CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Profile for

Pustula helianthicola Rost & Thines, 2012

white blister rust of sunflower

Pest Rating: B

Kingdom: Chromista, Phylum: Oomycota,
Class: Oomycetes, Order: Albuginales,
Family: Albuginaceae

Comment Period: 09/22/2025 through 11/06/2025

Initiating Event:

This pathogen has not been through the pest rating process. It is a pest of concern for export seeds. The risk to California from *Pustula helianthicola* is described herein, and a permanent rating is proposed.

History & Status:

Background: Sunflowers (*Helianthus annuus*) are native to North America. Sunflower oil is often preferred by the food processing industry because it is stable at high cooking temperatures. Sunflower oil supplies more vitamin E than other vegetable oil, and varieties with high levels of oleic oil content have low levels of saturated fat. The small-seeded oil types are also important for birdseed. The non-oil, large-seeded white-stripe sunflower types are favored by the snack food industry (Long et al., 2019).

California accounts for less than 2% of the total US sunflower acreage, but California is the #1 sunflower seed-producing state in the nation, with approximately 95% of the market share, supplying nearly all the domestic sunflower seed planted in the Midwest. In most years, approximately 25% of California's hybrid sunflower seeds are exported to international markets, although in some years, this figure can reach as high as 60%. Russia and Ukraine are California's largest export markets, followed by China and the European Union (Long et al., 2019). California produced 35,000 acres of sunflowers in 2023, valued at $9.5 million (www.cdfa.ca.gov/Statistics/PDFs/2022-2023_california_agricultural_statistics_review.pdf).

The Sacramento Valley is world-renowned as a premier location for sunflower seed production because of the Mediterranean climate with hot, dry summers and excellent field isolation capabilities for hybrid seed purity (Long et al., 2019). This ensures relatively disease-free seed to meet the phytosanitary restrictions required for export, as imposed by importing countries and for other states (Gulya et al., 2012). Production is limited in the San Joaquin Valley, as the higher heat can reduce pollination (Lazicki and Geisseler, 2016).

The oomycetes are a distinct phylogenetic lineage of fungus-like eukaryotic microorganisms within the Stramenopila. There are many important pathogens in this class, including water molds, white rusts, and downy mildews. They are filamentous and heterotrophic and can reproduce both sexually and asexually. Sexual reproduction of an oospore is the result of contact between hyphae of male antheridia and female oogonia; these spores can overwinter and are known as resting spores. Asexual reproduction involves the formation of chlamydospores and sporangia, producing motile zoospores. The white rusts (Albuginaceae) cause diseases that affect only or primarily aboveground plant parts, particularly the leaves, young stems, and fruits (Agrios, 2005).

White blister rust is an obligate biotrophic pathogen that causes leaf lesions and also invades the flowering parts of its host (Lava and Spring, 2012). North American reports on commercial sunflower go back to the mid-1990s from Kansas and Colorado (Gulya et al., 2002), as *Albugo tragopogonis*. Through dispersal of contaminated seeds, the pathogen has spread to many parts of the world (Viljoen et al., 1999; Thines et al., 2006a).

In the past, it was thought that the pathogen causing white blister rust on sunflower was *Pustula tragopogonis* (syn. *Albugo tragopogonis*). The identification of distinctive phenotypic and molecular genetic characters led to the description of the new species *P. helianthicola* (Rost and Thines, 2012) as the causal agent of sunflower white blister rust. The narrow species concept with high host specificity is supported by a lack of cross-infection of sunflower with sporangia of *Albugo* or *Pustula* from wild and weed hosts (Thines et al., 2006b).

Hosts: Sunflowers: *Helianthus annuus, Helianthus* sp. (Farr and Rossman, 2025).

Symptoms: Initially, pale, yellowish-green spots form on the upper leaf surface. These spots develop into pustules that are convex, chlorotic on the upper side of the leaf, and concave and dull white on the underside of the leaf. Pustules on cultivated sunflower were generally limited to three to six leaves in the middle of the plant and affected 10 to 40% of the leaf area (Gulya et al., 2002). The pustules release a powdery white sporangial spore mass. Blackish oospores can be visible through the epidermis of the abaxial surface of bracts. Infected stems may also show gray lesions, and in severe cases, plants can lodge, be stunted, or wilt (Lava et al., 2013).

Transmission: White blister rust produces sporangia and zoospores, plus oospores. Oospores are assumed to be the source of primary infection for biotrophic oomycetes living on seasonal plants (Vanterpool, 1953; Lava et al., 2013). Viljoen et al. (1999) made the first report of white blister rust being seed-borne in sunflower. They showed that oospores were produced in the pericarps and testae of seeds. However, no oospores or hyphae were observed in the embryos. Although the incidence of

seed infection was low, they were concerned that the long-range dissemination of the fungus by infected seed into regions or countries where the disease had not been previously reported was possible (Lava et al., 2013).

Damage Potential: Extensive colonization of sunflower heads by *P. helianthicola* was observed in field trials and breeding nurseries in South Africa (Viljoen et al., 1999). The disease has emerged as a serious threat to the commercial production of sunflowers and may appear suddenly as an outbreak (Lava et al., 2015). In the US Midwest, Gulya et al. (1999) found that foliar white rust lesions generally have little economic impact on sunflowers. The presence of stem lesions is significant because stem lesions may lead to lodging, which has been reported by van Wyk et al. (1995). Seed for export may be rejected at any level of infection.

Worldwide Distribution: Argentina, Australia, Belgium, Bolivia, Brazil, Germany, Kenya, Mozambique, Peru, South Africa, United States (Kansas, Colorado), and Zimbabwe (Farr and Rossman, 2025).

Official Control*:* This pathogen is on the USDA PCIT's harmful organisms list for Brazil and China (USDA-PCIT, 2025). It is an A1 pest in the EPPO database for Brazil, and a quarantine pest in China (EPPO, 2025). China and Israel require a growing season inspection for sunflower mother plants with a negative result for white blister rust.

California Distribution: none

California Interceptions: none

The risk that *Pustula helianthicola* would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction**: Incidences of sunflower white blister rust have mainly been reported from areas with hot and dry summers, such as South Africa (Van Wyk et al., 1995), Argentina (Delhey and Kiehr-Delhey, 1985), and Australia (Allen and Brown, 1980). The disease is likely to develop in the main growing areas in the Sacramento Valley.

   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 sunflower

   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.

3) **Pest Reproductive Potential:** This pathogen produces multiple types of spores that can be moved by wind or with contaminated seeds.

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:** Losses can be direct from the depletion of photosynthetic leaf area and early stem lodging that prevents harvest. This is also a quarantine pest for seed in some jurisdictions. Fungicides are applied to the seed to prevent seedling infection (Lava et al., 2015).

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

Economic Impact: A, B, C
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 or more of these impacts.

5) **Environmental Impact:** *Helianthus annuus* is an annual herb that is native to California. This pathogen does not kill its hosts but could reduce seed production. There are other species of native *Helianthus* in California, and their susceptibility to white blister rust is unknown.

Evaluate the environmental impact of the pest on 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 *Pustula helianthicola:* 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.

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* ***= 11***

Uncertainty:

The susceptibility of California varieties of commercial sunflowers under field conditions and the susceptibility of native species other than *H. annuus* is unknown.

Conclusion and Rating Justification:

Based on the evidence provided above, the proposed rating for ***Pustula helianthicola*** **is B.**

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*Comment Period: 09/22/2025 through 11/06/2025

*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.

Pest Rating: B
