California Pest Rating Profile for

Plantago asiatica mosaic virus

Pest Rating: C

Kingdom: Viruses and Viroids, Category: Riboviria,
Category: Orthornavirae, Phylum: Kitrinoviricota,
Class: Alsuviricetes, Order: Tymovirales,
Family: Alphaflexiviridae, Genus: Potexvirus

Comment Period: 07/21/2026 through 09/04/2026

Initiating Event:

In May 2026, an agricultural biologist in San Luis Obispo County submitted a lily sample to CDFA's Plant Pest Diagnostics Center from a regulatory cut-flower nursery inspection. Plant Pathologist Tongyan Tian identified Plantago asiatica mosaic virus from the plants, which showed symptoms of stunting and discoloration on the foliage. In California, this pathogen has previously only been found affecting *Nandina domestica*, and it has not been through the pest rating process. The risk to California from Plantago asiatica mosaic virus is described herein, and a permanent rating is proposed.

History & Status:

Background:

The natural occurrence of Plantago asiatica mosaic virus (PlAMV) in *Plantago asiatica* in the Russian Far East was reported in the 1970s (Kostin and Volkov, 1976), and during the same period, it was also observed in *Nandina domestica* in California (Moreno et al., 1976; Zettler et al., 1980). More recently, PlAMV has emerged as a damaging virus of ornamental lilies (Moreno et al., 1976; Hughes et al., 2005; Hammond et al., 2015; Hammond, 2018; Komatsu and Hammond, 2022).

PlAMV is a potexvirus. Potexviruses have flexuous filamentous virions and positive-sense single-stranded RNA genomes with five open reading frames, including a replicase, triple gene block movement proteins, and a coat protein (Solovyev et al., 1994; International Committee on Taxonomy of Viruses, 2026; Komatsu and Hammond, 2022). Potexviruses are generally transmitted mechanically, with no known vectors (International Committee on Taxonomy of Viruses, 2026). Hughes et al. (2005) sequenced PlAMV first and Nandina mosaic virus second. They concluded they were the same virus

and the name PlAMV should take precedence, with the name Nandina mosaic virus relegated to a synonym. The virus is also called *Potexvirus marmorplantagonis* (International Committee on Taxonomy of Viruses, 2026; EPPO, 2026).

In heavenly bamboo (*Nandina domestica*), PlAMV is easily transmitted, and today it is widespread in the nursery trades. It causes only mild mosaic symptoms on leaves. The virus became more important after it was detected in Asiatic and Oriental lily bulbs imported into the United States from the Netherlands, and those detections were associated with necrotic symptoms in greenhouse-grown lilies (Hammond et al., 2015). PlAMV is readily transmitted between lilies through roots or contaminated planting medium and by mechanical transmission during bulb processing or horticultural operations (Hammond and Rane, 2024).

Hosts: Lilium spp. (lily), *Lilium lancifolium*, *Lilium leichtlinii* var. *maximowiczii*, *Lilium longiflorum* (Easter lily), *Nandina domestica* (heavenly bamboo), *Plantago asiatica* (Asiatic plantain), *Primula sieboldii* (Japanese primrose), *Rehmannia glutinosa* (Chinese foxglove), *Urtica hyperborea* (Himalayan nettle), *Urtica laetevirens* (Asian nettle), and *Viola grypoceras* (Japanese violet) (CABI, 2026; EPPO, 2026).

Symptoms: Symptoms vary depending on the host species, virus isolate, cultivar, environmental conditions, and plant age. In cultivated lilies, infections commonly produce chlorotic mosaic, mottling, chlorotic or necrotic streaking, leaf distortion, reduced vigor, and diminished flower quality. Highly susceptible Asiatic and Oriental hybrid lilies may develop severe systemic necrosis characterized by reddish-brown streaks on leaves and stems, progressive collapse of foliage, and premature plant death. Some cultivars exhibit only mild chlorotic mottling, whereas others become severely necrotic. In its original host, *Plantago asiatica*, infections are frequently mild or asymptomatic. Likewise, numerous naturally and experimentally infected hosts may harbor the virus without obvious symptoms, allowing infected plants to remain undetected while serving as sources of inoculum (Komatsu et al., 2022; Hammond et al., 2015).

