CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

# California Pest Rating Profile for

# *Berkeleyomyces basicola* (Berk. Broome) Nel et al. 2018

# Black root rot

## Pest Rating: C

Kingdom: Fungi, Phylum: Ascomycota,
Subphylum: Pezizomycotina, Class: Sordariomycetes,
Subclass: Hypocreomycetidae, Order: Microascales,
Family: Ceratocystidaceae

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**Comment Period: 04/01/2025 through 05/16/2025**

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## Initiating Event:

This pathogen has not been through the pest rating process. It is listed as a pest of concern for seed export programs. The risk to California from *Berkeleyomyces basicola* is described herein and a permanent rating is proposed.

## History & Status:

**Background:**

*Berkeleyomyces basicola* is a soilborne fungus belonging to the Microascales (Ascomycota) and is a major contributor to root rot in a variety of ornamental and agricultural crops. The species is known in at least 30 countries across all continents except Antarctica, although its origin is unclear. The fungus is a hemibiotroph, meaning that during the biotrophic phase of its life cycle, it invades the living root cells of its host, and during the necrotrophic phase it causes cell death. Necrosis induced during this phase leads to characteristic black discoloration of the plant roots (Nehl et al., 2004). Stunting of plants due to root necrosis can lead to significant yield losses. Because the fungus grows on plant parts below ground, it can be undetectable and spread quickly through the movement of infected plants and soil during the biotrophic phase of infection. This necrosis also results in brittleness of the root tissues and insufficient water and nutrient uptake by the plants, leading to stunting and reduced crop yield (Nehl

et al., 2000). When infection is very severe, the vessels of the roots can become completely blocked by penetrating hyphae, ultimately resulting in plant death (Noshad et al., 2006). In most areas, *B. basicola* is not a regulated pathogen.

Two distinct asexual spores that this pathogen produces led to its original descriptions as both *Thielaviopsis basicola* and *Chalara elegans* (Domsch et al., 1980; Shew and Meyer, 1992). While *C. elegans* was based on the smaller, hyaline conidia formed in phialides (phialoconidia or endoconidia), which are characteristic of members of the Microascales, *T. basicola* was based on the thick-walled, pigmented propagules known as chlamydospores (aleuriospores) (Nag Raj and Kendrick, 1976). As a result, *C. elegans* is classified as a synanomorph of *T. basicola*.

This pathogen was moved to the genus *Berkeleyomyces* in 2018. Fungi are no longer referred to by different names since the "one fungus, one name" principle was established by Hawksworth et al. (2011). The new genus *Berkeleyomyces* was created to accommodate the pathogen since, according to assessments of multi-locus sequence data, the species did not belong to either the genus *Thielaviopsis* or *Chalara* (Nel et al., 2018). The adjective *basicola* was kept, and the name *B. basicola* was created because nomenclatural rules state that the oldest name comes first. *Berkeleyomyces rouxiae*, a sister species, was also reported at this time with morphological traits and clinical symptoms that were identical to those of *B. basicola* (Nel et al., 2018a). Therefore, it is likely that the host range and distribution of black root rot is still inadequately understood and a comprehensive assessment of the global distribution of *B. basicola* and *B. rouxiae* remains to be resolved.

*Hosts*: This fungus has a wide host range with 120 species in 15 families known to be susceptible. It is most often associated with plants in the Fabaceae, Malvaceae, Solanaceae, and Cucurbitaceae (Farr and Rossman, 2025). Important crops include cotton (*Gossypium*), tobacco (*Nicotiana tabacum*), legumes, and many ornamental and landscape plants.

*Symptoms*: Plants are rarely killed by black root rot. If root infection is severe, plants may exhibit chlorosis and wilting, but the most common symptom is stunting. The first symptoms are brown to black discolored lesions on the fine roots. Disease quickly increases until much of the root system is blackened. The cortical tissue can collapse, and the epidermis and cortical tissue may slough off. Peeling back the black discolored tissue should reveal a white, healthy vascular cylinder as the vascular system is not invaded. For some hosts, disease symptoms may extend to the stem above the soil surface. Root systems may have few lateral roots or stubby roots (CABI, 2025). Over the season, roots can become badly rotted. Stems below ground may enlarge and develop black, rough, longitudinal cracks. Dark brown to black, thick-walled, barrel-shaped chlamydospores form in infected tissues and may be visible under magnification (Koike et al., 2020).

