CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Prune dwarf ilarvirus
Cherry ring mottle

Current Pest Rating: C

Proposed Pest Rating: C

Realm: Riboviria, Kingdom: Orthornavirae, Phylum: Kitrinoviricota, Class: Alsuviricetes, Order: Martellivirales, Family: Bromoviridae, Genus: *Ilarvirus*

Comment Period: 10/12/2023 through 11/26/2023

Initiating Event:

This pathogen has not been through the pest rating system. The risk to California from Prune dwarf virus is described herein and a permanent rating is proposed.

History & Status:

Background:

Stone fruits, also known as drupes, get their name from the pit or "stone" in their center. They have thin skins that can be fuzzy or smooth. California is known as the "stone fruit state" because it produces over 80% of the nation's stone fruit crops, including 70% of the nation's peaches, 95% of apricots, 95% of fresh plums, 99% of dried plums, and 100% of nectarines. California's stone fruit production was worth $2B in 2022. Almonds are in the same genus, *Prunus*, but considered separately as a nut crop. California produces 82% of the world's almonds, and in 2022, almonds were valued at $5B (https://www.cdfa.ca.gov/Statistics/PDFs/2022_Ag_Stats_Review.pdf). The largest stone fruit-producing counties are in the San Joaquin and Sacramento valleys, but smaller producers and backyard orchards thrive along the coast, in Southern California, in the Sierra foothills.

Prune dwarf virus (PDV) is in the genus *Ilarvirus*. It is a positive-strand RNA virus in the family Bromoviridae. They are isometric and labile viruses. *Ilarvrius* are distributed worldwide and infect

many agriculturally relevant herbaceous and woody hosts including fruits, vegetables, and ornamentals.

The most economically important Ilarviruses for stone fruits are Prune dwarf virus and Prunus necrotic ringspot virus (Pallas et al. 2012). PDV was first reported in prunes showing stunting and leaf malformations by Thomas and Hildebrand in New York State in 1936 and is considered today to have a worldwide distribution (Fry and Wood, 1970). PDV infects all species of the genus *Prunus*, especially peach, sweet and sour cherry, plum, and almond. PDV frequently occurs in mixed infections with Prunus necrotic ringspot virus and/or Apple mosaic virus. All three viruses are transmitted by pollen, seeds, and grafting, which has contributed to their worldwide distribution (CABI, 2023). Although both viruses can cause disease independently, coinfection with PDV and PNRSV can result in peach stunt disease (Pallas et al., 2013). Peach stunt disease has more severe symptoms than single virus infections, resulting in premature defoliation, a reduction in trunk circumference, and increased production of water sprouts (Scott et al., 2001).

In nurseries and scion block orchards, it is recommended to use virus-free rootstock and scion wood and monitor trees carefully for virus symptoms. Diseased trees should be immediately removed and destroyed. In young fruit orchards, symptomatic trees that are less than 10 years old should be removed and replaced. However, if trees are older than 10 years, replacement is usually not cost-effective. The spread of the disease from tree to tree can be reduced greatly by keeping orchard weeds and ground covers from flowering until after the trees have bloomed, because the disease may be spread mechanically by thrips feeding on pollen grains containing the virus, or by pollen grains carrying the virus on their surface (Adaskaveg et al., 2009; Greber et al., 1992).

Hosts: Crataegus (hawthorns), *Prunus* (stone fruit), *P. amygdalus (syn. P. dulcis)* (almond), *P.armeniaca* (apricot), *P. avium* (sweet cherry), *P. besseyi* (bessey cherry), *P. cerasifera* (myrobalan plum), *P. cerasus* (sour cherry), *P. domestica* (plum), *P. dulcis* (almond), *P. fruticosa* (dwarf cherry), *P. mahaleb* (mahaleb cherry), *P. padus* (bird cherry), *P. persica* (peach), *P. pumila* var. *besseyi* (western sand cherry), *P. salicina* (Japanese plum), P. *serotina* (black cherry), *P. serrulata* (Japanese flowering cherry), *P. spinosa* (blackthorn), *P. tomentosa* (Nanking cherry tree), and *P. virginiana* (common chokecherry) (CABI, 2023).

