

## California Pest Rating Proposal for

**Citrus exocortis viroid**

**Current Pest Rating: C**

**Proposed Pest Rating: C**

Domain: Virus, Group: Viroids,  
Family: Pospiviroidae, Genus: Pospiviroid

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**Comment Period: 08/10/2021 through 09/24/2021**

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### Initiating Event:

A pest rating has not been written for this pathogen. The risk to California from Citrus exocortis viroid (CEVd) is described herein and a permanent rating is proposed.

### History & Status:

#### Background:

Exocortis is a bark-scaling and stunting disease that affects many species and cultivars of citrus and some citrus relatives. It can be latent and there are non-citrus hosts. In the past, viroids were difficult to diagnose and were commonly moved with clonal propagative material. Advances in testing and the widespread use of certified budwood, along with sanitation techniques during propagation, has reduced this disease to the point that it exists mainly in older orchards and in non-citrus hosts. It is not known to be seedborne.

Viroids are the smallest known plant pathogens and are composed of only a short, circular, single-stranded RNA. Although viroids are composed of nucleic acid, they do not encode any protein and have no protein coats. All viroids are inhabitants of higher plants; some cause diseases while others are asymptomatic. Viroids are classified within two families: Pospiviroidae and Avsunviroidae. Citrus are natural hosts of several viroid species that belong to the family Pospiviroidae.

CEVd replicates using "rolling circle" synthesis to make new RNA from the negative strand viroid RNA by RNA polymerase II, a host cell enzyme normally associated with synthesis of messenger RNA from

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plant DNA (Warrilow and Symons, 1999). Only viroids in Pospiviroidae replicate this way in the nucleolus.

*Hosts:* All *Citrus* species are susceptible to infection by CEVd, although many do not show symptoms. Non citrus hosts include *Brassica rapa* subsp. *oleifera* (turnip rape), *Cestrum* (jessamine), *Chrysanthemum vestitum*, *Daucus carota* (carrot), *Gynura aurantiaca* (java velvet plant), *Gynura procumbens*, *Lycianthes rantonnetii*, *Petunia* sp., *Petunia hybrida*, *Solanum laxum*, *Solanum lycopersicum* (tomato), *Solanum melongena* (eggplant), *Solanum tuberosum* (potato), *Tagetes patula* (French marigold), *Verbena* sp. (vervain), *Vicia faba* (faba bean), and *Vitis vinifera* (grapevine) (CABI-CPC, 2021).

*Symptoms:* Exocortis disease only develops in susceptible rootstocks, most commonly trifoliolate orange and its hybrids. Rangpur lime and some lemon and citron rootstocks are also affected. Characteristic symptoms of exocortis disease include bark shelling or peeling, with whole tree stunting. The bark can crack longitudinally and peel away in thin strips with droplets of gum under the loose bark. Other common names that describe the symptoms include scaly butt and scaly bark.

Shelling can develop slowly about 1-2 years after budding, and be restricted to a small area, or can develop rapidly over the entire rootstock. Tree death is rare, but growth is slow and productivity declines with a significant reduction in yield. Leaves may have a blotchy mottle. *Citrus medica* (Etrog citron) is a sensitive indicator that develops severe leaf epinasty and rugosity, cracking and browning of the underside of the veins and leaf tip, and stunting (Dreistadt, 2012; CABI-CPC, 2021).

Herbaceous hosts can range from asymptomatic to developing leaf epinasty, rugosity and stunting. CEV symptoms in tomato and potato are indistinguishable from those caused by Potato spindle tuber viroid (Semancik et al., 1973).

*Transmission:* The viroid is easily spread with infected but asymptomatic budwood and on contaminated propagation or pruning tools. CEVd infections result from the use of asymptomatic infected scion material, but the viroid is transmitted to the very susceptible rootstock grown from seed. There are no known vectors. The viroid reaches higher concentrations under warm (30-37°C) conditions. CEV probably spreads to the roots, often before it spreads upward (Semancik et al., 1978).

*Damage Potential:* Exocortis is of minor importance in California today because strict regulations on budwood sources have kept new plantings largely free of this viroid disease. Exocortis is widespread in older plantings, but it is a mild disease that causes only moderate stunting and limited loss of production. Infected trees rarely die, but growth is stunted, and productivity slowly declines. Among the commonly used rootstocks, trifoliolate is most affected by exocortis. Due to strict regulations on the testing and movement of citrus budwood, new plantings are largely free-from this disease.

