CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Erysiphe elevata (Burrill) U. Braun & S. Takam 2000
≡*Microsphaera elevata* Burrill 1876

Current Pest Rating: Z

Proposed Pest Rating: C

Comment Period: 09/27/2019 through 11/11/2019

Initiating Event:

Beginning in 2012, heavily infected leaf samples with powdery mildew from *Catalpa* spp., and their intergeneric hybrids with *Chilopsis* spp. called *XCatalpa,* have been submitted by agricultural officials to the CDFA plant diagnostics lab and have been identified as *Erysiphe elevata*. Samples have come from Contra Costa, Riverside, and Sacramento counties. Based on literature stating that this pathogen is presumed to be native and widespread in the United States and Canada, it was assigned a temporary Z rating. The risk of this pathogen to California is assessed herein and a permanent pest rating is proposed.

History & Status:

Background:

Catalpa bignonioides, southern catalpa or Indian bean tree, and *C. speciosa*, northern catalpa, are both native to the southeastern United States and they are planted as shade trees throughout the world. *Chilopsis linearis*, desertwillow or desertcatalpa, is native to the desert washes and arroyos of southern California (Calflora, 2019). *Catalpa* and *Chilopsis* are closely related and intergeneric hybrids between *Chilopsis linearis* and *Catalpa bignoniodes* exist and are named *XChitalpa tashkeneinsis* and *XChitalpa*. These hybrids are well adapted to arid California climates and widely planted in landscapes.

Erysiphe elevata is a commonly observed powdery mildew species infecting *Catalpa and Chilopsis* as well as the intergeneric hybrids between them in North America (Braun, 1987). *Erysiphe elevata* was first reported to have spread into Europe in 2002 (Vanja et al., 2004), and then to Asia (Korea) in 2014 (Cho et al.). In addition to reports on *Catalpa*, *Chilopsis* and their hybrids, it has recently been reported

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on Frangipani (*Plumera rubra*) in China and Taiwan, and on *Eucalyptus* in Thailand (Meeboon and Takamatsu, 2017; Yeh et al., 2019; Wu et al., 2019).

Hosts: Catalpa spp., *Chilopsis* spp., X*Chitalpa tashkentensis, XChitapla, Eucalyptus camaldulensis*, *Plumeria rubra*, and *Catharanthus roseus* (Farr and Rossman, 2019).

Symptoms: *Erysiphe elevata* is an obligate parasite that produces mycelium and asexual spores called conidia 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 plant. This species occurs as white to grayish powdery mildew growing in spots or patches on young plant tissue or covering entire leaves and other plant organs. Mildew growth is most common on upper side of leaves but may also be found on the underside of leaves, young shoots and stems, buds, flowers, and young fruit. Pinhead-sized spherical chasmothecia (completely closed fungal fruiting bodies containing sexual spores) are initially white to yellow brown and later becoming black in color. 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 is common in cool or warm humid regions but can also be common in warm and dry climates because the spores only require high relative 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. Buds can become infected as they form and then the mycelium goes dormant over the winter. New leaves emerging from those infected buds will already be infected and 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 reduce crop yields up to 40% (Agrios, 2005). In North Carolina, research was done on the susceptibility of *Catalapa*, *Chilopsis* and their hybrids to E. elevata. Moderate to severe powdery mildew developed on trees in a lath house on *Catalpa*, *Chilopsis* and the *XCatalpa* hybrids tested (Olsen et al., 2006). On frangipani (*Plumeria rubra*) in Taiwan, *E. elevata* was involved in an accelerated leaf-fall, particularly in connection with additional stress factors such as drought or coinfection with the rust fungus *Coleosporium plumeriae* (Yeh et al., 2019). On frangipani in China, approximately 60% of the leaves were infected by *E. elevata* with white, dense, superficial masses of mycelia and conidia resulting in curling, discoloration, and defoliation (Wu et al., 2019). From 2011 to 2013, hundreds of southern catalpa trees were found heavily damaged by this powdery mildew with 90 to 100% disease incidence in a park in Korea. Symptoms appeared as circular to irregular white patches, which subsequently showed abundant mycelial growth on both sides of leaves and herbaceous stems. Severe infections caused poor growth and premature loss of leaves, resulting in reduced aesthetic value (Cho et al., 2014).

Worldwide Distribution: Europe: *Bulgaria, Czech Republic, France, Germany, Hungary, Poland, Slovakia, Switzerland, United Kingdom*; Asia: *China*, *Korea*, *Japan, Thailand, Taiwan, Turkey*; North America: *United States* (eastern states, Nebraska, Texas) (Farr and Rossman, 2019; Cho et al., 2014; Wu et al., 2019)

Official Control: None

California Distribution: Official samples have been submitted from Sacramento, Riverside, and Contra Costa counties.

California Interceptions: None

The risk *Erysiphe elevata* 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 elevata* is limited to a few species of ornamental shade trees, although host species are widely planted around the world

   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 mildews produce massive numbers of conidia that are wind dispersed. They primarily infect new leaves and 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 grown. They can cause significant cosmetic damage and defoliation as leaves are curled and covered with mycelium 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:** None has been observed.

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: 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 elevata is 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**: Literature suggests this pathogen is widespread in North America (Ale-Agha et al,. 2004). California detections have been made in multiple counties and disease is widespread in Sacramento County (S. Latham, CDFA, *pers. comm*., 2019), and the hybrids appear most susceptible (C. Blomquist, CDFA, *pers. comm.,* 2019).

Evaluation is 'High':

Score: -3
-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* ***= 6***

Uncertainty:

Erysiphe elevata has been reported on Eucalyptus in Thailand. It is uncertain if it could infect the millions of naturalized *Eucalyptus* spp. that are in California. There are no official records of *E. elevata* infecting the native desert willow (*Chilopsis linearis*), but it is a potential host.

Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for *Erysiphae elevata* is C.**

References:

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Yeh, Y.-W., Kirschner, R., and Lu, H.-F. 2019. First record of *Erysiphe elevata* on *Plumeria rubra* in Taiwan. Plant Disease. Vol 103 No 2

Responsible Party:

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***Comment Period: 09/27/2019 through 11/11/2019**

***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 plant.health[@]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: C