

California Pest Rating Proposal for

Dracaena mottle virus

Current Pest Rating: Z

Proposed Pest Rating: C

Virus; Realm: Riboviria
Kingdom: Paramvirae; Phylum: Artverviricota;
Class: Revtraviricetes; Order: Ortervirales;
Family: Caulimoviridae; Genus: Badnavirus

Comment Period: 04/08/2021 through 05/23/2021

Initiating Event:

In February 2021, agricultural officials in San Diego County submitted samples of lucky bamboo (*Dracaena sanderiana*) to CDFA's Plant Pest Diagnostics Center. A wholesale nursery in that county had previously submitted samples to a private plant pathology lab for diagnostic testing. The private lab detected Dracaena mottle virus (DrMV) by PCR and genomic sequencing. As this was a reportable first detection in California, San Diego County collected official samples and asked for confirmation of the presence of DrMV. CDFA plant pathologist Tongyan Tian was also able to detect and confirm DrMV by using PCR and genomic sequencing. Pathologist Tian assigned it a temporary Z rating. The risk to California from DrMV is described herein and a permanent rating is proposed.

History & Status:

Background: DrMV is a member of Badnavirus group. They are **bacilliform dsDNA** viruses without a membrane envelope. Badnaviruses cause economically important diseases in tropical crops including sugarcane, taro, and yucca, and in ornamentals including canna, kalanchoe, and schefflera. They are known to infect both monocots and dicots, though most of the species have a limited host range. They are transmitted by mealybugs, and occasionally by aphids, in a semi-persistent manner (Bhat et al., 2016).

Some badnaviruses are endogenous viruses; their sequences have integrated into the genome of the host by illegitimate recombination. Endogenous viruses can be latent, until awakened through abiotic stressors. In 2006, Su et al. reported that a badnavirus had been cloned from symptomatic *Dracaena*

sanderiana plants in China and named it Dracaena mottle virus (DrMV). They showed it was distinct from other badnaviruses and found sequences of it in the genomic DNA of asymptomatic *D. sanderiana* plants, suggesting that DrMV sequences were integrated into the plant genome. The diagnostics of this group is challenging because only the presence of the episomal (non-integrated) form of the virus is considered a positive indicator of infection. Since episomal virus particles were found, the San Diego County sample was positive. DrMV was reported in the United States in Florida in 2014 by Baker and Jeyaprakash.

Dracaena sanderiana is a species of flowering plant in the family Asparagaceae, native to Western and Central coastal Africa. It is a monocot but not a true bamboo; *Dracaena* is in the Order Asparagales and subfamily Nolinoideae, whereas bamboos are in the Order Poales and family Poaceae. *Dracaena sanderiana* is a popular houseplant and can be grown easily from cuttings. It is grown extensively in Taiwan and China, where propagators braid, twist and curl the stems into shapes that resemble bamboo. The common names of “lucky bamboo”, “fortune bamboo”, and “Chinese water bamboo”, lead to the incorrect assumption that the plant is of Asian origin. Lucky bamboo in various forms is thought to increase feng shui, bringing positive energy into your home or office, and believed to bring good luck and good fortune, especially if given as a gift (VanZile, 2014).

Hosts: Dracaena sanderiana (syn *D. braunii*) (Su et al., 2007).

Symptoms: Disease symptoms can be mild to moderate and include chlorotic mottling or necrotic streaks, deformation of leaves, and reduced internode lengths with stunting. Plants may be asymptomatic, with symptoms manifesting when subjected to abiotic stress, such as temperature shifts and depletion of nutrients (Bhat et al., 2016). It is possible that the manipulation in the form of braiding, twisting, and curling the young stalks could be the stressor on the plants that triggers viral symptoms (Baker and Jeyaprakash, 2014).

Transmission: Most badnaviruses infect perennial hosts that are vegetatively propagated with cuttings. International, large-scale, primary transmission is through the movement of infected cuttings. Secondary spread is with various mealybug species, sometimes with aphids semi-persistently. Seed transmission is a possibility with this group of viruses, but lucky bamboo is not usually grown from seed. No insect vector has been identified for Dracaena mottle virus.

