CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

# California Pest Rating Proposal for

## Cherry rasp leaf virus
## Flat apple associated virus

**Current Pest Rating: None**

**Proposed Pest Rating: C**

Kingdom: Viruses and viroids, Category: Riboviria,
Category: Orthornavirae, Phylum: Pisuviricota
Class: Pisoniviricetes, Order: Picornavirales
Family: Secoviridae, Genus: Cheravirus

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**Comment Period: 03/02/2022 through 04/16/2022**

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## Initiating Event:

This pathogen has not been through the pest rating system. The risk to California from Cherry rasp leaf virus (CRLV) is described herein and a permanent rating is proposed.

## History & Status:

**Background:**

Cherries came to North America with English colonists and later were introduced to California by Spanish missionaries. In the late 1800s, sweet cherries were planted in what have become their major sites of production in Washington, Oregon, and California. Today, California is the second largest cherry-producing state in the United States behind Washington. California is also a large international exporter of sweet cherries; 2019/20 statistics recorded 34,000 cherry acres with a total value close to $200M, with $85M in exports. Most commercial acreage in California is found in the Central Valley from Sacramento to Bakersfield, with some coastal production between Morgan Hill and Hollister. The county with the greatest production of cherries is San Joaquin, which primarily produces the traditional Bing variety. Cherry production in Southern California is limited to low-chill varieties (calcherry.com; CDFA Ag Stats 2020).

**Che**rry **ra**sp leaf is the type species in the genus **Chera**virus. This genus contains viruses that were previously classified as tentative members of the genus Nepovirus. Cherry rasp leaf disease was first observed in Colorado in 1935, and in California in 1942 (Bodine and Newton, 1942). The virus appears to be native to western North America where it is present over a wide geographic area. The virus is

present primarily west the of the Rocky Mountains, to California, Oregon, and Washington, to southern British Columbia. In 1968, Wagnon et al. observed the disease in eight California counties in sweet cherry trees on both mazzard and mahaleb rootstocks. Symptoms on sweet cherry consist of enations on the undersides of affected leaves on the lowest branches. Infected trees slowly decline and become nonproductive, eventually dying, with the disease spreading slowly to adjacent or nearby trees. In this 1968 study, CDFA Nematologist A. Weiner examined soil samples collected around the rasp-leaf infected trees and found various nematode species including *Xiphinema americanum*, the American dagger nematode, which was a known virus vector. This nematode is widespread with records in more than 40 California counties and has received a C-rating https://blogs.cdfa.ca.gov/Section3162/?p=6906.

In the 1960s, there were many reports of CRLV in other parts of the world, based on the presence of rasp-leaf symptoms. Later, it was shown that leaf enation symptoms can be caused by strains of Prunus necrotic ringspot virus or Tomato ringspot virus (Nyland, 1976). European cherry rasp leaf (Pfeffinger disease) is caused by a combination of Prune dwarf virus with either Raspberry ringspot virus or Arabis mosaic virus (Nyland, 1976). In the absence of definitive diagnostic testing, reports of CRLV outside of the known CRLV-infested areas of western North America should be considered as unconfirmed. Flat apple disease-associated virus (FAV) are isolates of the same virus (James et al., 2001). There are reports on the detection of CRLV in asymptomatic raspberry plants (*Rubus idaeus*) (Stace-Smith and Ramsdell, 1987), and there is a recent report of CRLV causing symptoms on high tunnel grown tomatoes in Minnesota (Bratsch et al., 2020).

*Hosts:* The major hosts are *Prunus avium* (sweet cherry), *Prunus mahaleb* (rock cherry), and *Malus* (apple). *Solanum lycopersicum* (tomato) is also a host. Other crop plants that can be infected include *Cucurbita maxima* (pumpkin), *Ocimum basilicum* (basil), *Phaseolus vulgaris* (bean), *Rubus idaeus* (raspberry), *Sambucus nigra* (elder), and *Solanum tuberosum* (potato).

The host range of CRLV includes many domesticated and weedy species that are asymptomatic or express only minor symptoms including *Atriplex hortensis* (mountain spinach), *Balsamorhiza sagittate* (arrowleaf balsamroot), *Chenopodiastrum murale* (Australian spinach), *Cyamopsis tetragonoloba* (cluster bean), *Gomphrena globose* (globe-amaranth), *Malva* sp. (mallow), *Nicotiana* sp., *Physalis floridana* (ground cherry), *Plantago major* (common plantain), *Sesbania herbacea* (coffeeweed), *Solanum betaceum* (tree tomato), *Solanum sisymbriifolium* (sticky nightshade), and *Taraxacum officinale* (dandelion).

