

California Pest Rating Proposal for
***Fusarium phalaenopsidis* Tsao et al., 2024**
***Phalaenopsis* leaf yellowing**

Current Pest Rating: Q

Proposed Pest Rating: B

Domain: Eukaryota, Kingdom: Fungi,
Phylum: Ascomycota, Subphylum: Pezizomycotina,
Class: Sordariomycetes, Subclass: Hypocreomycetidae,
Order: Hypocreales, Family: Nectriaceae

Comment Period: 02/25/2026 through 04/11/2026

Initiating Event:

Phalaenopsis orchids with disease symptoms were shipped to Monterey County from Taiwan in 1998. A *Fusarium* sp. was detected by CDFA plant pathologist Timothy Tidwell from the diseased leaves. The pathogenicity of the isolate could not be confirmed. In the subsequent decades, multiple detections of *Fusarium solani* were made from *Phalaenopsis* orchids that originated in Taiwan and during regulatory nursery inspections in multiple counties. The first confirmation of *F. solani* f. sp. *phalaenopsis* was made in 2020 by CDFA plant pathologist Albre Brown from samples submitted by San Luis Obispo County agricultural inspectors. She used PCR sequencing of ITS and TEF1- α genes to confirm her diagnosis to the forma specialis level and assigned a Q-rating. Some plants were also infected with *Dickeya fangzhongdai*, a bacterial pathogen of orchids. The risk to California from *Fusarium solani* f. sp. *phalaenopsis*, now called *F. phalaenopsidis*, is described herein, and a permanent rating is proposed.

History & Status:

Background:

The *Phalaenopsis* genus is one of the most horticulturally significant groups within the Orchidaceae family, being widely regarded as the top ornamental orchid globally. *Phalaenopsis* are sold both as cut flowers and potted plants, making them a major commodity in local, domestic, and international trade. Currently, the genus includes 210 species, comprising 104 accepted names, 96 synonyms, and 10 unverified classifications (Han et al., 2025). Additionally, the Royal Horticultural Society International Orchid Register Database records over 39,000 artificially created *Phalaenopsis* hybrids

(<https://www.rhs.org.uk>). Advancements in cultivation techniques have significantly driven the growth of the orchid industry and its global trade.

Fusarium solani sensu lato is a soil-borne, highly variable fungal species that contains many saprophytic and pathogenic forms that are morphologically identical. It predominantly uses asexual spores called conidia for reproduction. *Fusarium solani* is generally regarded as a 'species complex', a collection of clonal lines that differ in their host range and aggressiveness (Schroers et al., 2016). The various forms cannot be distinguished without using molecular tools and/or pathogenicity tests. *Fusarium solani* is often known best as a vascular wilt pathogen, colonizing the xylem of its hosts, turning vascular tissue brown, causing progressive yellowing as it grows internally into the plant, eventually causing collapse and death. Some strains cause leaf yellowing, crown rot, root rot, or bulb rot instead of vascular wilts (Agrios, 2005).

The *Fusarium solani* species complex is known to contain species and strains responsible for leaf yellowing and root and collar rot affecting multiple orchid genera, including *Phalaenopsis* and *Cymbidium* (Benyon et al., 1996; Burnett, 1986). A novel forma specialis, '*phalaenopsis*', was described in Taiwan, where it is the predominant pathogen of greenhouse-grown *Phalaenopsis* orchids and is highly host-specific to *Phalaenopsis*. Phylogenetic analysis of rDNA-ITS showed that the isolates of *F. solani* from *Phalaenopsis* form a monophyletic group distinct from other *F. solani* f. sp. (Chung et al., 2011).

In 2024, Tsao et al. used pathogenicity assays, phylogenetic analyses, and distinctive morphological characteristics to study isolates of *F. solani* f. sp. *phalaenopsis*. They compared the proteomes of multiple isolates and identified unique genes, developing specific primers targeting this pathogen. The results of their whole-genome sequencing, de novo assembly, and gene annotation provided support for elevating *F. solani* f. sp. *phalaenopsis* to *Fusarium phalaenopsidis* sp. nov. The formal description of *F. phalaenopsidis* resolves longstanding diagnostic ambiguity within the *F. solani* species complex, enabling more accurate regulatory tracking.

