CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Profile for

Rotylenchulus parvus (Williams) Sher 1961

Pest Rating: C

Kingdom: Animalia, Phylum: Nematoda,

Class: Chromadorea, Order: Rhabditida,

Family: Hoplolaimidae

Comment Period: 11/05/2024 through 12/20/2024

Initiating Event:

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

History & Status:

Background: The original description of *Rotylenchulus parvus* was made from individuals collected from sugarcane soil in Mauritius by Williams (1960). Today it is widespread in eastern and southern Africa on several important crops including corn, potato, cowpea, sweet potato, and cassava. It was first found in California in 1963 by CDFA Nematologist D.E. Konicek from a cotton field in Imperial County. Additional records in the southern United States have been published by Lehman and Inserra (1990).

Adult female reniform nematodes are obligate sedentary semi-endoparasites of plant roots. All eggs, juvenile stages, immature females, and immature and mature males are found within the rhizosphere soils of host plants. The genus is bisexual and can reproduce through cross-fertilization and through parthenogenesis with females alone. Males are exceedingly rare for *R. parvus*, and in greenhouse studies, the life cycle (egg to egg) was completed parthenogenetically in 27-36 days.

Soon after the final molt, the vermiform immature adult female becomes infective and penetrates host roots. After infection, she becomes oriented perpendicularly to the longitudinal axis of the roots with usually only the anterior part of the body embedded within the root tissue. Feeding occurs on the tissue of the cortex, phloem, and pericycle. Nurse cells are formed near the pericycle with hypertrophy of the pericycle and endodermis cells. Epidermal and cortical cells are destroyed resulting in slight

browning and necrosis of surrounding tissue. About one week after root penetration, the immature female body enlarges and matures to form the typical kidney shape and secretes a gelatinous matrix that encases her body on the surface of the root. It is within this matrix that the female lays her eggs (Jatala, 2020).

Reniform nematodes are capable of surviving in air-dried soil for extended periods and in the absence of the host. Reproduction and development of the reniform nematode are favored by fine-textured soils with a relatively high content of silt and/or clay (Chitambar et al., 2018). A population of *R. parvus* found by CDFA in a cotton field in the Imperial Valley was studied by Konicek (1963). In inoculation trials, no reproduction was noted on tomato, sweet potato, onion, lettuce, or yellow nutgrass. Numerous mature females and egg masses were formed on the roots of kidney beans, cowpeas, and bermudagrass. Dasgupta and Raski (1968) also performed host range studies on the California population and found that it reproduced well on both barley and bermudagrass. Cotton was rated as a poor host plant, as no eggs and only partially swollen females were found in inoculation studies. No data on the potential effects on hosts, e.g. growth responses, were provided.

Hosts: Arachis hypogaea (peanut), *Bougainvillea* sp. (bougainvillea), *Cajanus cajan* (pigeonpea), *Carica papaya* (papaya), *Carissa* sp., *Chloris gayana* (Rhodes grass), *Citrus aurantium* (sour orange), *Crotalaria juncea* (sunn hemp), *Cupressus* sp. (cypress), *Cynodon dactylon* (bermudagrass), *Cynodon plectostachyus* (African stargrass), *Cyperus* sp. (umbrella sedge), *Glycine max* (soybean), *Gossypium hirsutum* (upland cotton), Helianthus annuus (sunflower), *Hordeum vulgare* (barley), *Lactuca sativa* (lettuce), *Macadamia* sp., *Macadamia ternifolia* (Queensland nut), *Medicago sativa* (alfalfa), *Nicotiana tabacum* (tobacco), *Olea europaea* (olive), *Pennisetum americanum* (pearl millet), *Phaseolus vulgaris* (common bean), *Pinus* (pines), *Pittosporum* sp., *Saccharum officinarum* (sugar cane), *Solanum lycopersicum* (tomato), *Solanum tuberosum* (potato), *Sorghum bicolor* (Sudangrass), *Thymus* sp. (thyme), *Vigna unguiculata* (cowpea), and *Zea mays* (corn) (Nemaplex, 2010; CABI, 2024).

Symptoms: Above-ground symptoms are not specific to nematode feeding damage. Host plants can show symptoms of chlorosis, wilting, or general unthriftiness. Plants may become senescent at an early stage of growth. Roots will be sparse and distorted and may have small necrotic lesions that are often invaded by secondary fungal and bacterial pathogens. A survey of pigeon peas in Kenya found *R. parvus* together with Fusarium wilt (*Fusarium udum*), and Hillocks and Songa (1993) showed that *R. parvus* has the potential to increase wilt incidence.

Transmission: The nematode is readily transported over long distances in plant roots and associated soil, as well as spread over short distances in contaminated irrigation water, infested plant roots, and soil. Therefore, imported nursery plants and farm-destined crops are potential pathways of entry.

