CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Rotylenchus robustus (de Man, 1876) Filipjev, 1936

Spiral nematode

Current Pest Rating: D

Proposed Pest Rating: C

Kingdom: Animalia, Phylum: Nematoda,
Class: Chromadorea, Order: Rhabditida,
Family: Hoplolaimidae

Comment Period: 01/24/2023 through 03/10/2023

Initiating Event:

During the 1950-60s, several species of plant parasitic nematodes were given a 'D' rating as they were regarded as parasites, predators, or organisms of little or no economic importance that did not require State enforced regulatory action. However, these nematode species were inaccurately assigned a D rating as most, if not all, are plant parasitic and therefore are capable of damaging plant production and causing significant economic losses, especially at the county and local residential/grower level. Furthermore, the detection of plant parasitic nematodes in nursery stock may be an indication of contamination in violation of the State's standard of pest cleanliness required for nurseries. *Rotylenchus robustus* was originally rated D. The risk of infestation and permanent rating of this species is re-assessed here, and a permanent rating is proposed.

History & Status:

Background:

Members of the genus *Rotylenchus* are commonly known as 'spiral nematodes' since they assume a spiral form when relaxed with gentle heat. Species reproduce mainly by parthenogenesis and eggs are produced. There are three juvenile stages. These nematodes usually inhabit the soil-root region of plants and feed as obligate ectoparasites with their stylet (sword-like hollow tooth) inserted into the root. All motile juvenile and adult stages of *Rotylenchus* feed. All species are parasitic on roots and other underground parts of plants (Siddiqi, 1972).

The genus *Rotylenchus* Filipjev, 1936 belongs to the family Hoplolaimidae, which contains several agricultural and economically important genera including *Helicotylenchus, Hoplolaimus* and *Scutellonema*. The genus *Rotylenchus* has more than 95 valid species. Members of this genus are very similar in gross morphology which makes species identification challenging. Sequencing the D2-D3 expansion regions of the 28S, ITS1-rRNA genes, and the partial COI, has improved the ability of nematologists to make accurate species identification (Cantalapiedra-Navarrete et al., 2013).

Hosts: This species is highly polyphagous with reports on many woody and herbaceous plants, including conifers, fruit trees, vegetables, and ornamentals. California hosts include apple, potato, olive, grape, grasses (Goodey et al., 1965; Siddiqui et al., 1973; Fernandez Diaz-Silveira and Herrera, 1998; CDFA PDR database). Species have been associated with different plants in soil around the root zone, however, the host status of associated plants is not always known.

Symptoms: Feeding of *Rotylenchus* spp. results in production of small, discolored lesions in the root cortex and other underground parts. Local lesions in the cortex result in death of cells on which the nematodes feed. Feeding of high population levels of *Rotylenchus* can severely damage roots by causing them to become slightly swollen, spongy, and discolored. Eventually the cortex of such roots is sloughed off (Maggenti, 1981; Mai et al., 1960). Above ground symptoms may express yellowing of foliage, mild stunting, wilt, and defoliation – depending on the population level of spiral nematodes present.

Transmission: The main mode of long and short distance spread is through artificial means: movement of nematode-contaminated soil, run-off and irrigation water, cultivation tools, equipment and any human activity that can move soils from infested to non-infested sites.

Damage Potential: Spiral nematodes do not usually produce recognizable, acute disease symptoms in plants but can generally depress yields of crops (Oostenbrink, 1972). In the Netherlands, this nematode stunts pea and causes root-rot and also causes damage that affects the shape and size of carrots. Stunting, yellowing, and reduction in yield in lettuce were associated with high populations of *Rotylenchus robustus* in California field experiments. Yields of marketable heads of lettuce were doubled on plots treated first with preplant nematicides (Lear et al., 1969), showing nematodes were a significant factor. Small patches of *Pinus radiata* seedlings growing in light, sandy, nursery soils in Australia turned chlorotic; many seedlings were stunted, and a few died. These symptoms were associated with a heavy infestation of *Rotylenchus robustus* in roots and soil (Winoto-Suatmadji and Marks, 1989).

Worldwide Distribution: Europe, Australia, and the United States (California) (Nemaplex, 2010).

Official Control: *Rotylenchus* spp. are on the USDA PCIT's harmful organism list for Australia, French Polynesia, and Nauru. With a D rating, this nematode has not been under any regulation in California (see 'initiating events').

