CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Longidorus orientalis Loof, 1982
Needle nematode

Current Pest Rating: none

Proposed Pest Rating: C

Kingdom: Animalia, Phylum: Nematoda,
Class: Adenophorea, Subclass: Enoplea,
Suborder: Dorylaimina; Superfamily: Dorylaimoidea,
Family: Longidoridae

Comment Period: 09/05/2023 through 10/20/2023

Initiating Event:

This nematode has not been through the pest rating process. The risk to California from *Longidorus orientalis* is described herein and a permanent pest rating is proposed.

History & Status:

Background:

California leads the nation in date production and is the nation's sole exporter of dates. In 2021, California produced 59,450 tons of dates from 15,600 acres. The total value of the crop was $228.6 million ("Non-citrus Fruits" NASS, 2022). Most date production takes place in the Coachella Valley of Riverside County, with additional acreage in Imperial County.

Longidorids are found throughout the warmer, temperate regions of the world on a variety of hosts. *Longidorus* sp. are considered cosmopolitan with many economically important pests of agricultural plants. The family Longidoridae Thorne, 1935, holds nematodes divided into two subfamilies: Longidorinae Thorne, 1935, and Xiphinematinae Dalmasso, 1969. Within the genus *Longidorus* Micoletzky, 1922, there are over 170 valid species (Archidona-Yuste et al., 2019; He et al., 2005; Cai et al., 2020). They are very long and slender; some are the longest phytopathogenic nematodes known, reaching up to 12 mm in length. They are called "needle nematodes" because, in addition to having a very long and narrow body, they are identified by having an elongated axial spear called an odontostyle and an extension called an odontophore. Their long odontostyle/odontophore combination can be inserted deep into plant tissues.

Longidorus sp. are polyphagous root ectoparasites of a wide range of economically important herbaceous and woody plants and grasses (Agrios, 2005; Nemaplex, 2010). They cause damage by directly feeding on root cells. A few species can transmit nepoviruses (Taylor and Brown, 1997). These nematodes acquire the viruses by feeding on infected hosts, and they can transmit to new hosts for several months. There is usually a marked specificity between plant viruses and their *Longidorus* vector species, except for *L. elongatus* which is known to transmit both tomato black ring virus and raspberry ringspot virus (Decraemer and Robbins, 2007). No nepoviruses have been found associated with *L. orientalis*.

The most common method for reproducing date palms is through the vegetative propagation of offshoots, which ensures the genetic identity of the varieties. Offshoots develop from axillary buds on the trunk near the soil surface. These offshoots, after 3 to 5 years of development attached to the parental palm, produce roots and can be removed and planted (Chao and Kruger, 2007). This method of propagation has a very high risk of spreading soil-borne plant parasitic nematodes.

Longidorus orientalis is mostly likely native to the Middle East and was originally described by Loof (1982) from declining date palms (*Phoenix dactylifera*) in Saudi Arabia. It is possible that *Longidorus orientalis* came to California as early as 1912 with propagative date palms from the Middle East (Morton, 1987) before any phytosanitary restrictions were in place. From California, they were accidentally spread to Arizona and Florida with ornamental date palms (Subbotin et al., 2015; Inserra et al., 2015). From commercial date palm farms, large trees at the end of their productive fruiting cycle are sold as landscape trees and shipped mainly within the U.S. where climates are appropriate to date palms. The first official record of this nematode in the Americas, and molecular characterization of populations in the U.S. and other countries, was made by CDFA nematologists (Subbotin et al. 2015). The populations were mostly females but also contained a few males, which was not reported in the original description from Loof (Inserra et al., 2015). The prevalence of these nematodes in palms shipped to Florida was less than 6%. The abundance of *L. orientalis* in California date palm growing areas and their damage potential for the date palm industry and other crops remains to be determined. Although there are records of infection and damage to both grapes and citrus in the literature (Loof, 1982), and both are grown in Riverside and Imperial counties, there have been no detections on those hosts.

Hosts: Citrus sp., fig (*Ficus* sp.), date palm (*Phoenix dactylifera*), graminaceous plants, grapevines (*Vitis* sp.). (Loof, 1982; Noruzi and Barooti, 2005; Palomares-Rius et al., 2010; Tzortzakakis et al., 2014).