Transmission: PlAMV is transmitted primarily through infected vegetative propagation material, especially infected lily bulbs. International movement of infected bulbs has been identified as the principal pathway responsible for global spread of the virus (Hammond et al., 2015; Komatsu et al., 2022). The virus is readily transmitted mechanically because potexvirus particles are highly stable. Mechanical transmission occurs through sap contamination during propagation, harvesting, handling, cutting, pruning, and contact between wounded plants or contaminated tools (Komatsu et al., 2022).

No insect vector has been demonstrated despite considerable investigation. Current evidence indicates that natural spread occurs primarily through mechanical means and movement of infected propagative material rather than by arthropod vectors (Komatsu et al., 2022; CABI, 2018). Experimental transmission has been achieved through mechanical inoculation to numerous herbaceous hosts under greenhouse conditions, but these studies do not necessarily indicate natural transmission pathways.

Damage Potential: PlAMV has become one of the most economically significant viral diseases of cultivated lilies. Commercial losses result primarily from reduced marketability of flowering plants and cut flowers due to necrotic foliage, stem lesions, poor plant appearance, and reduced flower quality.

Severe infections may render entire crops unmarketable (Komatsu et al., 2022). Because lilies are propagated vegetatively, infected bulbs serve as long-term sources of inoculum. Latently infected bulbs may enter commercial production and distribute the virus widely before symptoms become evident, making eradication difficult once the virus becomes established in propagation systems. Losses in affected Dutch greenhouse cut-flower lily production were reported as significant, with up to 80 percent losses in some greenhouse situations (Hammond et al., 2015).

The damage to *Nandina* is minor in comparison. Plants develop a mild mosaic or mottling with light red or chlorotic discoloration. Leaves can be misshapen, strappy, or slightly twisted. Plants can be stunted. *Nandina* are often co-infected by one or both nandina stem pitting virus and cucumber mosaic virus, which produces more serious symptoms than PlAMV, including thin or shoestring leaves, a wine-red discoloration in spring, severe reduction of flowers, or reduced berry production (Simone, 2001; Hughes et al., 2005).

The virus has a broad experimental and natural host range that includes ornamental species, weeds, and several asymptomatic reservoir hosts. These hosts may contribute to long-term persistence of the virus and complicate disease management. Nevertheless, documented economic damage is concentrated overwhelmingly in commercial lily production, where susceptible cultivars can develop severe systemic necrosis and significant economic losses. Evidence of comparable economic impacts in most non-lily hosts remains limited (Komatsu et al., 2022).

Worldwide Distribution: America: Chile, Costa Rica, United States of America. Asia: China, Japan, the Republic of Korea, and Taiwan. Europe: Hungary, Italy, the Netherlands, the Russian Federation, and the United Kingdom (CABI, 2026).

Official Control*:* Plantago asiatica mosaic virus is on USDA PCIT's harmful organism list for El Salvador, Mexico, and New Zealand (USDA PCIT, 2026). It is a quarantine pest in Mexico (EPPO, 2026).

California Distribution: Statewide (French, 1989).

California Interceptions: none

The risk that Plantago asiatica mosaic virus would pose to California is evaluated below.

Consequences of Introduction:

1) **Climate/Host Interaction:** PlAMV has been reported statewide from cultivated *Nandina domestica* in California for 50 years. Susceptible hosts and suitable environments occur widely in the state.

   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 includes plants in multiple 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:** This virus does not have a vector and is not known to be seed borne. PlAMV has high human-assisted dispersal potential. It is moved in vegetative propagative material, including lily bulbs, and can spread through contaminated tools, roots, and contaminated growing media

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.

4) **Economic Impact:** PlAMV can greatly reduce the marketability of ornamental lilies. It is under official control in some countries.

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:** This disease impacts ornamental plantings.

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 Plantago asiatica mosaic virus*:* Medium

Add up the total score and include it here. **12**
-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* ***= 9***

Uncertainty:

There is uncertainty around virus strain identity. California records are largely from disease on *Nandina*. Worldwide, the highest damage reports are associated with lily isolates in commercial lily production and international bulb movement. A first detection has been made recently in greenhouse grown lilies (for cut flowers). If lily-associated isolates are present in California production or imported bulb pathways, risk would be higher. A second uncertainty is host range. Experimental inoculation indicates that PlAMV can infect many plant species, but natural reservoir status, symptom expression, and epidemiological importance are not known for all experimental hosts (Hammond and Rane, 2024). This uncertainty affects host range interpretation and environmental impact.

