

California Pest Rating Proposal for

Pea early-browning tobravirus

Current Pest Rating: none

Proposed Pest Rating: B

Kingdom: Viruses and viroids, Category: Riboviria,
Category: Orthornavirae, Phylum: Kitrinoviricota,
Class: Alsuviricetes, Order: Martellivirales,
Family: Virgaviridae, Genus: *Tobravirus*

Comment Period: 06/06/2023 through 07/21/2023

Initiating Event:

This pathogen has not been through the pest rating process. The risk to California from Pea early-browning tobravirus (PEBV) is described herein and a permanent rating is proposed.

History & Status:

Background: The genus *Tobravirus* is in the family Virgaviridae, which holds seven genera of rod-shaped plant viruses with positive sense single stranded RNA. It was named for the type strain **Tobacco rattle virus**. Tobraviruses are transmitted mechanically and vectored by soil-borne nematodes in the genera *Nanidorus*, *Paratrichodorus* and *Trichodorus* (Trichodoridae). These genera have the common name “stubby root nematodes” and are widespread in California.

<https://blogs.cdfa.ca.gov/Section3162/?p=6389>, (Chitambar et al., 2018).

Pea early-browning virus causes a serious disease in peas. It can also infect beans, clover, alfalfa, sugar beet, and some common weeds. The disease has few or no symptoms in these other hosts, but from weeds it can be transmitted by nematodes to peas. Weeds have an important role in the maintenance and spread of tobraviruses. Seed transmission has also been reported.

This virus scores “moderate” in phytosanitary risk criteria (CABI, 2023), with a moderate economic importance and no distribution in North America. It can be seed transmitted but the seedborne incidence is low. It is listed as a pest of concern in the CDFA phytosanitary seed field inspection manual.

<https://www.cdfa.ca.gov/plant/pe/nsc/docs/seed/CPTM-PhytosanitaryFieldInspectionCropLists.pdf>

Hosts: Beta vulgaris var. *saccharifera* (sugarbeet), *Cucumis sativus* (cucumber), *Eschscholzia californica* (California poppy), *Lupinus luteus* (yellow lupin), *Medicago lupulina* (black medick), *Medicago sativa* (alfalfa), *Phaseolus vulgaris* (common bean), *Pisum sativum* (pea), *Solanum nigrum* (black nightshade), *Trifolium pratense* (red clover), *Trifolium repens* (white clover), *Tropaeolum majus* (nasturtium), *Vicia faba* (faba bean) (CABI, 2023).

Symptoms: The symptoms of PEBV can vary depending on the severity of the infection and the stage of the plant's growth. Symptoms on peas include i) stunting: Infected plants may grow more slowly than healthy plants and may appear smaller or stunted; ii) leaf yellowing: Leaves on infected plants may turn yellow or brown, and the veins of the leaves may remain green; iii) necrosis- infected plants may exhibit necrosis, or death of plant tissue, which can large necrotic segments develop in the stipules and leaflets and brown or black lesions on the stems, leaves, or pods; iv) reduced yield: Infected plants may produce fewer pods or smaller peas, which can reduce the overall yield of the crop; and v) delayed maturity: Infected plants may take longer to mature than healthy plants, which can delay the harvest of the crop. Necrotic areas sometimes occur on the pods. Seed from infected plants of some pea varieties may show greenish-grey discoloration of the seed coat and can be severely wrinkled. Large patches of dying plants in a field can be a symptom of a severe outbreak (Harrison, 1973; Bamford and Zuckerman, 2021; CABI-CPC, 2023)

Transmission: Like the other members of *Tobravirus*, PEBV is transmitted in soil by species of free-living plant parasitic nematodes of the family Trichodoridae, specifically by *Trichodorus* and *Paratrichodorus* spp. The virus can persist in the vector for weeks or months but does not multiply in the vector. These nematodes prefer free-draining sandy or light clay soil. It is also seed transmitted in several hosts, with Wang et al. (1997) reporting that pea seed embryos were uniformly infected with PEBV from the earliest stages of embryo development. Pea early-browning virus may be transmitted by 4 to 10% of the seed of infected plants (Agrios, 2005).

Damage Potential: There is a direct impact of this disease on pea yield and seed quality

Worldwide Distribution: Africa: *Algeria, Ethiopia, Libya, Morocco*; Europe: *Belgium, Italy, Netherlands, Poland, Sweden, United Kingdom* (CABI, 2023).

Official Control: Pea early-browning virus is on the EPPO's A1 list for Argentina, Brazil, Egypt, Inter-African Phytosanitary Council (IAPSC) and Jordan, and on the USDA PCIT's Harmful organisms list for Brazil, Colombia, Ecuador, Egypt, Georgia, India, Israel, Japan, Mozambique, New Zealand, Peru, Syrian Arab Republic, and Taiwan (EPPO, 2023; USDA PCIT, 2023).

California Distribution: none

California Interceptions: none

The risk Pea early-browning tobravirus would pose to California is evaluated below.

Consequences of Introduction:

1) Climate/Host Interaction:

Evaluate if the pest would have suitable hosts and climate to establish in California.

Score: 2

- 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.

Risk is Medium (2) – The hosts and vectors are widely distributed in California; the disease is likely to occur wherever susceptible hosts are grown.

2) Known Pest Host Range:

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.

Risk is low (2) – Peas are the primary host. There can be asymptomatic hosts including weeds

3) Pest Reproductive Potential:

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.

Risk is High (3) – The virus can only multiply inside a susceptible host, and the nematode vector moves very slowly under natural conditions. The seedborne nature in some hosts increases dispersal potential.

4) Economic Impact:

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.**

Risk is high (3) – Pea early browning infects peas and can cause significant damage to pea crops. The nematode vectors are also plant pathogens.

5) Environmental Impact:

Evaluate the environmental impact of the pest to 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.

Risk is Medium (2) –The pathogen could significantly impact cultural practices or home garden plantings.

Consequences of Introduction to California for: Medium

Add up the total score and include it here. **11**

-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 'not established'.

Score: 0

-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 = 11

Uncertainty:

None

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for **Pea early-browning virus is B.**

References:

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Wang, D., Macfarlane, S.A. and Maule, A.J., 1997. Viral determinants of pea early browning virus seed transmission in pea. *Virology*, 234(1), pp.112-117.

Responsible Party:

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***Comment Period: 06/06/2023 through 07/21/2023**

***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](mailto: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: B
