

California Pest Rating Proposal for

Pucciniastrum actinidiae Hirats. f. 1952

Rust of kiwifruit

Current Pest Rating: None

Proposed Pest Rating: A

Kingdom: Fungi, Phylum: Basidiomycota,
Class: Pucciniomycotina, Subclass: Pucciniomycetes,
Order: Pucciniales, Family: Pucciniastraceae

Comment Period: 10/27/2021 through 12/11/2021

Initiating Event:

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

History & Status:

Background: USDA APHIS maintains a Regulated Plant Pest List that helps evaluate the threat to the United States posed by phytopathogens including fungi. Once the fungi are known, activities can be directed at preventing their entry into the country. In 2006, Rossman et al. published an evaluation of the potential threat of fungi on the APHIS Regulated Plant Pest List for the federal interagency Invasive Terrestrial Arthropods and Pathogens (ITAP) Subcommittee on Plant Pathogens, using the data provided in Cline and Farr (2006). Out of 52 species listed, almost 60% of the fungi on this list are rusts, and Asia serves as the primary source for many of them, including this one.

Pucciniastrum actinidiae on kiwifruit from Asia was listed as a “threat to horticultural or crop plants of minor economic importance”. This is the only rust fungus reported on species of *Actinidia*. It was described in Japan by Hiratsuka in 1936 based on the uredinial stage. The same author later added a description of the telial stage (Hiratsuka, 1952). This pathogen could enter the United States on nursery stock, particularly on plants for planting.

Kiwifruit (*Actinidia deliciosa* and *A. chinensis*) are perennial, deciduous, woody vines native to southern China. Commercial production of kiwifruit began in California in the late 1960s, and today nearly all the

commercial acreage in the United States is here. California is also the nation's sole exporter of kiwifruit produce. In 2019/20, kiwifruit was reported in commercial production on 4400 acres in California, yielding 51,500 tons of fruit valued at \$86M. Production increased 36% in 2019/20 (CDFA, 2020).

California primarily grows green-fleshed Hayward, the dominant cultivar of *A. deliciosa*. Production is mainly in the northern Sacramento Valley in Butte, Sutter, and Yuba counties, with additional production in the southern San Joaquin Valley in Fresno, Kern, Kings, Madera, and Tulare counties. Kiwifruit is dioecious with separate female and male plants. In order to produce marketable yield, the vines require winter chill, adequate summer irrigation, and protection from wind.

Rust fungi are obligate pathogens that can have up to five spore stages and may use multiple unrelated hosts to complete their lifecycle. Many species including *P. actinidiae* are autoecious, having only one host, and some spore stages are unknown. *Pucciniastrum actinidiae* has stage II (uredia-bearing uredospores (n+n)) and stage III (telia bearing teleospores (n+n), 2n), but lacks stage 0 (spermogonia-bearing spermatia and receptive hyphae (n)), stage I (aecium-bearing aeciospores (n+n)), and stage IV (promycelium bearing sporidia (basidiospores) (n)) (Hernandez, 2005). Urediniospores and teliospores are produced in the same sori. Urediniospores are called the "repeating stage" and are produced vegetatively and in repeating cycles that autoinfect and greatly increase the size of an epidemic. Teliospores are usually the overwintering stage and are produced as days become shorter in the fall.

Hosts: Species of *Actinidia* (Actinidiaceae).

Symptoms: *Pucciniastrum* rusts are not systemic pathogens. There is little specific information available about this species. Germinating teleospores initiate infections on new leaves in the spring. The pustules will be scattered or grouped on yellow or yellowish brown, discolored areas. Pustules are round, minute, 0.08-0.2 mm across. In severe cases, plants can be defoliated. Yellow uredinia and powdery urediniospores form on the bottom sides of leaves (Hernandez, 2005).

Transmission: The pathogen probably overwinters as teleospores in field debris, or as latent uredinia. Wet conditions favor disease development and huge numbers of spores are produced in pustules. The spores are windborne. Long distance spread is with infected planting stock.

