CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Pest Rating Proposal for

Tobacco mild green mosaic virus

Current Pest Rating: none

Proposed Pest Rating: C

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

Comment Period: 07/03/2026 through 08/17/2026

Initiating Event:

This pathogen has not been through the pest rating process. It is an important pathogen for export tomato seed certification. The risk to California from tobacco mild green mosaic virus is described herein, and a permanent rating is proposed.

History & Status:

Background:

Tobacco mild green mosaic virus (TMGMV) is a species in the genus *Tobamovirus* (family Virgaviridae). Tobamoviruses are among the most extensively studied plant viruses and include several economically important pathogens such as tobacco mosaic virus (TMV), tomato mosaic virus (ToMV), pepper mild mottle virus (PMMoV), and tomato brown rugose fruit virus (ToBRFV). Members of the genus possess a monopartite, positive-sense single-stranded RNA genome encapsidated within rigid rod-shaped particles approximately 18 nm in diameter and 300–310 nm in length (ICTV 2023). Tobamoviruses are distinguished from other members of the family Virgaviridae by their non-segmented genome organization and are characterized by exceptional environmental stability (ICTV 2023). Virions can remain infectious in dried plant tissues and contaminated sap for years, and thermal inactivation temperatures (i.e., temperatures necessary to “kill” the virus) may approach 90 °C (ICTV 2023).

Unlike many economically important plant viruses, tobamoviruses are not known to be transmitted by insects, mites, or nematode vectors. Natural spread occurs primarily through mechanical transmission, including direct plant-to-plant contact, contaminated tools, handling during cultural operations, propagation activities, and infected plant debris. Some tobamoviruses may also be associated with seed transmission through contamination of seed coats, although embryo infection generally does not

occur (ICTV 2023). As a result, sanitation and the use of clean propagation material are the principal management strategies for tobamovirus diseases.

TMGMV was originally described as a distinct tobamovirus infecting tobacco and related hosts and likely has synonymized as mild dark-green tobacco mosaic virus, para-tobacco mosaic virus, and certain strains of tobacco mosaic virus before modern taxonomic revision. Sequencing of the complete viral genome demonstrated that TMGMV is a distinct species within the genus *Tobamovirus* (Solis and García-Arenal 1990). Subsequent molecular studies have shown that TMGMV populations exhibit substantial genetic diversity and geographic structure, particularly in populations infecting the wild host *Nicotiana glauca* (Fraile et al., 1996).

Tree tobacco (*Nicotiana glauca*) appears to be one of the most important natural reservoir hosts of TMGMV. This perennial shrub, native to South America and widely naturalized throughout California, is common in disturbed habitats, roadsides, riparian corridors, vacant lots, and urban interfaces. Fraile et al. (1996) examined TMGMV isolates collected from *N. glauca* populations in California, Australia, Spain, and the eastern Mediterranean Basin, and demonstrated significant genetic diversity among geographic populations. The authors concluded that viral populations exhibited substantial differentiation and that *N. glauca* serves as a long-term reservoir for TMGMV.

Additional studies conducted in southern California demonstrated extensive genetic variation within local TMGMV populations. Bodaghi et al. (2000) analyzed isolates obtained from 58 naturally infected *N. glauca* plants in southern California and identified two major viral groups that differed in the structure of the 3’ untranslated region. The authors concluded that both viral types were widespread within Southern California populations. A subsequent study found that natural mixed infections involving the two TMGMV genotypes occurred frequently in *N. glauca* populations and that cross-protection interactions could occur between strains (Bodaghi et al., 2004). These findings suggest that TMGMV has been established in California for a prolonged period and has undergone substantial local evolutionary diversification.

The host range of TMGMV is centered in the Solanaceae but extends beyond that family. Natural hosts include species of *Nicotiana*, pepper (*Capsicum annuum*), petunia (*Petunia* spp.), and several ornamental species. More recent investigations have demonstrated infection of hosts in multiple plant families and suggest that host adaptation may be less restrictive than previously believed (de Andrés-Torán et al., 2023). Symptoms vary depending on host species, cultivar, environmental conditions, and virus isolate, and may include mosaic, mottling, chlorosis, leaf distortion, necrosis, stunting, and reduced vigor. Because symptom expression overlaps substantially with that caused by other tobamoviruses, laboratory testing is required for reliable diagnosis.

Hosts: Hosts reported for Tobacco green mild mosaic virus include *Calibrachoa* sp. (calibrachoa), *Capsicum annuum* (bell pepper, chili pepper), *Capsicum chinense* (habanero pepper and related peppers), *Eryngium aquaticum* (rattlesnake master), *Eryngium planum* (blue eryngo), *Gesneria* sp. (gesneria), *Impatiens* sp. (impatiens), *Nicotiana glauca* (tree tobacco), *Nicotiana tabacum* (cultivated tobacco), *Osteospermum* sp. (African daisy), *Petunia integrifolia* (wild petunia), *Petunia* sp. (petunia), *Solanum lycopersicum* (tomato), *Tabernaemontana divaricata* (crape

jasmine), *Torenia fournieri* (wishbone flower), and *Tradescantia spathacea* (oyster plant) (EPPO, 2026; de Andrés-Torán et al., 2023).

