California Pest Rating Profile for

Blueberry shock virus

Pest Rating: B as of 08/28/2024

Kingdom: Viruses and viroids, Category: Riboviria, Category: Orthornavirae, Phylum: Kitrinoviricota, Class: Alsuviricetes, Order: Martellivirales, Family: Bromoviridae, Genus: Ilarvirus

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Comment Period: 07/12/2024 through 08/26/2024

Initiating Event:

In May 2024, a blueberry grower in Humboldt County submitted a sample for disease testing through their UCCE Farm Advisor. A highbush blueberry (*Vaccinium corymbosum* 'Chandler') was experiencing scorching of branch tips, including flowers and buds, during bloom. The presence of Blueberry shock virus (BlShV) was confirmed by CDFA Virologist Tongyan Tian. Official samples from the bush and surrounding bushes were collected by biologists from the Humboldt County Agricultural Commissioner's Office. No additional positives were found, and BlShV was assigned a temporary Q-rating. This pathogen has not been through the pest rating process. The risk to California from Blueberry shock virus is described herein and a permanent rating is proposed.

History & Status:

Background:

California produces blueberries in 28 counties on over 8,000 acres, with a total value in 2022 of $206M (CDFA Ag Stats, 2023). The counties with the largest acreages are Tulare, San Joaquin, Kern, and Fresno. Commercial production is exclusively with northern highbush varieties of *Vaccinium corymbosum*, a perennial, deciduous shrub native to North America.

Blueberry shock disease is caused by Blueberry shock virus (BlShV), which belongs to the genus Ilarvirus. BlShV is a typical member of the genus *Ilarvirus* (family Bromoviridae), with a tripartite genome of positive-sense, single-stranded RNA, quasi-isometric in shape (MacDonald et al., 1991). Woody plants are the primary hosts of ilarviruses.

BlShV was initially detected on blueberries in the Pacific Northwest (MacDonald et al., 1991) and has since been detected in other blueberry-growing regions in Canada and the United States, including California, Michigan, New York, Nova Scotia, and Pennsylvania (Martin et al., 2012). The virus has a narrow herbaceous host range and causes ringspot-like symptoms on some tobacco varieties artificially inoculated with homogenized blueberry flowers (MacDonald et al., 1991). BlShV has never been found in native vegetation, making the origins of the virus uncertain. Movement of infected planting stock is likely to introduce disease into new areas (MacDonald et al., 1991).

Hosts: Blueberries are the only known host of BlShV. All blueberries are thought to be susceptible to the virus, though extensive cultivar trials have not been published. Some blueberry cultivars may exhibit tolerance, which means plants become infected but do not suffer loss of fruit production; however, such plants can still transmit the virus to other blueberries.

Symptoms: Infection of blueberries occurs with pollen during flowering, with the aid of honeybees, and symptoms are noticeable within 1 to 2 years. Symptoms may appear on the entire plant, or only on a few branches. Some infected plants may show only dieback and flower necrosis, while others show a 'shock' reaction that includes severe defoliation (Bristow and Martin, 1999). Symptoms peak just as the plant is in full bloom. In early summer, foliage and flowers appear blighted, eventually dropping off and leaving bare branches. By the end of summer, infected plants can have a new flush of growth and form reproductive buds for the next year. By harvest time, infected bushes look nearly normal except for the absence of fruit. Where only partial blighting occurs, the bushes will usually show symptoms the following year on previously symptomless wood (Martin et al., 2012; Bristow and Martin, 2002).

BlShV-infected blueberry plants can demonstrate a phenomenon called "symptom recovery", becoming asymptomatic 1 to 3 years after the onset of symptoms (Bristow and Martin, 2002). Recovered plants will continue to test positive for the virus and can serve as inoculum sources in the field (Martin et al., 2009). Virus symptoms are influenced by many factors including the cultivar, time of year, and weather.

Transmission: Ilaraviruses are spread by virus-infected pollen grains by wind, by bees or other pollinating insects, and mechanically by thrips feeding on virus-infected pollen and moving to new plants. It can also be spread with systemically infected planting material (Bujarski et al., 2019; Bristow and Martin, 1999).

