citrus, berries, and pears. It has also been recorded on cotton (CDFA database, 2022; Nemaplex, 1999).

Symptoms: *Pratylenchus* spp. are migratory endoparasitics that feed within root cortical tissue and are also found in the surrounding soil. Infected plants have roots with black lesions and fewer feeder roots resulting in stunted root growth. Top growth may exhibit general symptoms of an impaired root system including lack of vigor, dieback, chlorotic and small leaves, and reduction of yield. In general, root lesion infection results in plants exhibiting symptoms of chlorosis, wilting, and stunting. Infected roots show initial symptoms of small, water-soaked lesions that soon turn brown to black. Lesions are formed along the root axis and may coalesce laterally to girdle the roots, which are killed. Affected root tissue may slough off leaving a severely reduced root system. Secondary infection by fungi and bacteria may further destroy the root system by causing sloughing off the root tissues and rot. Plant yield is reduced and in severe infections, plants may be killed (Chitambar et al., 2018).

Transmission: On its own, *Pratylenchus* species can move 1-2 m per season from an infected root. The main mode of long and short distance spread is artificial. Infected roots, bare root propagative plant materials, soil debris, cultivation tools, equipment and human activity that can move soils from infested to non-infested sites. It can also be spread by drainage, irrigation, or flood water (Corbett, 1974).

Damage Potential: In California, as in many regions worldwide, this nematode is the primary cause of tree decline and replant problems in orchards (McKenry 1999). *Pratylenchus vulnus* is the root lesion species most found in walnut orchards in California. Walnut tree vigor and yields are reduced by the feeding activity of *P. vulnus*, which places infected trees under stress (Westerdahl et al., 2017). Growth of young walnut trees can be arrested by *P. vulnus* and even at the density of one nematode/250 cm^3 and established walnut orchards in California are able to support 500 *P. vulnus*/250 cm^3 soil (Buzo et al. 2009).

Root systems of young grapevines may be restricted in growth with absence of major roots and dead feeder roots while root lesions at feeding sites may not be present (Raski et al., 1973). *Pratylenchus*

vulnus reduces plum yields (McKenry, 1989). During the 1970s, *P. vulnus* was also found to affect rose production in California (Lear et al., 1970).

Worldwide Distribution: Africa: *Cameroon, Egypt, Kenya, Morocco, Reunion*. America: *Argentina, Brazil, Canada, Cuba, Uruguay*. Asia: *China, India, Iran, Israel, Japan, Korea, Republic, Kyrgyzstan, Pakistan, Sri Lanka, Europe: Belgium, Bulgaria, Denmark, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Spain, United Kingdom*. Oceania: *Australia, New Zealand* (CABI-CPC, 2022).

In the United States, *P. vulnus* is widely reported in California and in several other states including Alabama, Arkansas, Florida, Georgia, Idaho, Missouri, North Carolina, and Tennessee (CABI-CPC, 2022).

Official Control: *Pratylenchus vulnus* is on the USDA PCIT's harmful organism list for Argentina, Canada, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Iceland, Mexico, Norway, Panama, Paraguay, Peru, Svalbard and Jan Mayen, Taiwan, and Uruguay (USDA, 2022). It is on the EPPO's A1 list for Uruguay, A2 list for Comite de Sanidad Vegetal del Cono Sur, and is a quarantine pest for Mexico (EPPO, 2022).

California Distribution: *Pratylenchus vulnus* has records in Alameda, Butte, Eldorado, Fresno, Glenn, Humboldt, Kern, Kings, Lake, Los Angeles, Madera, Marin, Mendocino, Merced, Napa, Placer, Riverside, Sacramento, San Benito, San Bernardino, San Diego, San Joaquin, San Mateo, Santa Barbara, Santa Cruz, Shasta, Solano, Sonoma, Stanislaus, Sutter, Tehama, Tulare, Ventura, Yolo, and Yuba counties (CDFA Database, 2022).

California Interceptions: This nematode has been detected in several incoming shipments of plants and soil to California (CDFA database, 2022).

The risk *Pratylenchus vulnus* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:**

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**.

Risk is High (3) – Pratylenchus vulnus *has established throughout the State.*

2) **Known Pest Host Range:**

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.

Risk is Medium (2) – Pratylenchus vulnus *is primarily a parasite of woody plants, but its diverse range of hosts are grown throughout the State and include widely planted fruit trees and berries, plus woody ornamentals.*

3) Pest Reproductive Potential:

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.

Risk is High (3) –Long and short distance spread is mainly infected roots, bare root propagative plant materials, soil debris, run-off and irrigation water, cultivation tools, equipment and human activity that can move soils from infested to non-infested sites.

4) Economic Impact:

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

Economic Impact: A, C, 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.

Risk is High (3) – Yields are reduced for susceptible hosts due to damage to their root systems from nematode feeding. Pratylenchus vulnus *is a quarantine pest for many other countries. The nematodes can be spread with anything that moves soil or water.*

5) **Environmental Impact:**

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.

Risk is Medium (2) – The impact of Pratylenchus neglectus *on natural environments is most likely not significant as the species is already widespread without causing apparent detriment to ecological balances and processes, however, the infestations of this root lesion nematode could affect home/urban gardening.*

Consequences of Introduction to California for *Pratylenchus vulnus:* 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 '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.

Evaluation is High (-3). Pratylenchus vulnus *is widely spread in several contiguous and non-contiguous climate and host regions throughout the state.*

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* **= 10**

Uncertainty:

None

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Pratylenchus vulnus* is C.

References:

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USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PExD) Harmful Organisms Database Report. *Pratylenchus vulnus*. Accessed 1/18/2022

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*Comment Period: 02/22/2022 through 04/08/2022

*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: C
