

California Pest Rating Proposal for *Dolichodoros heterocephalus* Cobb, 1914

Cobb's awl nematode

Current Pest Rating: A

Proposed Pest Rating: A

Domain: Eukaryota, Kingdom: Metazoa,
Phylum: Nematoda, Class: Secernentea
Order: Tylenchida, Suborder: Tylenchina,
Family: Dolichodoridae

Comment Period: 08/10/2021 through 09/24/2021

Initiating Event:

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

History & Status:

Background: The genus *Dolichodoros* was created by Cobb (1914) when he named *D. heterocephalus* collected from fresh water at Silver Springs, Florida and Douglas Lake, Michigan. This nematode is a migratory ectoparasite that feeds only from the outside on the cells, on the root surfaces, and mainly at root tip. They live freely in the soil and feed on plants without becoming attached or entering inside the roots. Males and females are both present. This genus is notable in that its members are relatively large for plant parasites and have long stylets.

Usually, awl nematodes are found in moist to wet soil, low areas of fields, and near irrigation ditches and other bodies of fresh water. Because they prefer moist to wet soils, they rarely occur in agricultural fields and are not as well studied as other plant-parasitic nematodes (Crow and Brammer, 2003). Infestations in Florida may be due to soil containing nematodes being spread from riverbanks

onto fields, or by moving with water during flooding (Christie, 1959). They are found occasionally on golf courses in South Carolina (Zeng et al., 2012).

Hosts: *Aeschynomene americana* (American joint vetch), *Apium graveolens* (celery), *Brassica oleracea* (broccoli), *Capsicum frutescens* (pepper), *Cynodon dactylon* (Bermuda grass), *Cyperus alternifolius* (umbrella flatsedge), *Dianthus plumarius* (cottage pink), *Eleocharis dulcis* (Chinese water chestnut), *Eremochloa ophiuroides* (centipedegrass), *Impatiens balsamina* (garden balsam), *Mentha spicata* (spearmint), *Nerium oleander* (oleander), *Ocimum basilicum* (sweet basil), *Phaseolus* sp. (bean), *Phaseolus vulgaris* (French bean), *Pittosporum tobira* (Japanese pittosporum), *Saccharum officinarum* (sugar cane), *Solanum lycopersicum* (tomato), *Sorghum bicolor* (millet), *Stenotaphrum secundatum*, (buffalo grass), *Tagetes patula* (French marigold), *Vaccinium corymbosum* (highbush blueberry), *Vaccinium macrocarpon* (American cranberry), *Zea mays* (maize), *Zoysia matrella* (Japanese carpet grass)

Symptoms: As ectoparasites, awl nematodes can feed on small or large roots, root tips, and hypocotyls. The cells at feeding sites become brownish-yellow after several days, and brown lesions form. The result is tissue disorganization, root curvature and dead or dying roots. The damage caused by feeding leads to severe stunting of the entire plant because of depletion of the root system. The roots are often coarse with stubby tips. The few secondary roots that are formed can be stubby as well. During feeding of *D. heterocephalus*, Paracer et al. (1967), observed discrete root galls, curvature at the root tips and localized lesions in the root cortex and epidermis. There was some enlargement of nuclei in cortical cells at the feeding site.

Transmission: Anything that moves soil including plants with soil, cultivation, containers, vehicles, or people, can spread soil-borne nematodes. Often awl nematodes are an indicator of excess soil moisture. In some cases, improving drainage or reducing irrigation may reduce or eliminate problems with this nematode. Using soil dredged from ditches, ponds, or other water sources to top-dress agricultural fields or to make planting beds may be a source of contamination with awl nematodes. When awl nematodes are present in high numbers, these practices should be avoided. Movement of infested nursery stock can move this nematode long distances. There are no records of it being seed borne.

Damage Potential: As ectoparasites, the damage they cause is from feeding on the roots, especially the root tips. Severe stunting, accompanied by depleted root systems, was observed in field infestations of *D. heterocephalus* in celery and corn in Florida and celery yield was reduced by 50% in one field. Water chestnuts growing in hydroponic beds were stunted and feeding from this nematode caused stunting of tomato, bean, and pepper (Perry, 1953). Others have also reported damage on a range of field crops and ornamentals in moist sandy soils (Christie, 1952; Tarjan et al., 1952; Perry, 1953; Paracer et al., 1967; Crow and Brammer, 2003). McGovern et al. (2002) describe damaging populations of this nematode in residential, ornamental landscapes in Florida.

Several different biotypes of *D. heterocephalus* may be present in different geographical areas (e.g., in Florida vs. Massachusetts). Populations and the biotypes have been separated by their pathogenicity to celery (Paracer et al., 1968).

Worldwide Distribution: Italy, South Africa, United States (*Florida, Massachusetts, Michigan, Ohio, South Carolina*) and Zimbabwe (Nemaplex, 2019).

Official Control: This nematode is on the USDA-PCIT's harmful organism list for Honduras, Taiwan, and Thailand (USDA, 2021).

California Distribution: None

California Interceptions: This nematode was first intercepted in California in quarantine shipments of aquatic plants from Ohio in 1966. Since then it has been detected occasionally in soils associated with ornamental plants from Florida including *Brassaia actinophylla*, *Chamaedorea elegans* and *Ficus benjamina* (Chitambar, 2007: CDFA PDR database, accessed 5/14/2021).

The risk *Dolichodorus heterocephalus* would pose to California is evaluated below.

Consequences of Introduction:

- 1) Climate/Host Interaction:** This nematode is established in tropical and temperate areas. It can likely establish wherever its hosts are grown but would reach higher populations in wetter soils.

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 establish 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 dozens of plants in several families.

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:** This nematode requires movement of host plants or infested soil or field water to spread. Spread through the soil by swimming would be very slow.

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.
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- 4) Economic Impact:** This nematode causes significant damage to multiple crops and can move with irrigation water and prefers wet areas. Movement of soil from ditches or riverbanks onto fields should be avoided

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

Economic Impact: A, D, 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.**

- 5) Environmental Impact:** This nematode has a host list that includes plants that can be naturalized including various grasses. If introduced, it could easily become established outside of crop areas.

Evaluate the environmental impact of the pest to California using the criteria below

Environmental Impact: A

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 *Dolichodorus heterocephalus*: 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 have been some detections on incoming nursery stock but there have been no detections in California soils.

Evaluation is 'Not established'.

Score: 0

-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 = 12

Uncertainty:

None

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Dolichodorus heterocephalus* is A.

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Responsible Party:

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***Comment Period: 08/10/2021 through 09/24/2021**

***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.
- ❖ 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.
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- ❖ 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: A
