



Figure 1: *Erysiphe convolvuli* de Candolle 1805 (Braun 1995). Photo: Albre Brown, CDFA Plant Pathologist

California Pest Rating Proposal for
***Erysiphe convolvuli* de Candolle 1805 (Braun 1995)**

Current Pest Rating: Q

Proposed Pest Rating: C

Comment Period: 1/22/2020 through 3/7/2020

Initiating Event:

On October 29, 2019, a sample of field bindweeds, *Convolvulus arvensis*, showing symptoms of powdery mildew was collected from a commercial orchard in Winters, Solano County, California. The sample was collected by county agricultural officials and submitted to the CDFA Plant Pathology Lab for diagnosis of the pathogen associated with the disease. On November 8, 2019, Albre Brown and Suzanne Rooney-Latham, CDFA Plant Pathologists, identified the associated pathogen as *Erysiphe convolvuli* by morphology. Their identification was confirmed by DNA sequencing. The isolates were a 100% match to multiple *E. convolvuli* sequences. This detection marked a first record of the pathogen in California, and the pathogen was given a temporary Q rating. The consequences of introduction of *E. convolvuli* to California are assessed here and a permanent rating is proposed.

History & Status:

Background: Field bindweed, *Convolvulus arvensis* L., is widespread in California where it is considered a noxious weed under the California Code of Regulations Section 4500; it is also listed under Section 3855 as a noxious weed seed rated R (restricted). A California pest rating has been published for field bindweed (Iqbal, 2018). The powdery mildew pathogen *Erysiphe convolvuli* was first reported in North America in Washington and Oregon by Glawe et al. in 2003, and in Idaho by Dugan and Glawe in 2007.

Three varieties of *E. convolvuli* have been described based on the number of ascospores or shape of the chasmothecia and the host. *E. convolvuli* var. *convolvuli* is found associated with *Convolvulus* spp. and has 3 to 4 ascospores per ascus, while *E. convolvuli* var. *calystegiae* is found on *Calystegia* spp. and has 5 to 6 ascospores per ascus. *Erysiphe convolvuli* var. *dichotoma* is distinct from both of the other varieties because it has ramified appendages on its chasmothecia (Braun 1995). However, the production of chasmothecia, asci, and ascospores by *Erysiphe* species is dependant upon environmental conditions. For *E. convolvuli*, drier weather at the end of the summer can stimulate the production of this sexual fruiting body (Braun, 1995).

Hosts: Bindweeds and false bindweeds in the family Convolvulaceae - *Calystegia* spp., *Convolvulus* spp., and *Ipomoea* spp.

Symptoms: *Erysiphe convolvuli* is an obligate parasite that produces mycelium and asexual spores called conidia and sometimes sexual spores called ascospores in a chasmothecia (completely closed fungal fruiting body), on the surface of plant tissues. The pathogen obtains nutrients from the plant by producing haustoria (specialized absorbing organs) that grow into the epidermal cells of the host plant. This species appears as white to grayish powdery mildew growing in spots or patches, first on young plant tissue, eventually covering entire leaves and other plant organs. Mildew growth is most common on the upper side of leaves but may also be found on the underside of leaves, young shoots and stems, buds, flowers, and young fruit. Spherical chasmothecia are pinhead-sized, initially white to yellow-brown and black in color with age. They develop singly or in clusters on older mildew colonies and can be seen without magnification (Agrios, 2005).

Transmission: On the plant surface, the fungal mycelium produces short conidiophores that in turn produce numerous chains of conidia that appear as white powdery mat. These conidia are easily dispersed by air currents to cause new infections of host plants. When conditions are unfavorable, the pathogen may produce chasmothecia containing the ascospores. The disease can occur in cool or warm humid regions but can be very damaging in warm and dry climates because the spores only require humidity and not free-standing water to be released, germinate, and cause infections (Agrios, 2005). Once a plant is infected, mycelium continues to spread on a leaf surface regardless of the level of atmospheric moisture. The fungus can overwinter inside dormant buds, which become infected as they form. From infected buds the disease spreads to emerging leaves, that will begin producing new mycelial colonies and conidia immediately.

Damage Potential: In general, powdery mildews seldom kill their hosts. However, they reduce photosynthesis, utilize plant nutrients, increase respiration and transpiration, impair plant growth, and can reduce crop yields up to 40% (Agrios, 2005). Damage to leaves was reported in Italy on ornamental *Ipomoea tricolor* growing in public and private gardens (Bertetti et al., 2008). *Erysiphe convolvuli* has been proposed as a possible biocontrol agent for field bindweed in vegetable crops, where weed control options are limited (Giannopolitis and Chrysayi, 1986). In Turkey, a survey found that the natural infection rate for field bindweed from this powdery mildew in the survey year was 22%, but when plants were inoculated, infection levels reached nearly 90% (Kadioğlu et al., 2008).

Worldwide Distribution: Africa (north), Asia, Europe, North America: *United States* (Idaho, Oregon, Washington), South America (Farr and Rossman, 2019; Glawe et al., 2003).

Official Control: None.

California Distribution: Official samples have been collected from Solano County.

California Interceptions: None

The risk *Erysiphe convolvuli* would pose to California is evaluated below.

Consequences of Introduction:

- 1) Climate/Host Interaction:** Powdery mildews thrive in hot, dry conditions and require humidity, but not free water to infect their hosts. They can be problematic in the desert all year and along the coast in the dry summer months, especially when there is high relative humidity.

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 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 *Erysiphe convolvuli* is limited to three genera bindweed and false bindweed. There are ornamental and weedy species on the host lists.

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 Dispersal Potential:** Powdery mildews produce massive numbers of conidia that are wind dispersed. This species can produce chasmothecia in the Pacific northwest and Chile, but they have not been observed in California. However, there has only been one sample examined. Both spore types primarily infect new leaves and the mycelium can overwinter by infecting buds.

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:** Powdery mildews rarely kill their hosts but can weaken them and slow their growth. They can cause significant cosmetic damage and defoliation as leaves are curled and covered with mycelia and conidia.

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

Economic Impact: A, B

- 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: 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:** No negative impact has been observed. There is potential for biological control of a California noxious weed (field bindweed) by this pathogen.

Environmental Impact:

- 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: 1

- **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 *Erysiphe convolvuli*: Medium

Add up the total score and include it here.

- 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 'low'. This pathogen has only been detected in one location in California. However, given how widespread it is in the Pacific Northwest and how widespread the hosts are, if there were surveys, it is highly likely to be detected in other parts of California.

Score: -1

- 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:**

Final Score: *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information = 8*

Uncertainty:

None.

Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for *Erysiphe convolvuli* is C.**

References:

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Responsible Party:

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***Comment Period: 1/22/2020 through 3/7/2020**

***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[[@](mailto:permits@cdfa.ca.gov)]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
