CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Aphelenchoides oryzae Yokoo, 1948
Rice leaf nematode

Current Pest Rating: Q

Proposed Pest Rating: B

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

Comment Period: 02/19/2026 through 04/05/2026

Initiating Event:

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

History & Status:

Background: J. R. Christie, in 1942, published a description of a strawberry population of foliar nematodes from North Carolina and named them *Aphelenchoides besseyi*. In 1948, T. Yokoo described a foliar rice nematode found in Kyushu and Hokkaido, Japan, and named it *A. oryzae*. They both have a stellate tail terminus and overlap in many morphological characters. This led M. W. Allen in 1952 to consider *A. oryzae* a junior synonym of *A. besseyi*. This resulted in *A. besseyi* becoming well-known as a foliar nematode that primarily parasitizes rice, but it is occasionally found on strawberries and other plants, including ornamentals. It has been detected in multiple states and many countries, and is a quarantine pest in countries where it is not established, primarily over concerns for rice.

This classification has recently been challenged by the work of Subbotin et al. (2021). Using an integrated approach and supported by molecular and phylogenetic analysis, they have shown *A. besseyi* sensu lato to be a species complex with several cryptic species that are not easily separated by morphology. A species delimitation among *A. besseyi sensu lato* populations is very important for phytosanitary purposes and for the selection of crop cultivars resistant to these nematodes. Subbotin et al. (2021) have separated populations as species and called for the reinstatement of *A. oryzae* as a valid species name for the nematode that causes white tip of rice, separated from *A. besseyi sensu stricto,* which infects strawberries only. Their work also provides a means to classify other foliar

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nematode populations damaging ornamental and agronomic crops, including cotton and soybean, as new species, as *A. pseudobesseyi,* and *A. pseudogoodeyi*.

A survey of California by CDFA for the presence of rice leaf nematodes was initiated in 1997. Paddy rice seed was sampled at commercial grain dryers in 13 rice-producing counties. It was intended that this survey would provide a sound basis for certifying California paddy rice "free from" foliar nematodes and thereby eliminating the requirement by the government of Turkey for methyl bromide treatments of export shipments. Sampling was designed to detect the presence of the nematode at the county or rice-growing regional level, and 170 samples were collected.

During the 1997 survey, one confirmed and three suspected findings of rice foliar nematode resulted from samples collected in Butte and Sutter counties. These areas tested negative when examined a second time. The government of Turkey required that batches of rice intended for shipment to that country should be sampled and certified to be free of the nematode. Between 1998 and 2001, the nematode was found in three export loads. Subsequent detections were from paddy rice seed shipments intended for export have now been made in multiple years in Butte, Sutter, and Yolo counties; the most recent was in 2007. Rejection of shipments has resulted in millions of dollars in losses.

The origin of the rice foliar nematode in California is not known. If it was introduced many years ago, then its low rate of detection and only sporadic occurrence in cultivated fields is an indication of its inability to reach damaging levels within the state. Chitambar (2008) reasoned that certain biological, cultural, and ecological factors, such as insufficient moisture, planting by airplane directly into flooded fields, the presence of resistant varieties, and high ambient temperatures, may be working against the nematode's ability to successfully establish and spread within California (Nemaplex, 2010; Chitambar, 1999; Chitambar, 2008; Chitambar et al., 2018).

Hosts: Because *A. oryzae* has only recently been described separately from *A. besseyi*, this host list may be incomplete: *Dioscorea cayenensis* (Guinea yam), *Oryza sativa* (rice), *Polianthes tuberosa* (tuberose), and *Setaria italica* (foxtail millet) (Subbotin et al., 2021).

Symptoms: During the early growth of rice, the most conspicuous symptom is the emergence of the chlorotic tips of new leaves from the leaf sheath. These tips later dry and curl, often becoming brown and tattered. The young leaves of infected tillers can be speckled with a white splash pattern or have distinct chlorotic areas. Leaf margins may be distorted and wrinkled. Characteristic symptoms may not appear until after tillering, including the yellowing of leaf tips with white areas in the upper portions of the leaf blade. Plants are stunted, with twisting or distortion of the flag leaf and distortion and discoloration of panicles and florets. Plants have small panicles. Affected panicles show high sterility, distorted glumes, and small and distorted kernels. In extreme cases, the affected grains become chaffy. (Groth and Hollier, 2010; CABI, 2025).

