California Pest Rating Proposal for

Plum bark necrosis stem pitting-associated virus

Current Pest Rating: None

Proposed Pest Rating: C

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

Initiating Event:

In May 2018, a stone fruit nursery in Kern County requested virus testing of cherry trees for phytosanitary certification for export. Samples were collected by Kern County agricultural officials. CDFA plant pathologist Tongyan Tian identified plum bark necrosis stem pitting-associated virus (PBNSPaV) by quantitative reverse transcription PCR (RT-qPCR) from two samples. At that time, a pest rating was not assigned pending a pest rating review. The risk posed by this pathogen is assessed herein and a permanent rating is proposed.

History & Status:

Background: In 1986, USDA and UC Davis researchers identified young 'Black Beaut' plum trees (*Prunus salicina*) in two orchards in Tulare County that showed bark necrosis and gumming. The internal woody cylinders of the branches and trunks were severely pitted. The symptoms were shown to be caused by a graft-transmissible agent by Uyemoto and Teviotdale in 1996. A compete viral RNA genome was cloned and sequenced in 2007 at UC Davis by Al Rwahnih et al. and Plum bark necrosis stem pitting-associated virus, a positive sense single stranded RNA virus in the family Closteroviridae and the genus Ampelovirus, was described. Over the last 30 years, PBNSPaV has been detected in Asia, Europe, and South America in multiple species of *Prunus.*

Foundation Plant Services (FPS) in Davis, CA works with CDFA plus plant pathology researchers and the fruit tree industry to develop and introduce new materials originating from breeding programs, domestic and foreign public collections, and private plantings. Trees are tested and treated to eliminate disease and qualified for planting in the FPS Foundation Orchard. Regular serological and bioassay tests and twice-a-year visual inspections retain the CDFA certified status of the trees. FPS reports that PBNSPaV is a common virus in their foundation and they have also detected it in multiple samples sent to them from around the state for diagnosis (M. Al Rwahnih, pers. comm, 9/6/19).

Hosts: Prunus armeniaca (apricot), *Prunus domestica* (plum), *Prunus cerasifera* (ornamental plum), *Prunus salicina* (Japanese plum), *Prunus serrulata* (Japanese flowering cherry), *Prunus avium* (sweet cherry), *Prunus persica* (peach), *Prunus persica* var. *nucipersica* (nectarine), *Prunus dulcis* (almond) (Cui et al., 2011; Boscia et al., 2011; CABI, 2019).

Symptoms: From inoculation studies on cherries with PBNSPaV, a six-month incubation period ends with the arrival of chlorotic ring spots on young expanding leaves in the spring. A year later, chronic symptoms of light green or water-soaked marks appear on the leaf midrib. In plums, the formation of gumballs and die back of the bark begins in the second season after inoculation, with more severe symptoms appearing in the third year. Plums do not develop leaf symptoms as cherries do. Peaches, almond, some sweet cherries, Japanese cherries, and some prune and plum varieties developed latent and symptomless infections where they tested positive after inoculation but never developed any disease (Marini et al., 2002; Marini et al., 2007). In Southern Italy, apricot trees (*Prunus armeniaca*) showed similar bark and stem symptoms and PBNSPaV was identified as the causal agent (Di Terlizzi and Savino, 1995). In China, sweet cherry trees infected with PBNSPaV had symptoms of long and crinkled leaves, minor fruit-set, and late fruit-ripening (Wang et al., 2016).

Transmission: Plum bark necrosis stem pitting-associated virus can be graft transmitted. Even if the grafts fail to form completely, the virus can move between scion and rootstock (Marini et al., 2002). The virus is not mechanically transmitted and has no known vector, although natural virus spread has been reported (Di Terlizzi et al., 1995). As with other similar virus species, PBNSPaV is not known to be seed transmitted.

Damage Potential: From the original orchard detections in Tulare County, nearly all the trees exhibited coupious numbers of dark gumballs on the scaffold branches and main trunks. Eventually both orchards had to be removed and replanted (Marini et al., 2002). In China, damage to trees infected with this virus was described as “devistating” and included general decline, gummosis, flattening of scaffold branches, and stem necrotic pits in peach, nectarine, plum, ornamental plum, sweet cherry, and flowering cherry (Cui et al., 2011). In Spain, the virus was detected in apricots but there were no symptoms (Garcia-Ibarra, et al., 2010). A survey of stone fruit trees in Europe and Asia was able to identify PBNSPaV with incidence of 26% in Italy, 40% in Egypt, 51% in Serbia and 70% in Turkey (Matic et al., 2010)

Worldwide Distribution: China, Chile, Egypt, Italy, Japan, Korea, Morocco, Serbia, Spain, United States, Turkey (CABI, Bouani et al., 2004; Di Terlizzi and Savino, 1995; Amenduni et al., 2005; Usta et al., 2007; Zamorano et al., 2017; Garcia-Ibarra et al., 2010; Mandic et al., 2005; El Maghraby et. al., 2006)

Official Control: None

California Distribution: Originally described from Tulare County and found by CDFA in Kern County (see “Initiating events”) plus reports from Foundation Plant Services (see “Background”).

California Interceptions: None

The risk Plum bark necrosis stem pitting-associated virus would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** Climate should not be a limiting factor; this disease should be able to survive wherever its hosts are grown.

   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 *Prunus* spp. but there are many important agricultural and horticultural species.

   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:** There is just one report from Italy of natural spread of this disease: all other reports are of transmission through grafting of infected budwood.

   Evaluate the natural and artificial dispersal potential of the pest.

   Score: 1

   - **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 disease can be latent and symptomless in some hosts and extremely damaging to others. Infected nursery stock should be destroyed to limit spread of disease.

   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:** This virus is unlikely to spread to native *Prunus* spp. as it has no known vectors. No environmental impact has been reported during the decades it has already been in California. It could impact ornamental plantings if they are not tested with the same rigor as commercial fruit trees.

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 *Plum bark necrosis stem pitting-associated virus is Medium:*

Add up the total score and include it here. **9**
-Low = 5-8 points
-Medium = 9-12 points
-High = 13-15 points

6) **Post Entry Distribution and Survey Information**: This disease was first identified and described in California. CDFA detections have been in Kern and Tulare counties however FPS reports detecting it frequently in samples they receive from various California locations.

Evaluation is 'Medium'.

Score: -2
-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* ***= 7***

Uncertainty:

The distribution of PBNSPaV in California has not been formally surveyed. However, virus incidence is likely low in commercial nursery stock because Shiro plum is used as a standard *Prunus* virus indicator in the California Stone Fruit and Nut Tree Registration and Certification program, and that indicatior should easily detect PBNSPaV. It is possible that there are still unknown vectors in California that could disperse this virus and infect plants.

Conclusion and Rating Justification:

Based on the evidence provided above **the proposed rating for *Plum bark necrosis stem pitting-associated virus* is C.**

References:

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cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

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