

California Pest Rating Proposal for

Fig mosaic virus

Current Pest Rating: C

Proposed Pest Rating: C

Kingdom: Viruses and viroids, Category: Riboviria,
Category: Orthornavirae, Phylum: Negarnaviricota,
Subphylum: Polyploviricotina, Class: Ellioviricetes,
Order: Bunyavirales, Family: Fimoviridae,
Genus: Emaravirus

Comment Period: 04/13/2022 through 05/28/2022

Initiating Event:

This pathogen has not been through the pest rating system. The risk to California from Fig mosaic emaravirus is described herein and a permanent rating is proposed.

History & Status:

Background: The United States ranks second after Turkey in worldwide fig production, and nearly 100% of the domestic production occurs in California (approximately 29,000 tons, CDFA Ag Statistics). Commercially, figs are grown through grafting or self-rooted cuttings. This type of production favors the spread of pests, including the viruses and viroids linked to fig mosaic disease (FMD).

FMD was initially identified in California by Condit (1933). Even though it is a major disease that affects many important varieties of figs worldwide for nearly a century, the etiological agents associated with FMD have been known for only slightly more than a decade (Elbeaino, 2009). FMD is complicated and has been linked to 12 viruses and 3 viroids worldwide, including one confirmed causative agent, Fig mosaic emaravirus (Preising et al., 2021).

Fig mosaic emaravirus virus (FMV), is a (-) ssRNA virus in the genus *Emaravirus*, the sole genus in the family Fimoviridae. The genus *Emaravirus* contains European mountain ash ringspot-associated virus (the origin of the acronym “emara” in the genus name), rose rosette disease, Maize red stripe virus, pigeon pea sterility mosaic disease and raspberry leaf blotch disorder. These viruses all share

similarities with respect to their genomic organization and some of their biological properties and several are transmitted by eriophyid mites. FMV is mite and graft but not seed-transmitted.

Hosts: Ficus sp., F. benjamina, F. carica, F. lyrata, Cyclamen persicum (CABI CPC, 2021).

Symptoms: Fig mosaic virus can affect both the leaves and the fruit. Mosaic patterns on leaves are bright yellow that contrasts with the dark green color of healthy foliage, and the borders progressively fade as opposed to having a sharp edge. These mosaic patterns appear as uneven patches of light green dispersed across the leaf. Later in the season, a rust-colored band appears along the mosaic's perimeter that is thought to be generated by epidermal or subepidermal cell death. Leaf shapes become non-symmetrical. Normal and deformed leaves can co-occur on the same twig. Mosaic patches on fruits are similar in appearance to those found on leaves, however the yellow color is less intense. In some cultivars premature fruit drop and reduced growth were reported (Michailides and Ferguson, 2006).

Cyclamens show virus-like symptoms of leaf mottling and yellowing, leaf deformation, and flower breaking (Elbeaino et al., 2018).

Transmission: The fig mosaic is vectored by the eriophyid mite *Aceria fici*; feeding by a single mite can be enough to transmit the virus to a healthy seedling of *F. carica*. Mites can overwinter in buds on fig trees (Ashihara et al., 2004). This species was described by Essig in 1922 and is known to be in California. The virus can also be transmitted by grafting to both figs and cyclamen, but it is not seedborne or mechanically transmitted (Michailides and Ferguson, 2006; Elbeaino et al., 2018).

Damage Potential: Mosaic symptoms can be exacerbated by high temperatures in the summer. Infected Calimyrna fig trees seem to produce smaller and fewer fruit. Black Mission is the most seriously damaged cultivar; Kadota and Calimyrna are less affected. *Ficus palmata*, or trees derived from seedlings having *F. palmata* as the male parent, appear to be immune (Michailides and Ferguson, 2006). Cyclamen lose esthetic value from symptoms.

Worldwide Distribution: Africa: *Egypt, Tunisia*. Asia: *China, Iran, Japan Turkey*. Europe: *Bosnia and Herzegovina, Croatia, Italy, Spain*. North America: *United States*. Oceania: *New Zealand (CABI-CPC, 2022)*.

Official Control: None

California Distribution: FMD is widely observed in coastal counties and also in the Sacramento area, with many samples submitted before there was a confirming test for FMV (CDFA PDR database, 2022).

California Interceptions: None

The risk Fig mosaic virus would pose to California is evaluated below.

Consequences of Introduction:

- 1) Climate/Host Interaction:** This virus can be spread by propagation. It is likely to be found anywhere its hosts can grow.

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 is limited to *Ficus* and *Cyclamen*

Evaluate the host range of the pest.

Score: 2

- 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 virus is mainly spread through propagation from infected mother plants. It is not transmitted mechanically, or by seed or pollen.

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:**

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

Some fig cultivars experience premature fruit drop and mottling of fruit which decreases the yield and the value of the crop. There is an eriophyid mite that can vector this virus.

Economic Impact: A, B, E

- 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.
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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: There are no native hosts for this virus, and no environmental impact has been seen in the century it has been in California.

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

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 Fig mosaic virus: 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.

FMD has been present in California but not under regulation for decades. It is present in the nursery trade.

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: (Score)

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

Uncertainty:

Other FMD-associated viruses and viroids have been identified around the world and could be present in California. There could potentially be synergistic effects of multiple viruses that increase disease severity that have not yet been elucidated (Preising et al., 2021).

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for Fig mosaic virus is C.

References:

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Responsible Party:

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***Comment Period: 04/13/2022 through 05/28/2022**

***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.
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Proposed Pest Rating: C