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for **Plantago asiatica mosaic virus is C.**

References:

CABI, 2018. CABI Compendium. Plantago asiatica mosaic virus https://doi.org/10.1079/cabicompendium.121894 Accessed 6/26/26

EPPO Database. 2026. *Potexvirus marmorplantagonis.* https://gd.eppo.int/taxon/PLAMV0 Accessed 6/26/2026

French, A. M. 1989. California plant disease host index. CA Division of Plant Industry. 2nd Ed. 394 pg

Hammond, J. 2018. Plantago asiatica mosaic virus. CABI Compendium. CAB International. DOI: 10.1079/cabicompendium.121894.

Hammond, J., Bampi, D. and Reinsel, M. D. 2015. First report of Plantago asiatica mosaic virus in imported Asiatic and Oriental lilies (*Lilium* hybrids) in the United States. Plant Disease 99, 292. DOI: 10.1094/PDIS-08-14-0792-PDN.

Hammond, J. and Rane, K. 2024. Assessment of the experimental host range of a lily isolate of Plantago asiatica mosaic virus (PlAMV), an emerging virus. Acta Horticulturae 1392, 87-94. DOI: 10.17660/ActaHortic.2024.1392.10.

Hughes, P. L., Harper, F., Zimmerman, M. T. and Scott, S. W. 2005. Nandina mosaic virus is an isolate of Plantago asiatica mosaic virus. European Journal of Plant Pathology 113, 309-313. DOI: 10.1007/s10658-005-0624-2.

International Committee on Taxonomy of Viruses. 2026. Genus Potexvirus. ICTV Report on Virus Taxonomy. Available at: https://ictv.global/report/chapter/alphaflexiviridae/alphaflexiviridae/potexvirus. Accessed 25 June 2026.

Komatsu, K. and Hammond, J. 2022. Plantago asiatica mosaic virus: an emerging plant virus causing necrosis in lilies and a new model RNA virus for molecular research. Molecular Plant Pathology 23, 1401-1414. DOI: 10.1111/mpp.13243.

Kostin, V.D., and Volkov, Y. 1976. Some properties of the virus affecting *Plantago asiatica* [in Russian]. Virusnye Bolezni Rastenij Dalnego Vostoka, 25:205–210.

Moreno, P., Attathom, S., Weathers, L.G. 1976. Identification, transmission, and partial purification of a potexvirus causing a disease of Nandina plants in California. Proceedings of the American Phytopathological Society, 3:319.

Simone, G.W. Nandina diseases. In: Jones, R.K. and Benson, D.M. (eds.) 2001. Diseases of Woody Ornamentals and Trees in Nurseries. St. Paul, MN: APS Press.

USDA Phytosanitary Certificate Issuance and Tracking System, Phytosanitary Export Database (PExD) Harmful Organisms Database Report. Nandina mosaic potexvirus and Plantago asiatica mosaic virus. Accessed 6/26/2026.

Solovyev, A. G., Novikov, V. K., Merits, A., Savenkov, E. I., Zelenina, D. A., Tyulkina, L. G. and Morozov, S. Y. 1994. Genome characterization and taxonomy of Plantago asiatica mosaic potexvirus. Journal of General Virology 75, 259-267. DOI: 10.1099/0022-1317-75-2-259.

Tanaka, M., Verbeek, M., Takehara, M., Pham, K., Lemmers, M., Slootweg, C., Arie, T. and Komatsu, K. 2019. Differences in infectivity and pathogenicity of two Plantago asiatica mosaic virus isolates in lilies. European Journal of Plant Pathology 153, 813-823. DOI: 10.1007/s10658-018-1594-5.

Zettler, F.W., Hiebert, E., Maciel-Zambolim, E., Christie, R.G., El-Nil, M.M.A., 1980. A potexvirus infecting Nandina domestica 'Harbor Dwarf'. Acta Horticulturae, 110:71-77.

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.

***Comment Period: 07/21/2026 through 09/04/2026**

***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.

Pest Rating: C