Hosts: *Cymbidium* sp. and *Phalaenopsis* sp. (Chung et al., 2011).

Symptoms: Early symptoms of infection on *Phalaenopsis* are seen on the lower leaves, which turn yellow. Over time, the leaves will abscise. Lesions form on leaves and stems and can extend to the roots, causing root and collar rot. Under high humidity, white fungal mycelia and perithecia are sometimes observed on the diseased leaf sheaths. Infected plants can die (Su et al., 2010; Laurence et al., 2016). On *Cymbidiums*, symptoms range from active growing roots with a few necrotic lesions to roots no longer growing with a brown discoloration of the root tip and extensive lesions, to a brown-black rot extending up into the pseudobulbs and leaves from the root system (Benyon et al., 1996).

Transmission: Sexual and asexual morphs have been observed on leaves producing perithecia, ascospores, sporodochia, and conidophores. Although chlamydospores are commonly produced by *Fusarium solani* sensu lato, they have not been observed for *F. phalaenopsidis*. Infected plants, stems, leaves, plant debris, soil, air currents, rainwater splash, and contaminated equipment can all spread

spores (Agrios, 2005). Long-distance spread is with infected nursery stock (CDFA PDR database, 2026; CABI, 2026).

Damage Potential: This pathogen is reported to cause leaf yellowing of *Phalaenopsis* in Taiwan (Chung et al., 2011) and root rot of *Cymbidium* in Australia (Benyon et al., 1996). The disease often occurs with incidence rates ranging between 30 and 60% in susceptible orchid varieties (Su et al., 2010). Affected orchids exhibit necrotic rot at the leaf collar, resulting in leaf chlorosis, leaf abscission, and ultimately plant death. Even minor cosmetic defects can cause serious loss in plants grown as ornamentals.

Worldwide Distribution: Australia, China, Japan, Singapore, Taiwan, Thailand, United States (California, Hawaii) (Swett and Uchida, 2015; Tsao et al., 2024).

Official Control: Neither *Fusarium solani* f. sp. *phalaenopsis* nor *F. phalaenopsisidis* is listed as a harmful organism for any country on the USDA-PCIT or as a pest by the European Plant Protection Organization. It is not a US-regulated pest.

California Distribution: Nursery detections have been made in Fresno, San Diego, and San Luis Obispo counties (CDFA PDR database, 2026).

California Interceptions: Del Norte and Monterey Counties (CDFA PDR database, 2026).

The risk that *Fusarium phalaenopsisidis* would pose to California is evaluated below.

Consequences of Introduction:

- 1) Climate/Host Interaction:** *Cymbidium* orchids are grown outside in frost-free parts of California. *Phalaenopsis* are restricted to greenhouses and indoor cultivation.

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 is limited to two orchid genera.

Evaluate the host range of the pest.

Score: 1

- **Low (1) has a very limited host range.**
 - Medium (2) has a moderate host range.
 - High (3) has a wide host range.
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- 3) Pest Reproductive Potential:** The disease is spread through multiple types of spores that can be airborne.

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 disease is a significant cause of crop loss, both by killing plants and by causing leaf yellowing, which is unacceptable for ornamentals.

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

Economic Impact: A, B

- 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:** This is a significant problem for ornamental plants.

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.**
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- High (3) causes two or more of the above to occur.

Consequences of Introduction to California for *Fusarium phalaenopsis*: 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.

Nursery detections do not count towards establishment.

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 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:

Relatively little is known about the other *Fusarium* sp. that attack orchids. In Hawaii, Swett and Uchida (2015) found five *Fusarium* species associated with diseased plants and two previously undescribed species. Identification of *Fusarium* pathogens requires an expert diagnostician.

Conclusion and Rating Justification:

Based on the evidence provided above, the proposed rating for *Fusarium phalaenopsis* is **B**.

References:

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Responsible Party:

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***Comment Period: 02/25/2026 through 04/11/2026**

***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](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.
 - ❖ 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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Proposed Pest Rating: B