*Transmission:* Seed is not a primary method of introduction or dissemination of this pathogen, but it can be carried with soil and on the outside of seeds. *Berkeleyomyces basicola* may be easily spread with the movement of diseased plant material, especially as transplants or container-grown plants. The fungus can also be spread in water. Chlamydospores can be transmitted by the frass excreted by adults and larvae of shore flies (*Scatella stagnalis* Fallen.) who acquire the fungus while feeding on naturally

infected plants (Stanghellini et al., 1999). Harris (1995) showed that the fungus gnat, *Bradysia coprophila*, could be a potential vector for the spread of black root rot.

*Damage Potential:* Plants are rarely killed from black root rot. Soil temperatures are critical for the development of black root rot. Temperatures that are unfavorable for the growth of the host (too high or too low) result in maximum disease severity (CABI, 2025). In cotton in the San Joaquin Valley, black root rot was detected in 79% of the fields sampled. Pathogen populations were positively correlated with the number of years the fields had been planted to cotton, as was disease severity (Holtz and Weinhold, 1994). On lettuce grown in the Salinas Valley, disease was limited to patches along edges of iceberg lettuce fields; disease incidence in these discrete patches reached as high as 35% (Koike, 2008). For a variety of ornamental and floriculture crops in California, plants are stunted and grow poorly (Koike et al, 2020).

**Worldwide Distribution**: Africa: *Democratic Republic of the Congo, Egypt, Morocco, South Africa, Uganda, Zimbabwe*. America: *Brazil, Canada, Colombia, Costa Rica, Cuba, Haiti, Jamaica, Peru, Puerto Rico, Trinidad and Tobago, United States of America* (Alabama, Arizona, Arkansas, California, Colorado, Connecticut, Florida, Idaho, Illinois, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Montana, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Tennessee, Texas, Utah, Virginia, Washington, Wisconsin). Asia: *China, India, Indonesia, Iran, Iraq, Israel, Japan, Lebanon, Pakistan, Philippines, Singapore, Taiwan, Tajikistan, Turkmenistan, Uzbekistan*. Europe: *Armenia, Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Moldova, Netherlands, North Macedonia, Norway, Poland, Romania, Russia, Serbia, Spain, Sweden, Switzerland, Türkiye, Ukraine, United Kingdom*. Oceania: *Australia, New Zealand* (EPPO, 2025).

**Official Control:** *Berkeleyomyces basicola/Chalara elegans/Thielaviopsis basicola* is on the USDA PCIT's harmful organisms list for Argentina, Canada, Cuba, Dominican Republic, Egypt, Honduras, Nicaragua, Panama, Paraguay, Thailand, Syrian Arab Republic, and the Republic of Moldova (USDA-PCIT, 2025).

**California Distribution:** Widespread in cultivated and uncultivated soils, in coastal regions, the Sacramento-San Joaquin Valley, and in southern California (French, 1989; Yarwood, 1974).

**California Interceptions:** none

The risk that *Berkeleyomyces basicola* would pose to California is evaluated below.

## Consequences of Introduction:

1) **Climate/Host Interaction:** This pathogen has been detected throughout California in agricultural and uncultivated soils.

   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 is very large and includes many 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 fungus has multiple types of asexual spores. It spreads easily with the movement of soil. It does not have a significant airborne phase. It is capable of prolonged survival in the absence of a host with its resting chlamydospores.

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 pathogen decreases root growth and plant health. It can be vectored by shore flies.

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

**Economic Impact: A, E**

**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:** Yarwood (1974) detected *B. basicola* in 197 of 402 soil samples collected in California, 46% of the positive samples were from soils that had not been used for agriculture and 54%

of the positive samples were from agricultural fields, indicating that it is common in native and agricultural ecosystems where it is pathogenic in a variety of native and cultivated hosts. It is problematic in ornamental plantings (CDFA PDR database, 2025).

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

**Environmental Impact: A, 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: 3**
- 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 *Berkeleyomyces basicola:* high

Add up the total score and include it here. 13
-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 'High'***.

**Score: -3**
-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:

none

## Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for ***Berkeleyomyces basicola*** **is C.**

## References:

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**Responsible Party:**

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***Comment Period: 04/01/2025 through 05/16/2025**

***NOTE:**

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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.

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## 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.

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## Pest Rating: C

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