Transmission: The principal dispersal method for *A. oryzae* is with seed. This nematode moves long distances with infected seed, and shorter distances within a field by splashing or with people handling the plants. It can be transmitted in flood water in lowland rice (Tamura and Kegasawa, 1958). The

nematodes overwinter in buds, growing points, and dead leaves on the ground. In the spring, the nematodes become active and can climb up the stems by swimming in films of water. Once at the growing points, they attack leaves by entering through the stomata and moving between cells. The eggs, juveniles, and adults all develop in the leaves. The nematodes aggregate in the glume axis of maturing grain and slowly desiccate as kernel moisture is lost. They become anabiotic and can survive for up to 3 years after harvest (Cralley, 1949; Cralley and French, 1952). *Aphelenchoides oryzae* is amphimictic (Huang et al., 1979), and males are usually abundant; however, reproduction can also be parthenogenetic.

Damage Potential: Infection and damage are generally greater in lowland and deep water systems than in upland environments. The viability of *A. oryzae-infected* seed is lower and germination is delayed (Tamura and Kegasawa, 1959). Diseased plants have reduced vigor and height. Infected panicles are shorter, with fewer spikelets and a smaller proportion of filled grain. In severe infections, the shortened flagleaf is twisted and can prevent the complete extrusion of the panicle from the boot (Todd and Atkins, 1958). The grain is small and distorted and the kernel may be discolored and cracked (Uebayashi et al., 1976). Infected plants mature late and have sterile panicles borne on tillers produced from high nodes. Yield loss from the white tip nematode varies widely, with some sources citing average losses of 10%–30%, while severe cases on susceptible varieties have reported losses as high as 71%. Factors like the rice cultivar, environmental conditions, and the specific management practices in place all influence the extent of yield reduction, which can range from minimal damage to over 70% loss (CABI, 2025).

Worldwide Distribution: The known distribution of *A. besseyi* sensu lato on rice includes; Australia, Brazil, China, Comoro Islands, Costa Rica, Cuba, El Salvador, Hungary, India, Indonesia, Iran, Italy, Japan, Madagascar, Mexico, Pakistan, Philippines, Spain, Sri Lanka, Taiwan, Thailand, Turkey, former USSR, Viet Nam, and in most countries of central and West Africa, United States (California and many southern U.S. states) (Nemaplex, 2010; Subbotin et al., 2021; CABI, 2025).

Official Control*: Aphelenchoides oryzae* is on the USDA PCIT's harmful organisms list for French Polynesia, Hong Kong, and New Caledonia (USDA-PCIT, 2025). *Aphelenchoides besseyi* s. l. is on the EPPO's A1 list for Azerbaijan, Bahrain, Comunidad Andina, Chile, Inter-African Phytosanitary Council, Jordan, Russia, Ukraine, Uruguay; on the A2 list for Comite Regional de Sanidad Vegetal del Cono Sur, Egypt, European plant protection organization, and Turkey; It is a quarantine pest for Israel, Mexico, Morocco, and Tunisia (EPPO, 2025).

It is listed on the USDA's harmful organism list for Albania, Algeria, Argentina, Cambodia, Chile, Colombia, Egypt, Eurasian Customs Union, European Union, French Polynesia, Georgia, Guatemala, Holy See (Vatican City State), Honduras, Indonesia, Israel, Jordan, Mexico, Monaco, Morocco, Namibia, New Caledonia, Nicaragua, Oman, Panama, Paraguay, Peru, Qatar, San Marino, Serbia, South Africa, Thailand, Timor-Leste, Tunisia, Turkey, United Arab Emirates, United Kingdom, Uruguay, and Viet Nam (USDA PCIT, 2025).

California Distribution: Butte, Sutter, Yolo counties (CDFA PDR database, 2025).

California Interceptions: none

The risk that *Aphelenchoides oryzae* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** It could establish wherever its hosts are grown.

   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 includes plants in multiple families.

   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:** This nematode moves with infected seed and plants and with floodwater.

   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.

4) **Economic Impact:** This nematode can lower yield, and it is an important quarantine pest for some trading partners.

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

   Economic Impact: A, 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: **3**
- Low (1) causes 0 or 1 of these impacts.
- Medium (2) causes 2 of these impacts.
High (3) causes 3 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 *Aphelenchoides oryzae:* Medium

Add up the total score and include it here. **11**
-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.

During a large survey of 13 rice-producing counties, only a small number of detections were made. The most recent detection was 18 years go.

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* ***= 10***

Uncertainty:

Aphelenchoides spp. are important quarantine pests on several agronomic crops, including strawberries and rice, so proper identification is key to phytosanitary enforcement. Due to recent taxonomic changes, the host range and distribution of *A. oryzae* vs. *A. besseyi* is not fully determined.

Conclusion and Rating Justification:

Based on the evidence provided above, the proposed rating for ***Aphelenchoides oryzae*** **is B.**

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Responsible Party:

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***Comment Period: 02/19/2026 through 04/05/2026**

***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: B
