

California Pest Rating Proposal for

Pratylenchus scribneri Steiner, 1943 Scribner's root-lesion nematode

Current Pest Rating: D

Proposed Pest Rating: C

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

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

Initiating Event:

This pathogen has not been through the pest rating system. The risk to California from *Pratylenchus scribneri* 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 when 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).

Like other *Pratylenchus* species, *P. scribneri* 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 of 45-65 days. Males are not present for this species, and they are not sexually reproducing. Roman and Triantaphyllou (1969) determined that there are two reproductive forms in the species; one has n=6 chromosomes and reproduces by meiotic

parthenogenesis. In meiotic parthenogenesis there is no fertilization of oocytes and following a meiotic reduction division of the unfertilized egg cell, the diploid number of chromosomes is re-established by fusion with the nucleus of a polar body. The other form has a somatic chromosome number of about 25 and reproduces by mitotic parthenogenesis. In mitotic parthenogenesis there is no fertilization and there is mitotic division of oogonia so that the somatic number of chromosomes is preserved throughout (Nemaplex, 2010).

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: Agrostis palustris (creeping bentgrass), *Allium cepa* (onion), *Amaranthus* sp. (amaranth), *Amaryllis belladonna* (belladonna Lily), *Amaryllis* sp., *Anthurium* sp. (tailflower), *Beta vulgaris* (sugar beet), *Brassica oleracea* (broccoli), *Capsicum frutescens* (pepper), *Carpinus caroliniana* (American hornbeam), *Celtis laevigata* (hackberry), *Chenopodium* sp. (goosefoot), *Chrysanthemum X morifolium* (florist's mum), *Cymbidium* sp. (orchid), *Cypripedium* sp. (lady's slipper), *Dahlia* sp., *Daucus carota* (carrot), *Digitaria sanguinalis* (hairy crabgrass), *Fragaria chiloensis* (strawberry), *Fragaria X ananassa* (garden strawberry), *Glycine max* (soybean), *Hordeum vulgare* (barley), *Malus* sp. (apple), *Malus sylvestris* (apple), *Medicago sativa* (alfalfa), *Mentha spicata* (spearmint), *Miscanthus X giganteus*, *Musa* sp. (banana), *Nicotiana tabacum* (tobacco), *Ocimum basilicum* (basil), *Panicum virgatum* (switchgrass), *Phaseolus limensis* (lima Bean), *Phaseolus lunatus* (sieva bean), *Phaseolus* sp. (bean), *Phaseolus vulgaris* (bean), *Prunus persica* (nectarine), *Raphanus sativus* (radish), *Rosa* sp. (rose), *Saccharum officinarum* (sugar cane), *Solanum lycopersicum* (tomato), *Solanum tuberosum* (potato), *Sorghum bicolor* (sudangrass), *S. vulgare* (sorghum), *Tribulus terrestris* (puncture vine), *Trifolium pratense* (clover), *Triticum aestivum* (wheat), *Uniola* sp. (sea oat), *Vitis* sp. (grape), *Vitis vinifera* (grape), *Zea mays* (corn), *Zoysia matrella* (Manilagrass) (Nemaplex, 2010).

Symptoms: Pratylenchus spp. are migratory endoparasites. 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 of 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, soil debris, cultivation tools, equipment and human activity can move soils from infested to non-infested sites. It can also be spread by drainage, irrigation, or flood water (Corbett, 1974).

Damage Potential: *Pratylenchus scribneri* is known to be an economic pathogen causing damage to the roots and loss of yield to a wide range of crops, including barley, maize, soybean, potato, sugar beet, broccoli, tomato, onion, strawberry, and peach (Castillo and Volvas 2007). It reduces the yield and quality of potato tubers (Orlando et al., 2020).

Worldwide Distribution: Africa: *Cameroon*, Asia: *China, Pakistan, Turkey*, Europe: *Italy*, North America: *United States* (widespread in 35 states) (CABI-CPC, 2022; Nemaplex, 2010; Widely Prevalent Nematodes of the United States, University of Georgia).

Official Control: *Pratylenchus scribneri* is on the USDA's harmful organism list for Argentina, Brazil, Canada, Ecuador, French Polynesia, Namibia, Peru, South Africa, and Uruguay. It is on the EPPO's A1 list for Argentina, Brazil, and Uruguay, and on the A2 list for Comité de Sanidad Vegetal del Cono Sur (COSAVE).

California Distribution: Contra Costa, Fresno, Imperial, Los Angeles, Merced, Riverside, San Bernardino, San Joaquin, San Mateo, Santa Barbara, Santa Cruz, Shasta, Siskiyou, Solano, Sonoma, Sutter, Tulare, Yolo, and Yuba counties with most detections on citrus, grapes, olives, stone fruit, tomatoes, and turf grass.

California Interceptions: There have been multiple interceptions on ornamentals from various Florida and Central American shippers including on *Ficus lyrata*, *F. benjamina*, *F. elastica*, *Ravenea rivularis*, *Areca palm*, *Aglaonema sp.*, *Wodyetia bifurcata*, *Chamaerops humilis*, and *Beaucarnea recurvata*

The risk *Pratylenchus scribneri* 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 scribneri* has established throughout the State based on official records (CDFFA PDR Database).

2) Known Pest Host Range:

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.**

Risk is High (3) – *Pratylenchus scribneri* 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, woody ornamentals, vegetables, small fruit, and grasses.

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, 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.
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- 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 scribneri* 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 scribneri* 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 scribneri*: 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.
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Evaluation is 'High'.

Score:

-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 = 11*

Uncertainty:

Pratylenchus often occur in mixed populations with other species and other genera of parasitic nematodes. This can complicate the estimates of damage due to a single species.

Conclusion and Rating Justification:

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

References:

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Responsible Party:

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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](mailto: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.
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❖ 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