Symptoms: Plant-parasitic nematodes can cause damage to the root system of plants, leading to a reduction in the plant's ability to obtain water and nutrients from the soil. When nematode numbers increase or when environmental stresses occur, aboveground symptoms may become evident. Common aboveground symptoms of nematode damage include yellowing of foliage, wilting, thinning of foliage, stunting, and even death of plants. Nematode damage usually occurs in localized areas that may enlarge slowly over time. However, it is also important to consider that similar symptoms may be caused by other factors such as localized soil conditions, fungal diseases, or insects.

Infected date palms, grapevines, citrus, and figs show general decline symptoms (Loof, 1982; Noruzi and Barooti, 2005; Tzortzakakis et al., 2014). These symptoms are not specific to nematode damage and are easy to confuse with other root pathogens or cultural problems related to irrigation or plant nutrition. *Longidorus* spp. can be very damaging to seedlings, where they have been observed attacking the root tips, and causing root galling near the tips. Serious seedling damage has been seen at relatively low nematode population levels in soil (Kolodge et al., 1987).

Transmission: Nematodes inhabiting soil attached to the date palm offshoots can be transmitted from a field to a nursery and then again to a new, uninfested field. They can spread over short and long distances when transported in infested soils accompanying plant stock, farm machinery, runoff and splash-contaminated irrigation water, human and animal activity, and soil-contaminated clothing. It is also spread with the movement of large trees, including with mature date palms retired from orchards, moved from California to Arizona and Florida for ornamental planting (Subbotin et al., 2015).

Damage Potential: This nematode is well adapted to conditions in the southern California desert where commercial date palms are grown. Although there is no published data on the damage to date palms, nematode feeding steals energy from plants and causes wounds that allow attack from other soil-borne plant pathogens. Reports of this nematode as a pathogen on grapes, figs, and citrus in other countries are an additional threat to California.

Worldwide Distribution: Iran, Iraq, Greece, Saudi Arabia, Spain, United States (Arizona, California, Florida) (Subbotin et al., 2015).

Official Control: *Longidorus* sp. are on the USDA PCIT's Harmful organisms list for Australia, Canada, China, Jordan, Nauru, Peru, The Republic of Türkiye, and Tunisia (USDA PCIT, 2023).

California Distribution: Imperial and Riverside counties (Subbotin et al., 2015).

California Interceptions: none

The risk *Longidorus orientalis* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** This nematode seems well adapted to climates suitable for date palms. It is likely to survive wherever its hosts can grow. In other countries, it has also been reported on grapes and citrus, which are widely planted in California.

   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 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 includes date palms, figs, citrus, and grapes.

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 natural spread of soilborne nematodes is typically slow, not more than meters per year. The artificial spread with soil or nursery stock is very common and can move nematodes around the world.

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:** Loof (1982) describes infected date palms with general symptoms of decline. No specific economic impact has been measured in California, but it is reasonable to assume that large populations could cause significant damage to palm roots. Infection with C-rated nematodes can be a violation of state nursery stock cleanliness standards. Offshoots for propagation should not be harvested from areas where this nematode is known to occur. Needle nematodes can be spread with the movement of irrigation water.

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

Economic Impact: A, B, D, 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 everyday 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:** No impacts have been reported, although grass hosts have been described when closely associated with date palms in Spain (Palomares-Rius et al., 2010). This nematode could impact ornamental plantings as mature date palms are moved out of commercial groves and into landscaping.

Evaluate the environmental impact of the pest on 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 *Longidorus orientalis:* 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.

There are records from two counties in Southern California. This nematode has been in California but not under regulation for decades. It could be more widespread than known, as is known to move with mature date palms into ornamental landscapes (Subbotin et al., 2015).

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) **11**

Final Score: *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information* **=**

Uncertainty:

There is a very similar nematode that is also associated with California *Phoenix* palms, *L. africanus.* This nematode is also a pathogen of date palms and can co-occur with *L. orientalis* (Inserra et al., 2015). It requires an expert diagnostician to distinguish between the two species. *Longidorus africanus* is a C-rated pest in California. https://blogs.cdfa.ca.gov/Section3162/?p=9039

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for ***Longidorus orientalis*** **is C.**

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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: 09/05/2023 through 10/20/2023**

***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 that 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 before posting to ensure they are entirely germane.
- Posted comments shall be those which that have been approved in content and posted to the website to be viewed, not just submitted.

Proposed Pest Rating: C