California Distribution: Official records are from Marin, San Francisco, San Mateo, Sonoma, and Yolo counties (CDFA PDR Database, 2022).

California Interceptions: There has been one interception in San Mateo County in 2007 on *Sansevieria* plants from Lake County, Florida.

The risk *Rotylenchus robustus* 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) – Rotylenchus robustus would be to establish throughout the State. The nematode prefers sandy soils and survives in fallow soil for up to 6 months

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) – Rotylenchus robustus are known to be associated with diverse plant species, however, the host status of associated plants is not always known.

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) – The main mode of long and short distance spread is through artificial means: movement of contaminated soil, run-off and irrigation water, cultivation tools, equipment and any human activity that can move soils from infested to non-infested sites. Increase in reproduction rates depends on the plant species parasitized.

4) Economic Impact:

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

Economic Impact: A

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: **1**

- 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 Low (1) – Generally, *Rotylenchus robustus* are considered mild pathogens of plants. However, under high population levels in residential, nurseries and other small-area plantings, infections could result in lowered crop yield.

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 *Rotylenchus robustus* on natural environments is most likely not significant as the species is already established in some areas without causing apparent detriment to ecological balances and processes, however, heavy infestations of spiral nematodes could affect home/urban gardening.

Consequences of Introduction to California for *Rotylenchus robustus:* Medium

Add up the total score and include it here. **12**
-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 'medium'.

Score: -2
-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* ***= 10***

Uncertainty:

none

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Rotylenchus robustus* is C.

References:

Boag, B. and Neilson, R., 1996. Distribution and ecology of *Rotylenchus* and *Pararotylenchus* (Nematoda: Hoplolaimidae) in Great Britain. Nematologica, 42(1), pp.96-108.

Cantalapiedra-Navarrete, C., Navas-Cortés, J.A., Liébanas, G., Vovlas, N., Subbotin, S.A., Palomares-Rius, J.E. and Castillo, P., 2013. Comparative molecular and morphological characterisations in the nematode genus *Rotylenchus*: *Rotylenchus paravitis* n. sp., an example of cryptic speciation. Zoologischer Anzeiger-A Journal of Comparative Zoology, 252(2), pp.246-268.

Fernandez Diaz-Silveira, M., and Herrera, J.O. 1998. Nematropica 28: 151-163.

Goodey, J. B., Franklin, M. T., and Hooper, D. J. 1965. T. Goodey's: The Nematode Parasites of Plants Catalogued Under Their Hosts. Commonwealth Agricultural Bureaux, Farnham Royal, Bucks, England. Third Edition

Lear, B., Johnson, D.E. and Miyagawa, S.T., 1969. Disease of lettuce associated with an ectoparasitic nematode, *Rotylenchus robustus*. Plant disease reporter.

Mai, W. F., P. G. Mullin, H. H. Lyon, and K. Loeffler. 1996. Plant parasitic nematodes – a pictorial key to genera. Fifth Edition. Comstock Publishing Associates a division of Cornell University Press, Ithaca and London. 277 p.

Maggenti, A. 1981. General nematology. Springer-Verlag New York Heidelberg Berlin. 372 p.

Nemaplex UC Davis Nemabase 2010. http://Nemaplex.ucdavis.edu. Accessed 12/27/22

Oostenbrink, M., 1972. Evaluation and integration of nematode control methods. Evaluation and integration of nematode control methods.

Siddiqui, I. A., Sher, S. A., and French, A. M. 1973. Distribution of Plant Parasitic Nematodes in California. State of California Department of Food and Agriculture, Division of Plant Industry. 324p.

USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PExD) Harmful Organisms Database Report. *Rotylenchus robustus*. Accessed 12/27/2022

Winoto-Suatmadji, R. and Marks, G.C., 1989. *Rotylenchus robustus* in a Pinus radiata nursery in Victoria. Australasian Plant Pathology, 18(2), pp.38-38.

Responsible Party:

Heather J. Scheck, Primary Plant Pathologist/Nematologist, CDFA/PHPPS ECOPERS, 1220 N St Rm 221, Sacramento, CA 95814 Phone: (916) 654-1017, permits[@]cdfa.ca.gov.

***Comment Period: 01/24/2023 through 03/10/2023**

***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