Damage Potential: There is little reported information on losses attributed to *R. parvus,* but it is possible that with heavy infestations, yields will be negatively affected (CABI, 2024). UC Riverside Nematologists Ole Becker and Antoon Ploeg are unaware of any damage reports from crops grown in Imperial County from this nematode (pers. comm). Lesions formed on roots by nematode activity are commonly attacked by secondary root-rotting organisms including fungi and bacteria thus an increase in root disease is common in nematode-infested soils.

Worldwide Distribution: Africa*: Cote d'Ivoire, Egypt, Kenya, Malawi, Mauritius, Mozambique, Somalia, South Africa, Tanzania, Uganda, Zambia, Zimbabwe*. America: *Dominican Republic, United States of America* (Arizona, California, Florida), *Virgin Islands* (US). Asia: *India, Iran, Pakistan*. Europe: *Cyprus*. Oceania: *Australia*.

Official Control*: Rotylenchulus parvus* is on the EPPO's A1 list for Brazil and is a regulated quarantine pest in Mexico (EPPO, 2024). It is on the USDA PCIT's harmful organisms list for Brazil, Guatemala, Honduras, Mexico, and Panama (USDA PCIT, 2024).

California Distribution: Occasionally found in California in the Imperial Valley.

California Interceptions: none

The risk that *Rotylenchulus parvus* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** This nematode is indigenous to Africa and has not been found in cooler climates. It would likely be limited to warmer parts of California.

   Evaluate if the pest would have suitable hosts and climate to establish in California.

   Score: **2**
   - 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 for this nematode is large.

   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 natural dispersal of nematodes is limited to their ability to move through soil. Human-assisted movement of infested soils can spread them across fields or larger areas. All life stages can be moved with irrigation water and crop debris.

   Evaluate the natural and artificial dispersal potential of the pest.

   Score: 2
   - 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 has been found in California and other parts of the southern United States for decades. It seems to not be a significant pest of cotton or other crops grown in the desert and no yield losses have been reported. It is a regulated quarantine pest in Mexico and can be moved with irrigation water.

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

   Economic Impact: 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: **2**

   - 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:** None have been reported.

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

   Environmental Impact:

   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: 1

   - 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 *Rotylenchulus parvus:* Medium

Add up the total score and include it here. **10**

-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.

   There are records only from Imperial County

   Evaluation is 'Low'.

   Score: -1
   -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* ***= 9***

Uncertainty:

none

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for ***Rotylenchulus parvus*** **is C.**

References:

CABI Compendium. 2024. *Rotylenchulus parvus*.
https://www.cabidigitallibrary.org/doi/10.1079/cabicompendium.47891

Chitambar, J. J., Westerdahl, B. B., and Subbotin, S. A. 2018. Plant Parasitic Nematodes in California Agriculture. In Subbotin, S., Chitambar J., (eds) Plant Parasitic Nematodes in Sustainable Agriculture of North America. Sustainability in Plant and Crop Protection. Springer, Cham

Dasgupta, D.R., Raski, D.J., 1968. The biology of *Rotylenchulus parvus*. Nematologica, 14: 429-440.

EPPO Database. https://gd.eppo.int/taxon/ROTYPA Accessed 10/18/2024

Hillocks, R.J, and Songa, W., 1993. Root-knot and other nematodes associated with pigeonpea plants infected with *Fusarium udum* in Kenya. Afro-Asian Journal of Nematology, 3:143-147.

Jatala, P., 2020. Reniform and false root-knot nematodes, *Rotylenchulus* and *Nacobbus* spp. In Manual of agricultural nematology (pp. 509-528). CRC Press.

Konicek, D.E., 1963. A plant-parasitic nematode of the genus *Rotylenchulus* found in California. Phytopathology, 1963, Vol. 53, No. 10, 1140

Lehman, P.S., and Inserra, R.N., 1990. Morphometric variation of *Rotylenchulus parvus* and *Rotylenchulus reniformis* populations in the southern United States. Proceedings - Soil and Crop Science Society of Florida, No. 49:220-226; 14 ref.

Nemaplex UC Davis Nemabase. 2010. *Rotylenchulus parvus*. Accessed 10/18/2024

USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PExD) Harmful Organisms Database Report. *Rotylenchulus parvus* (Nematode). Accessed 10/18/2024.

Williams, J.R., 1960. Studies on the nematode soil fauna of sugar cane fields in Mauritius. 4. Tylenchoidea (partim). Occasional Papers, Mauritius Sugar Industry Research Institute, 4:1-30.

Responsible Party:

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*Comment Period: 11/05/2024 through 12/20/2024

*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.

Pest Rating: C