**Worldwide Distribution:** Africa: *Algeria, Cameroon, Cote d'Ivoire, Egypt, Ethiopia, Ghana, Libya, Madagascar, Mauritius, Morocco, Mozambique, Nigeria, Reunion, Sierra Leone, Somalia, South Africa, Sudan, Tunisia.* Americas: *Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Cuba, Guadeloupe, Jamaica, Mexico, Peru, Suriname, Trinidad and Tobago, United States (Arizona, California, Florida,*

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Louisiana, Texas), *Uruguay, Venezuela*. Asia: *China, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Korea, Republic, Lebanon, Malaysia, Oman, Pakistan, Philippines, Saudi Arabia, Syria, Taiwan, Thailand, United Arab Emirates, Vietnam, Yemen*. Europe: *Austria, Azerbaijan, Belgium, Cyprus, Czech Republic, France, Germany, Greece, Italy, Montenegro, Netherlands, Portugal, Russia, Slovenia, Spain, Turkey*. Oceania: *Australia, Cook Islands, Fiji, French Polynesia, New Zealand, Papua New Guinea, Samoa* (EPPO, 2021)

**Official Control:** USDA PCIT harmful organism list for Georgia, Japan, Madagascar, Mexico, and Oman. EPPO's A2 list for Bahrain and Jordan, A2 list for Argentina and Inter-African Phytosanitary Council, quarantine pest in Mexico.

**California Distribution:** Widespread in citrus-growing regions.

**California Interceptions:** None.

The risk *Citrus exocortis* viroid would pose to California is evaluated below.

### Consequences of Introduction:

- 1) Climate/Host Interaction:** CEVd is likely established within infested propagative citrus materials in all citrus-growing regions of California.

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:** Citrus is an important host, with other hosts in multiple plant families.

Evaluate the host range of the pest.

**Score: 3**

- 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:** CEVd replicates autonomously within infested plants and is spread mainly through the propagation and movement of infested planting materials to non-infested regions.

Evaluate the natural and artificial dispersal potential of the pest.

**Score: 2**

- Low (1) does not have high reproductive or dispersal potential.
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- **Medium (2) has either high reproductive or dispersal potential.**
- High (3) has both high reproduction and dispersal potential.

**4) Economic Impact:** Prior to widespread testing of budwood, this disease had a much larger impact. With current screening, use of certified planting materials, and good sanitation, incidence in California is declining.

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

**Economic Impact: A, B, C, 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.
- 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:** None have been reported.

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 Citrus exocortis virus: Medium**

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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.

Historical records and survey data show this viroid to have been widespread in California in decades past. There are far fewer modern detections (French, 1989; CDFA PDR Database, 2021).

***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 = 9***

**Uncertainty:**

None.

**Conclusion and Rating Justification:**

Based on the evidence provided above the proposed rating for Citrus exocortis viroid is C.

**References:**

CABI Crop Production Compendium 2021. Citrus exocortis viroid. Accessed 6/30/2021

<https://www.cabi.org/cpc/datasheet/16534>

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Eskalen, A., and Adaskaveg, J. E. 2019. Exocortis. UC IPM Pest management Guidelines: Citrus. UC ANR publication 3441

French, A. M. 1989. California plant disease host index. CA Division of Plant Industry. 2nd Ed. 394 pg

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Semancik, J.S., Magnuson, D.S. and Weathers, L.G., 1973. Potato spindle tuber disease produced by pathogenic RNA from citrus exocortis disease: evidence for the identity of the causal agent. *Virology*, 52(1), pp.292-294.

USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PExD) Harmful Organisms Database Report. Citrus exocortis viroid. Accessed 6/29/2021

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Weathers, L. G., Greer, F. C. Jr., Harjung, M.K. 1967. Transmission of exocortis virus of citrus to herbaceous plants. *Plant Disease Reporter*, 51:868-871.

### **Responsible Party:**

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**\*Comment Period: 08/10/2021 through 09/24/2021**

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

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### **Comment Format:**

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- ❖ 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**

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