Symptoms: PDV symptoms vary depending on the climate, host species, and cultivar, as well as the virus isolate (Vašková et al., 2000). Symptoms often include necrosis, chlorosis, and stunting or dwarfing of trees. PDV can cause shortening of the internodes, reduction in both plant and fruit growth, darker green foliage, and rosette formation in developing shoots, especially in peaches (Caglayan et al., 2011; Scott et al., 2001). In most peach cultivars, PDV induces mild stunting but infection by severe isolates can cause poor fruit quality. PDV symptoms in peaches are most pronounced in early spring, but as temperatures rise in late spring and summer, symptoms may become less apparent (Uyemoto et al., 1992). In cherries, PDV may cause leaf chlorotic spots, rings, and diffuse mottling, fruit cracking, and occasionally stem pitting and flat limbs. Fruits can be malformed and fruit production is reduced. In some apricots, PDV induces gummosis on the trunk (Caglayean et al., 2011).

Transmission: PDV is transmitted both from tree to tree, and from parent to progeny, through infected pollen (Mink, 1993). It can also be transmitted through grafting and budding with infected budwood. Seed transmission of PDV is a major method of virus dispersal in Mahaleb plums used as rootstocks and can range from 40 to 50% (Boari et al., 1998). The role of insects in facilitating pollen transmission is not well understood. Spread can be very rapid in young peach orchards, and honeybees have been implicated in spreading the virus as they pollinate flowers (Uyemoto et al., 1992). The thrips species *Frankliniella occidentalis* has been implicated as a transmission facilitator in greenhouse experiments (Greber et al., 1992). Transmission can occur by wounding on the interior surface of flowers that allows the cytoplasmic contents of pollen grains to invade the plant during thrips feeding (Uyemoto et al., 2003).

Damage Potential: PDV causes yield losses that can reach up to 50% in sour cherry. It also causes low bud-take in nurseries (40 to 50% less compared with healthy stocks) and slows the growth of young trees (Caglayan et al., 2011). PDV and other ilarviruses act synergistically in mixed infections, causing peach stunt disease. Trees show a progressive decline that can lead to tree death (Uyemoto and Scott, 1992). PDV is probably the most damaging almond infecting Ilarvirus and causes chlorotic mottle, line pattern, and occasionally, stunted vegetation in the Mediterranean region (Martelli and Savino, 1997).

Worldwide Distribution: PDV occurs worldwide (Nemeth, 1986; Kunze, 1988; CABI, 2023).

Official Control: Prune dwarf virus is on the USDA PCIT's Harmful Organism list for Australia, Canada, China, Colombia, Egypt, Georgia, Guatemala, Honduras, Israel, Japan, Republic of Korea, Mexico, Nauru, New Caledonia, Nicaragua, Peru, Taiwan, Turkey. It is on the EPPO's A2 list for Egypt and Turkey, it is a quarantine pest in Canada and Mexico, and a regulated non-quarantine pest in Switzerland and the United Kingdom.

The California Department of Food and Agriculture runs a fruit and nut tree registration and certification program. Eligible *Prunus* trees may be registered for the purpose of providing rootstock and scion sources for the propagation of certified nursery stock when inspected and tested for regulated diseases, including Prune dwarf virus.

California Distribution: Butte, Calaveras, Contra Costa, El Dorado, Kern, Kings, Sacramento, San Diego, San Joaquin, Santa Clara, Solano, Stanislaus, Sutter, Tehama, Tulare, and Yolo counties (French, 1989; CDFA PDR database, 2023).

California Interceptions: none

The risk that Prune dwarf virus would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** This pathogen is likely to be found wherever 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 be established in a larger but limited part of California.
- **High (3) likely to establish a widespread distribution in California.**

2) **Known Pest Host Range:** The hosts are in the genera *Prunus* and *Crataegus.*

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 multiplies only within its hosts. Insects can facilitate transmission but are not true vectors. The ability to spread with pollen leads to very high dispersal potential.

Evaluate the natural and artificial dispersal potential of the pest.

Score: 3

- 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 causes damage to trees and to fruit yield and it is one of the most economically important viruses of stone fruit trees, especially peach, sweet and sour cherry, plum, and almond. It is a quarantine pathogen for some trading partners including Canada and Mexico.

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

Economic Impact: A, B, C

A. The pest could lower crop yield.
B. The pest could lower crop value (including increasing crop production costs).
C. The pest could trigger the loss of markets (including 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, this virus can impact home gardening.

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

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: 2

- 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 Prune dwarf virus*:* High

Add up the total score and include it here. **13**
-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.

This virus is widespread in California.

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 the 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* ***= 10***

Uncertainty: none

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for **Prune dwarf virus is C.**

References:

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***Comment Period: 10/12/2023 through 11/26/2023**

***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.

Proposed Pest Rating: C