*Symptoms*: For *Prunus*, symptoms begin on the lower part of the tree and move upward as the virus spreads. Leaves infected with Cherry rasp leaf virus develop prominent leaflike growths (enations) on the underside, along the midrib. Because fewer leaf buds develop on infected wood, limbs become bare near the base of the tree while leaves higher up develop the rasp leaf symptoms. The disease may develop on new cherry trees planted where diseased cherry trees have been removed. Shoots may be stunted, and cankers may develop on the trunk and scaffold limbs. Affected leaves are distorted but remain green. The green color distinguishes rasp leaf from the rugose mosaic strain of Prunus necrotic ringspot virus (Adaskaveg and Capile, 2009).

Flat apple disease affects the taste and appearance of affected fruit, reducing their value or even making them unmarketable (Nemeth, 1986). Symptoms of flat apple include small, flattened fruit, reduced lateral branch growth, and small, narrow, and upward rolling (towards the midrib) leaves that have a dried appearance. The leaves also tend to point toward the terminus of the spur or shoot. The resulting appearance is one of water stress or drought. The fruit is flattened along the longitudinal axis but has a normal seed count. The calyx basin is more prominent, and the stem cavity is shallow. Reaction severity varies considerably among cultivars. Symptoms of flat apple occur mainly on cultivars Delicious, Golden Delicious, Jonagold and Gala. Cultivars Fuji, Empire and Granny Smith exhibit relatively mild symptoms (Hansen and Parish, 1990).

*Transmission:* Cherry rasp leaf virus is spread by dagger nematodes: *Xiphinema americanum, X. californicum* and *X. rivesi*, and by budding and grafting. The virus has been detected in pollen from infected cherry trees, but transmission by pollen has not been confirmed (Jones, 1987). As with other nematode-vectored virus diseases, symptoms appear in localized areas of an orchard and tend to spread outward in a circular pattern (Chitambar et al., 2018). The virus can be seed borne in dandelions (CABI, 2022).

The main pathway for CRLV over long distances is movement of infected host plants for planting, mainly cherry trees. The virus has been intercepted several times in Europe in imported plant material from North America (EPPO, 2022)

*Damage Potential:* CRLV can cause serious stunting in *Prunus* and fruit yield and quality reductions in cherries and apples. Infected spurs and branches usually die, giving the tree an open, bare appearance and reducing fruit production. Infected trees show a general decline and increased levels of winter injury mortality. Young, infected trees show retarded development and often die (Nyland, 1976; Stace-Smith and Hansen, 1976). It can reach high levels of infection in older orchards, and trees planted on previously infected sites can also become infected. Rootstocks and some scion cultivars may not show obvious symptoms. Clean stock programs are very effective at eliminating this virus from foundation materials. There are only a few reports of flat apple worldwide. No damage was seen on raspberries known to be infected.

**Worldwide Distribution**: Canada (*British Columbia*), China, United States (*California, Colorado, Idaho, Minnesota, Montana, Nebraska, New Mexico, Oregon, Utah, Washington, Wisconsin, Wyoming*) (CABI-CPC, 2022; EPPO, 2022).

**Official Control:** Cherry rasp leaf virus is on the USDA PCIT's harmful organism list for Albania, Azerbaijan, Canada, Chile, Colombia, Egypt, Eurasian Customs Union, European Union, Georgia, Holy See (Vatican City State), Israel, Japan, Korea, Republic of, Mexico, Moldova, Republic of, Monaco, Morocco, Namibia, Norway, Peru, San Marino, Serbia, South Africa, Tunisia, Taiwan, Tajikistan, Turkey, Turkmenistan, Ukraine, United Kingdom, Uzbekistan (USDA, 2022). It is on the EPPO's A1 list for Argentina, Chile, Egypt, Kazakhstan, Russia, Turkey, Ukraine, United Kingdom, European Plant Protection Organization, Eurasian Economic Union, European Union, Inter-African Phytosanitary

Council, on the A2 list for Jordan and Comite de Sanidad Vegetal del Cono Sur, and a quarantine pest in Canada, Israel, Mexico, Moldova, Morocco, Norway, and Tunisia (EPPO, 2022).

