

**California Pest Rating Proposal for
Pseudoidium hortensiae (Jørst.) U. Braun & R.T.A. Cook 2012**

Hydrangea powdery mildew

Current Pest Rating: Z

Proposed Pest Rating: C

Kingdom: Fungi; Division: Ascomycota; Class: Leotiomycetes,

Order: Erysiphales, Family: Erysiphaceae

Comment Period: 5/22/2020 through 7/6/2020

Initiating Event:

Samples of powdery mildew damage on hydrangea stems and leaves have been submitted to CDFA's plant pest diagnostics center for many decades from California nurseries and landscapes. In the past, the name *Erysiphe polygoni* was applied to powdery mildews that fit a general morphological description. Pathologists used the measurements of the conidia and footcells, shape of the appressoria, and whether the spores are born singly vs. in chains as taxonomic features in their classifications. With more recent DNA sequencing data, the name *Pseudoidium hortensiae* (syn=*Oidium hortensiae*) was given by Braun and Cook in 2012 and was first used for powdery mildew on hydrangea in California by CDFA plant pathologist Cheryl Blomquist in 2014. It was assigned a temporary Z rating. It seems very likely that earlier records of *E. polygoni* in French (1989) and the CDFA database are all the same powdery mildew species now called *P. hortensiae*. The risk of *P. hortensiae* to California is described herein and a permanent rating is proposed.

History & Status:

Background:

Powdery mildew fungi are plant pathogens assigned to more than 1600 genera. They are obligate biotrophs that must feed on a living plant host, and they obtain nutrients from the living cells of their hosts through specialized feeding organs called haustoria. Powdery mildews have evolved effective ways of attaching and feeding that avoid the defense mechanisms of their hosts. These allow for

appressorial development, peg penetration into host cell, haustorial initiation and development, removal of nutrients from host cells, fungal hyphal growth and sporulation, all while neutralizing host defenses. They affect all kinds of plants except gymnosperms (Agrios, 2005). Many species of powdery mildew are highly host specific (Braun and Cook, 2012).

Hosts: Hydrangea arborescens, H. hortensia, H. involucrata, H. macrophylla, H. opuloides, H. paniculata, H. serrata, and H. xanthoneura (Farr and Rossman, 2020).

Symptoms: Powdery mildews are probably the most easily recognizable plant diseases. On hydrangea, *P. hortensiae* appears first as spots or patches of a white to grayish, powdery, mildew growth on young leaves or stems. Over time, the growth of the leaves becomes distorted and crinkled as entire leaves can become completely covered by the white powdery growth and leaves may turn red or purple in response to infection (Park et al., 2012).

Transmission: Powdery mildew epidemics are driven by the production of masses of dry conidiospores on the surface of affected leaves that are easily spread by wind. Unlike other foliar plant pathogenic fungi, they do not require and may even be impeded by the presence of free water. Infection is favored by higher humidity such as is found in heavily shaded growing sites. Some species of powdery mildew produce sexual ascospores in structures called chasmothecia. These are overwintering structures and their production is generally triggered by low temperatures. Chasmothecia are not commonly found in California and none are known for *P. hortensiae*.

Damage Potential: Powdery mildews seldom kill their hosts, but utilize their nutrients, reduce photosynthesis, increase respiration and transpiration, impair growth, and reduce yields by as much as 20 to 40%. They thrive in humid areas but are most common and severe in warm, dry climates. On *H. macrophylla* in Korea, heavily infected plantings were unmarketable, mainly due to purplish red discoloration and crinkling of leaves (Park et al., 2012). Cho et al. (2018) reported that infection levels on *Hydrangea serrata* f. *acuminata* reached 100%

Worldwide Distribution: Worldwide: Australia, Azores, Armenia, Belgium, Brazil, Bulgaria, Canada, Chile, Denmark, Finland, France, Georgia, Germany, Greece, India, Indonesia, Italy, Japan, South Korea, Mauritius, Mexico, Netherlands, New Zealand, Norway, Romania, Russia, Poland, Portugal, Romania, South Africa, Sweden, Switzerland, Turkey, and United Kingdom (Farr and Rossman, 2020).

Official Control: None.

California Distribution: Widespread in central and southern coastal counties.

California Interceptions: None

The risk *Pseudoidium hortensiae* would pose to California is evaluated below.

Consequences of Introduction:

- 1) Climate/Host Interaction:** *Pseudoidium hortensiae* is likely to be found in all areas compatible with hydrangea production. Hydrangea are a temperate, shade dwelling species and shaded areas with high relative humidity are very favorable to powdery mildew epidemics.

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 of *P. hortensiae* is limited to hydrangeas.

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:** Powdery mildew fungi produce huge numbers of conidia that are wind dispersed. Although some species also produce overwintering chasmothecia, they are not known in this species.

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:** Although powdery mildews do not kill their hosts, they can be damaging to high value nursery stock causing leaf discoloration and crinkling. Fungicide treatments may be required to prevent epidemic levels of disease, especially in shade houses.

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

Economic Impact: B, D

- 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.
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- 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:** Hydrangea are not native to California but they are widely planted in coastal areas. Treatment for powdery mildew is required for disease suppression in nurseries.

Environmental Impact: D

- 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 *Pseudoidium hortensiae* is Medium:

Add up the total score and include it here. **9**

- 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'. Detections have been made in multiple counties on the central and south coast where the climate is most suitable for production of *Hydrangea* nursery stock.

Score: -3

- Not established (0) Pest never detected in California or known only from incursions.
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-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 = 5*

Uncertainty:

None.

Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for *Pseudoidium hortensiae* is C.**

References:

Agrios, G. N. 2005. Plant Pathology, 5th Edition. Elsevier Academic Press. 922 pg

Braun, U., and Cook, R. T. A. 2012. Taxonomy Manual of the Erysiphales (Powdery Mildews). CBS Biodivers. Ser. 11: 703.

Cho, S. E., Zhao, T. T., Jeon, C. H., Kang, S. H., Choi, W. I., and Shin, H. D. 2018. First report of powdery mildew caused by *Pseudoidium hortensiae* on *Hydrangea serrata* f. *acuminata* in Korea. Pl. Dis. 102(7): 1453.

Farr, D. F., and Rossman, A. Y. Fungal Databases, U.S. National Fungus Collections, ARS, USDA. Retrieved April 13, 2020, from <https://nt.ars-grin.gov/fungaldatabases/>

Park, M. J., Cho, S. E., Park, J. H., Lee, S. K., and Shin, H. D. 2012. First report of Powdery Mildew caused by *Oidium hortensiae* on Mophead Hydrangea in Korea. Plant Disease. Vol.96 No.7 pp.1072

Responsible Party:

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***Comment Period: 5/22/2020 through 7/6/2020**

***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: C