Damage Potential: Initially, shock disease includes tip dieback with the flowers becoming necrotic, greatly reducing the amount of fruit on shock-infected bushes. BlShV-infected bushes often show reddening of foliage, defoliation, dieback, and reduced yields for three to four years. Although yield losses up to 90% can occur in the year of blighting, recovery limits losses in subsequent years. After three to four years, infected plants recover normal bloom and fruit production. Infected plants regrow foliage, but curved tips of dead shoots often remain, and sometimes show branching near the growing point (Bristow and Martin, 2002). The impact on yield, if any, with the leaf reddening symptoms is still unknown.

Worldwide Distribution: Canada, United States (Martin et al., 2012).

Official Control: BlShV is on the EPPO's A1 list for Argentina, Brazil, and Chile, the A2 list for COSAVE (Comite de Sanidad Vegetal del Cono Sur), and is a regulated non-quarantine pest in the European Union, Switzerland, and the United Kingdom (EPPO, 2024). It is on the USDA PCIT's harmful organisms list for Brazil, Chile, Japan, Peru, and the Republic of Korea (USDA PCIT 2024).

California Distribution: One official sample from Humboldt County (see initiating event). In 2012, Martin et al. reported they had detected BlShV recently in California but did not give county locations.

California Interceptions: none.

The risk that BlShV would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** This disease is likely to occur wherever its host 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 host range is limited to blueberries

   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:** The ability to spread with wind-borne and insect-carrying pollen makes large epidemics of this disease possible.

   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:** Blueberry shock disease can have a profound impact on yield for several years, before the bushes seem to recover.

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

Economic Impact: A, 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: **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: none

Evaluate the environmental impact of the pest on 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 BlShV*:* Medium

Add up the total score and include it here. **10**

-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.

Published and official detections suggest this virus has a limited distribution in California.

Evaluation is 'Low'.

Score: -1

-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:

Final Score: *Score of Consequences of Introduction – Score of Post Entry Distribution and Survey Information* ***= 9***

Uncertainty:

Blueberry shock disease can be confused with blueberry scorch disease caused by Blueberry scorch virus. However, plants affected with BlShV produce a second flush of leaves after flowering and the plants will appear normal by late summer, except for the lack of fruit.

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for **Blueberry shock virus is B.**

References:

Bristow, P.R. and Martin, R.R., 1999. Transmission and the role of honeybees in field spread of blueberry shock ilarvirus, a pollen-borne virus of highbush blueberry. Phytopathology, 89(2), pp.124-130.

Bujarski J., Gallitelli D., García-Arenal F., Pallás V., Palukaitis P., Reddy M.K., Wang A. ICTV virus taxonomy profile: Bromoviridae. J. Gen. Virol. 2019;100:1206–1207.

EPPO Database. https://gd.eppo.int/taxon/ BLSHV0 Accessed 6/13/2024

MacDonald, S. G., Martin, R. R., and Bristow, P. R. 1991. Characterization of an ilarvirus associated with a necrotic shock reaction in blueberry. Phytopathology 81:210-214.

Martin, R.R.; Tzanetakis, I.E.; Caruso, F.L.; Polashock, J.J. 2009. Emerging and reemerging virus diseases of blueberry and cranberry. Acta Hortic., 810, 299–304.

Martin, R.R., Polashock, J.J. and Tzanetakis, I.E., 2012. New and emerging viruses of blueberry and cranberry. Viruses, 4(11), pp.2831-2852.

USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PExD) Harmful Organisms Database Report. Blueberry shock virus. Accessed 6/13/2024.

Responsible Party:

Heather J. Martin, Primary Plant Pathologist/Nematologist, CDFA/PHPPS ECOPERS, 1220 N St Rm 221, Sacramento, CA 95814 Phone: (916) 654-1017, permits[@]cdfa.ca.gov.

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*Comment Period: 07/12/2024 through 08/26/2024

*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.

Pest Rating: B