Symptoms: Symptoms vary with host, cultivar, virus isolate, plant age, and environmental conditions. In *Nicotiana glauca*, TMGMV may cause bright yellow mosaic, mild green mosaic, or oak-leaf patterns. In tobacco, symptoms may include mild mosaic or mottling, and later leaves may become weakly symptomatic or nearly symptomless. Pepper may develop severe mosaic, mottling, necrosis, and leaf drop. In some ornamental hosts, symptoms may be inconspicuous. Because symptoms are not diagnostic and can resemble those caused by other tobamoviruses, and because it is often found in mixed infections, reliable identification requires laboratory testing (Parrella et al., 2006; Nemes et al., 2015; Bello et al., 2025).

Transmission: TMGMV is readily transmitted by mechanical inoculation, plant handling, contaminated tools, plant-to-plant contact, infected sap, contaminated plant debris, and propagation or cultural practices that move infectious sap between plants. No natural biological vector is known. For tobamoviruses, seed transmission is generally associated with contamination of the seed coat or external seed tissues rather than embryo infection. Although tobamoviruses are often associated with seed transmission, there is no definitive evidence confirming that pepper or tomato seeds are a pathway for TMGMV (ASTA PeDS, 2026).

The most important pathways for movement are infected plants for planting, contaminated tools or equipment, infected plant debris, contaminated seed or seed lots, and infected ornamental or solanaceous hosts moved through nursery or greenhouse production. TMGMV's stability increases the risk that contaminated surfaces, plant residues, and handling practices can sustain spread, even without insect vectors (CABI, 2021).

Damage Potential: TMGMV is primarily a concern for crops and nursery hosts that are susceptible to tobamovirus infection, especially pepper, tobacco, and some ornamentals. In pepper, infection can be severe and may reduce marketability through foliar mosaic, necrosis, defoliation, and reduced plant vigor. In ornamental production, symptoms may reduce plant quality, although some infected hosts can be inconspicuous. In wild or naturalized *N*. *glauca*, TMGMV may persist as a reservoir and may occur in mixed infections with other viruses and satellite tobacco mosaic virus. The presence of established reservoirs in California reduces the feasibility of eradication and increases the importance of sanitation, clean propagation material, and accurate diagnosis (Font et al., 2009; Matthews and Hull, 2022).

The current impact is likely limited because TMGMV is already present in naturalized *N*. *glauca* populations in California and is not known to be vector transmitted. However, movement of infected plants or contaminated material could introduce TMGMV into protected production systems, nurseries, or susceptible crops where impacts may be greater.

Worldwide Distribution: Africa: *Réunion, Tunisia*. Asia: *China, Iran, Israel, Jordan, Taiwan, Turkey*. Europe: *Hungary, Spain*. North America: *Panama, United States* (California, Louisiana, Mississippi). South America: *Venezuela* (CABI, 2021).

Official Control*:* TMGMVO is on the USDA PCIT's harmful organism list for El Salvador, Honduras, Japan, and Nicaragua (USDA PCIT, 2026). It is a regulated non-quarantine pest in the United Kingdom (EPPO, 2026).

California Distribution: Lake, Riverside, San Joaquin, and Santa Barbara counties (CDFA PDR database; French, 1989).

California Interceptions: none

The risk that tobacco mild green mosaic virus would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** Climate is unlikely to be a limiting factor to TMGMV establishment in California. The virus is established in regions with Mediterranean, subtropical, and arid climates. TMGMV is likely to be established where susceptible hosts are present.

   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 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:** Originally known from solanaceous hosts, a recent host range study has expanded this species to multiple families (de Andrés-Torán et al., 2023)

   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:** Efficient spread can be made mechanically without an insect vector and virions of tobamoviruses are extremely stable. The most rapid spread is seen in greenhouses where plants are handled a lot.

   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:** TMGMV infects economically important crops, including pepper and tomato. Infection reduces vigor and yield. Management requires extensive sanitation, exclusion, and destruction of infected material to limit spread.

   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:** TMGMV infects several ornamental species and reduces their growth and aesthetic value. There is no evidence that it significantly impacts native plant communities.

   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 Tobacco mild green mottle 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.

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:

Further surveys and epidemiological studies of California native plants would improve understanding of the potential impacts of TMGMV in California.

Conclusion and Rating Justification:

Based on the evidence provided above, the proposed rating for **tobacco mild mosaic virus is C.**

References:

ASTA Pest Database for Seeds (PeDS). 2026. Tobacco mild green mosaic virus. https://phytodatabase.org//detail/pest/818 accessed 6/19/26

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USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PExD) Harmful Organisms Database Report. Tobacco mild green mosaic virus. Accessed 6/17/2026.

Responsible Party:

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***Comment Period: 07/03/2026 through 08/17/2026**

***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: C