**California Distribution**: Widespread with official records in Butte, Contra Costa, San Joaquin, Sonoma, and Yolo counties (French, 1989; CDFA PDR database 2022).

**California Interceptions:** None

The risk Cherry rasp leaf virus would pose to California is evaluated below.

## Consequences of Introduction:

1) **Climate/Host Interaction:** The pathogen is likely to survive wherever its hosts are grown. *Prunus*, *Malus,* and the many other crop and weedy hosts are widespread in the State.

   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 large including woody and herbaceous plants, including California natives.

   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:** The virus only survives in a living host or inside the nematode vectors. There is no airborne phase.

   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:** This virus is effectively controlled by clean stock programs and the use of certified budwood. Old orchards may hold reservoirs of virus in trees, weeds, and dagger nematodes, even after replanting with new trees. CRLV is a quarantine pest in many countries.

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

**Economic Impact: A, C, 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.

**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:** This pathogen has been in California for more than 80 years. No environmental impacts 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 Cherry rasp leaf virus*:* Medium

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.

   ***Evaluation is '-3'***.

   **Score:**

   -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 **Cherry rasp leaf virus** is **C**.

## References:

Adaskaveg, J. E., Caprile, J. L. 2009. UC IPM Pest Management Guidelines: Cherry UC ANR Publications 3440.

Bodine, E. W., and Newton, J. H. 1942. The rasp leaf of cherry. Phytopathology 32:333

Bratsch, S.A., Grinstead, S., Lockhart, B. and Mollov, D., 2020. Biological properties and genomic sequence of an isolate of cherry rasp leaf virus from tomato. Journal of Plant Pathology, 102(3), pp.843-848.

CABI Crop Production Compendium 2021. Cherry rasp leaf.https://www.cabi.org/cpc/datasheet/16197 Accessed 1/27/22

Chitambar, J. J., Westerdahl, B. B., and Subbotin, S. A. 2018. Plant Parasitic Nematodes in California Agriculture. In Subbotin, S., Chitambar J., (eds) Plant Parasitic Nematodes in Sustainable Agriculture of North America. Sustainability in Plant and Crop Protection. Springer, Cham.

EPPO Global Database. 2022. Cherry rasp leaf virus https://gd.eppo.int/taxon/CRLV00. Accessed 1/27/2022

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

Hadidi, A., Barba, M., Candresse, T., and Jelkmann, W. 2011. Virus and Virus-like Diseases of Pome and Stone Fruits. St. Paul, MN: APS Press.

Hansen, A. J., and Parish, C. L. 1990. Transmissible Fruit Disorders. In: Jones AL, Aldwinckle HS, eds. Compendium of Apple and Pear Diseases. St Paul, MN, USA. APS Press, 77-78

James, D., Howell, W.E. and Mink, G.I., 2001. Molecular evidence of the relationship between a virus associated with flat apple disease and Cherry rasp leaf virus as determined by RT-PCR. Plant disease, 85(1), pp.47-52.

Jones, A. T. 1987. Cherry rasp leaf virus in Rubus. In: Converse RH, ed. Virus Diseases of Small Fruits. USA: United States Department of Agriculture. Agriculture Handbook 631, 241-242.

Nemeth, M. 1986. Virus, Mycoplasma and Rickettsia Diseases of Fruit Trees. Akademiai Kiado, Budapest.

Nyland, G. 1976. Cherry rasp leaf. In: Virus diseases and non-infectious disorders of stone fruits in North America. USA: US Department of Agriculture. Agriculture Handbook 437, 219-221.

Stace-Smith, R. and Ramsdell, D.C., 1987. Nepoviruses of the Americas. In Current topics in vector research (pp. 131-166). Springer, New York, NY.

Wagnon, H. K., Traynor, J., Williams, H. E., and Weiner, A C. 1968. Investigations of cherry rasp leaf disease in California. Plant Disease Reporter, 52, pp.618-22.

USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PExD) Harmful Organisms Database Report. Cherry rasp leaf virus. Accessed 1/27/2022

**Responsible Party:**

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***Comment Period: 03/02/2022 through 04/16/2022**

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***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.

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## 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

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