Damage Potential: There is little published information about the damage caused by this species. Typically, rust fungi are among the most damaging and difficult to control fungal pathogens, with repeating spore stages leading to heavy infection of susceptible plant parts. Fruit infection is not mentioned in the literature for Kiwi.

Worldwide Distribution: China, Japan, Taiwan (Farr and Rossman, 2021)

Official Control: *Pucciniastrum actinidiae* is on USDA PCIT's harmful organism list for Colombia, Namibia, and South Africa (USDA, 2021) and is a regulated quarantine pest for United States (EPPO, 2021). All parts and propagules (except seeds and fruit), including cut flowers, greenery, and pollen of *Actinidia* spp. are prohibited from all counties. Plants for planting are not authorized pending a pest

risk analyses (NAPPRA), by a federal notice effective in 2013
(<https://www.regulations.gov/document/APHIS-2011-0072-0043>).

California Distribution: None

California Interceptions: None

The risk *Pucciniastrum actinidiae* would pose to California is evaluated below.

Consequences of Introduction:

- 1) Climate/Host Interaction:** As an obligate pathogen, it is likely this rust would survive anywhere its hosts are able to be 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 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 is limited to species of *Actinidia*.

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:** Rust fungi are among the most feared fungal pathogens for their ability to produce massive numbers of spores that are resistant to desiccation and ultraviolet light and can travel considerable distances with wind.

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:** Economic losses can occur directly from loss of yield and vines, and indirectly from quarantine regulations. To manage epidemics, orchards would likely need to rely heavily on fungicide use.
-

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

Economic Impact: A, B, C

- 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 pathogen has a limited host range. There are no native *Actinidia* spp. in California. All producers and home gardeners with kiwifruit would be significantly impacted by a detection of kiwi rust on their property, likely to receive and emergency action notice from USDA-APHIS requiring eradication.

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

Environmental Impact: D, 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 *Pucciniastrum actinidiae*: 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.

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:

There is very little information about the damage caused by this pathogen. Since it is a quarantine pest not known to occur outside of east Asia, and it would likely require substantial fungicide use to eradicate, quarantine measures to prevent its introduction and a pest rating of A are justified.

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for *Pucciniastrum actinidiae* is A.

References:

Cline, E. T. and Farr, D. F. 2006. Synopsis of fungi listed as regulated plant pests by the USDA Animal and Plant Health Inspection Service: Notes on nomenclature, disease, plant hosts, and geographic distribution. Online. Plant Health Progress doi:10.1094/PHP-2006-0505-01-DG.

EPPO Global Database. 2021. <https://gd.eppo.int/taxon/PUCIAC>. Accessed 9/13/21

Hernández, J.R. Systematic Mycology and Microbiology Laboratory, ARS, USDA. 28 September 2005. Invasive Fungi. *Pucciniastrum actinidiae* on Actinidia spp. Retrieved September 13, 2021, from /sbmlweb/fungi/index.cfm .

Hiratsuka, N. 1936. A Monograph of the Pucciniastreae. Mem. Tottori Agric. Coll. 4: 1-374.

Hiratsuka, N. 1952. Materials of a rust-flora of Eastern Asia. J. Jap. Bot. 27: 111-116.

Rossmann, A. Y., Britton, K., Luster, D., Palm, M., Royer, M. H., and Sherald, J. 2006. Evaluating the threat posed by fungi on the APHIS list of regulated plant pests. Online. Plant Health Progress doi:10.1094/PHP-2006-0505-01-PS.

USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PEXD) Harmful Organisms Database Report. *Pucciniastrum actinidiae*. Accessed 2/26/2021

Responsible Party:

Heather J. Scheck, Primary Plant Pathologist/Nematologist, CDFA/PHPPS ECOPERS, 1220 N St Rm 221, Sacramento, CA 95814 Phone: (916) 654-1017, permits[@]cdfa.ca.gov.

***Comment Period: 10/27/2021 through 12/11/2021**

***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.

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: A