Damage Potential: Lucky bamboo is an ornamental and any damage to the leaves or stems decreases their esthetic value. It is possible that the majority of cultivated *D. sanderiana* plants have DrMV DNA in their nuclear genome and would test positive for this virus. PCR testing cannot distinguish between free virus particles or integrated viral DNA. Removing the virus from the plants would be extremely difficult. Some research has suggested that the integrated virus may suppress infection by other plant viruses (Mette et. al. 2002).

Worldwide Distribution: Badnaviruses are distributed in tropical and temperate regions of Africa, Asia, Australia, Europe, and South and North America. DrMV has been reported in China, New Zealand, and the United States (California and Florida) (Su et al., 2007, Lyttle et al., 2011; Baker and Jeyaprakash, 2014).

Official Control: None

California Distribution: There has been one detection of BrMV in San Diego County in a nursery.

California Interceptions: None

The risk *Dracaena mottle virus* would pose to California is evaluated below.

Consequences of Introduction:

- 1) Climate/Host Interaction:** *Dracaena sanderiana* is a tropical plant only grown indoors in all but the warmest parts of California.

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

Score: 1

- **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.

- 2) Known Pest Host Range:** The host range is limited to *Dracaena sanderiana*.

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:** There are no known vectors of DrMV. It spreads only with infected cuttings.

Evaluate the natural and artificial dispersal potential of the pest.

Score: 1

- **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:** Plants grown as ornamentals lose value if they show viral symptoms such as mottling, chlorosis or stunting. Viral expression is often associated with stress from horticultural manipulation into “bamboo shapes” or from low nutrient levels

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

Economic Impact: A, B

- 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: 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:** Lucky bamboo is valued for its unique appearance and the ability to braid it into appropriate shapes for feng shui. If the presence of the virus reduces the ability to manipulate its form, this would be a significant cultural change.

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 Dracaena mottle virus: Low

Add up the total score and include it here. **7**

-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
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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.

There is one official sample from San Diego County.

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 introduction score minus the post entry distribution and survey information score: (Score) 6

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

Uncertainty:

None

Conclusion and Rating Justification:

Based on the evidence provided above the proposed rating for **Dracaena mottle virus** is **C**.

References:

Baker, C. A., and Jeyaprakash, A. 2014. Dracaena mottle virus in lucky bamboo. Plant Pathology Circular No. 413. Florida Department of Agriculture and Consumer Services, Division of Plant Industry, FDACS-P-01977

Bhat, A.I., Hohn, T. and Selvarajan, R., 2016. Badnaviruses: the current global scenario. Viruses, 8(6), p.177.

Lyttle, D.J., Orlovich, D.A. and Guy, P.L., 2011. Detection and analysis of endogenous badnaviruses in the New Zealand flora. AoB Plants, 2011.

Mette, M.F., Kanno, T., Aufsatz, W., Jakowitsch, J., Van der Winden, J., Matzke, M.A. and Matzke, A.J.M., 2002. Endogenous viral sequences and their potential contribution to heritable virus resistance in plants. *The EMBO Journal*, 21(3), pp.461-469.

Su, L., Gao, S., Huang, Y., Ji, C., Wang, D., Ma, Y., Fang, R. and Chen, X., 2007. Complete genomic sequence of *Dracaena mottle virus*, a distinct badnavirus. *Virus Genes*, 35(2), pp.423-429.

VanZile, J. 2014. Growing lucky bamboo.
<http://houseplants.about.com/od/typesofhouseplants/a/LuckyBamboo.htm>

Responsible Party:

Heather J. Scheck, Primary Plant Pathologist/Nematologist, CDFA/PHPPS ECOPERS, 2800 Gateway Oaks Suite 200, Sacramento, CA 95833 Phone: (916) 654-1017, [permits\[@\]cdfa.ca.gov](mailto:permits[@]cdfa.ca.gov).

***Comment Period: 04/08/2021 through 05/23/2021**

***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: C
