CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Broad bean mottle virus

Current Pest Rating: none

Proposed Pest Rating: B

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

Comment Period: 06/24/2026 through 08/08/2026

Initiating Event:

This pathogen has not been through the pest rating process. It is an important pathogen for export seed certification for fava beans. The risk to California from broad bean mottle virus is described herein, and a permanent rating is proposed.

History & Status:

Background:

With a dry summer climate and geographic isolation from other production areas of the United States, California enjoys "freedom-from" status for many foliar and pod pathogens of legumes and has a significant industry of seed growing for export. For seeds to qualify for federal phytosanitary certification, they must be free of several important seed-borne diseases, including broad bean mottle virus (BBMV).

Broad bean (more commonly called fava bean) is one of the oldest cultivated plants known, with its culture extending back to prehistoric times. Fava beans are a cool-season annual legume related to vetch. It has been cultivated as a pulse, vegetable, animal feed, and cover crops in California for more than 120 years. It is similar in size to a lima bean and is native to the Mediterranean region, including Italy and Iran. In California, fava beans are grown as seed crops along the coast from Lompoc to Salinas and in the Northern Sacramento Valley, but in other areas of the state, they are grown mostly as a cover crop or for green manure (Brasier et al., 2024).

Broad bean mottle virus (BBMV) was first described in England from a severely diseased crop of fava bean (*Vicia faba)* in Nottinghamshire (Bawden et al., 1951) and was later reported from a crop in Cambridge, also in England (Tinsley, 1957). The family Bromoviridae is widely distributed among hosts worldwide. Broad bean mottle virus is classified in the genus Bromovirus. BBMV has a tripartite linear single-stranded RNA (ssRNA) (+). It is a seed-borne virus that infects temperate pulses and other hosts.

This virus has been of academic interest for its unusually high concentration in infected cells and for the inclusion bodies that form in infected plant cells. BBMV is a convenient model for viruses infecting legumes (Lastra and Schlegel, 1975; Shrestha et al., 2022). The virus is transmitted by insects of the Order Coleoptera (beetles): *Acalymma trivittata* Mannerheim, *Apion arrogans* Wencher, *A. radiolus* Kirby, *A. vorax* Herbst, *Colaspis flavida* Say, *Diabrotica undecimpunctata* Mannerheim, *Hypera variabilis* Herbst, *Pachytychius strumarius* Gyll, *Sitina lineatus* var. *viridifrons* Motsch, *Sitona crinitus* Herbst, *S. limosa* Rossi, *S. lineatus* L., *Spodoptera exigua* Hübner, and *Smicronyx cyaneus* Gyll (Fortass and Diallo, 1993; Tawaha et al., 2024; Walters and Surin, 1973).

Hosts: Capeslla bursa-pastoris (shepherd's purse), *Cicer arietinum* (chickpea), *Datura stramonium* (jimsonweed), *Gomphrina globosa* (globe amaranth), *Glycine max* (soybean), *Lathyrus odoratus* (sweet pea), *Lens culinaris* (lentil), *Lupinus albus* (white lupin), *Melilotus albus* (white sweet clover), *Melilotus officinalis* (yellow sweet clover), *Nicotiana benthaminana* (benth), *N. clevelandii* (Cleaveland's tobacco), *N. glutinosa* (flowering tobacco), *N. tabacum* (common tobacco), *Phaseolus* (common bean), *Pisum sativum* (pea), *Tetragonia tetragonoides* (New Zealand spinach), *Trifolium incarnatum* (crimson clover), *T. pratense* (red clover), *T. subterranean* (subterranean clover), and *Trigonella foenum-graecum* (fenugreek), *Vicia faba* (broad bean or fava bean) *Vicia sativa* (common vetch), *Vigna unguiculata* (cowpea) (Bawden et al., 1951; Walters and Surin, 1973; Fischer, 1979).

Symptoms: This virus causes chlorotic mosaic and vein-clearing in most hosts. In *Vicia faba*, tip leaves show vein-clearing and later develop a characteristic blotchy mosaic. The symptoms produced in fava bean are mainly mottling, marbling, or diffuse mosaic, which is often associated with leaf malformation and sometimes with plant stunting. Some bean genotypes may show necrosis. BBMV can affect seed quality by causing necrosis and shriveling of the seed. In *Phaseolus vulgaris*, some cultivars show a bright interveinal mottle (Tawaha et al. 2024). *Pisum sativum* develops a lethal systemic wilt (Gibbs, 1972). Symptomless systemic infection has been described in many other legumes, such as cowpea, several cultivars of bean, soybean, and vetch (Makkouk et al., 1988).

Transmission: BBMV particles form in fava bean plants in very high concentrations, and seed transmission in this species (1.37%) was confirmed by Makkouk et al. (1988). Beetles spread the disease through a non-circulative, semipersistent mechanism. The virus is transmitted during feeding when beetles, having acquired the virus from infected plants, transport it in their gut and deposit it into new, healthy plant tissue (Wielkopolan et al., 2021).

Damage Potential: Disease epidemics are most severe when plants get infected during early stages of growth, e.g., from the seed (Bourbah and Fezzaz, 1979). Surveys in North Africa and the Middle East have documented infection rates as high as 58% and fava bean grain yield loss of 35–55%, depending on time of BBMV infection (Makkouk et al., 1988). Host reactions are variable between species, with peas suffering a lethal systemic wilt, while others show a mild chlorosis on the leaves, or for some hosts, plants are symptomless with no loss of yield.

Worldwide Distribution: Primarily found in Europe, Africa, and Asia, often reported in Mediterranean countries (Makkouk et al. 1988; Gibbs, 1972).

Official Control*:* BBMV is on the USDA PCIT's Harmful Organism List for Argentina, Egypt, India, Israel, Japan, Mexico, and New Zealand. It is on the EPPO's A1 list for Iran, A2 list for Jordan, a quarantine pest for Mexico, and a regulated non-quarantine pest for Egypt (EPPO, 2026).

California Distribution: none

California Interceptions: none

The risk that broad bean mottle virus would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** This virus is likely to be found 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 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 large, with hosts in multiple plant families.

   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:** Even with a low percentage from a single seed crop, seed transmission is a major concern. Beetle vectors increase disease spread within a field and to new fields.

   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 decreases yield, it is a quarantine pest in some places, and it is vectored by plant-feeding beetles. Seed from infected fields should not be used for plantings.

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

Economic Impact: A, B, C, E

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:** This virus could affect native legumes.

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

Environmental Impact: A

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 Broad bean mottle virus*:* High

Add up the total score and include it here. **14**

-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 consequence 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* ***= 14***

Uncertainty:

With many asymptomatic hosts, this virus may already be present in California.

Conclusion and Rating Justification:

Based on the evidence provided above, the proposed rating for **broad bean mottle virus is B.**

References:

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***Comment Period: 06/24/2026 through 08/08/2026**

***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: B
