

2017

Genome Sequence of Euphorbia mosaic virus from Passionfruit and Euphorbia heterophylla in Florida

J. E. Polston
University of Florida

M. A. Londoño
University of Florida

A. L. Cohen
University of South Florida

M. Padilla-Rodriguez
University of South Florida

K. Rosario
University of South Florida

See next page for additional authors

Follow this and additional works at: https://scholarcommons.usf.edu/msc_facpub

 Part of the [Life Sciences Commons](#)

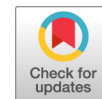
Scholar Commons Citation

Polston, J. E.; Londoño, M. A.; Cohen, A. L.; Padilla-Rodriguez, M.; Rosario, K.; and Breitbart, Mya, "Genome Sequence of Euphorbia mosaic virus from Passionfruit and Euphorbia heterophylla in Florida" (2017). *Marine Science Faculty Publications*. 693.
https://scholarcommons.usf.edu/msc_facpub/693

This Article is brought to you for free and open access by the College of Marine Science at Scholar Commons. It has been accepted for inclusion in Marine Science Faculty Publications by an authorized administrator of Scholar Commons. For more information, please contact scholarcommons@usf.edu.

Authors

J. E. Polston, M. A. Londoño, A. L. Cohen, M. Padilla-Rodriguez, K. Rosario, and Mya Breitbart



Genome Sequence of *Euphorbia mosaic virus* from Passionfruit and *Euphorbia heterophylla* in Florida

J. E. Polston,^a M. A. Londoño,^{a*} A. L. Cohen,^{b*} M. Padilla-Rodriguez,^{b*} K. Rosario,^b M. Breitbart^b

Department of Plant Pathology, University of Florida, Gainesville, Florida, USA^a; College of Marine Science, University of South Florida, St. Petersburg, Florida, USA^b

ABSTRACT *Euphorbia mosaic virus* (EuMV) was found in a symptomatic passionfruit (*Passiflora edulis*) plant from Homestead, Florida, USA, as well as in the symptomatic weed *Euphorbia heterophylla*. This is the first identification of EuMV in Florida and the United States and the first report of a natural infection of passionfruit by EuMV.

Euphorbia mosaic virus (EuMV) is a species of *Begomovirus* (*Geminiviridae*), a taxon of plant viruses characterized by single-stranded circular DNA genomes (1). EuMV has a bipartite genome consisting of a DNA-A (2,609 to 2,615 nucleotides [nt]) and a DNA-B (2,571 to 2,590 nt).

DNA was extracted from the leaves of a passionfruit plant (*Passiflora edulis* Sims) showing symptoms of leaf distortion and necrotic spots (2). The leaves were collected in 1993 from Homestead, Florida, USA, desiccated, and stored at 4°C. A DNA-A (2,609 nt; KJ647290), and a DNA-B (2,545 nt; KJ647291) were cloned from *EcoRI* and *AvaI*-digestion of rolling-circle amplification products generated using random hexamers. Pairwise scores generated by the Species Demarcation Tool (SDT) indicated that the DNA-A and the DNA-B had the greatest similarity, 98.6% and 97.2%, respectively, to the DNA-A and the DNA-B of EuMV-[CU:Hav:27:07] obtained from *Euphorbia heterophylla* L. in Cuba (HQ896201, HQ896201) (3, 4). The common regions of the DNA components (344 nt) were 97% identical, indicating that these constitute an isolate of *Euphorbia mosaic virus* (EuMV-[US:Fl:PF:313:1993]).

Samples of *E. heterophylla* plants showing symptoms of bright foliar mosaic were collected from Homestead, Florida, in 2013. A DNA-A (2,609 nt; JQ963887) and a DNA-B (2,585 nt; JQ963888) were obtained through cloning and sequencing of *XmnI*-digested rolling-circle amplification products generated using random hexamers. SDT pairwise scores indicated that the DNA-A and the DNA-B had their highest identities, 98.8% and 98.1%, respectively, with those of EuMV-[US:Fl:PF:313:1993]. The common regions of the components (341 nt) were 97% identical, indicating that these constitute a bipartite begomovirus, designated EuMV-[US:Fl:Eu4]. The B component sequences differed in size due to a 40-nt deletion near the iterons in EuMV-[US:Fl:PF:313:1993]. While the presence of a begomovirus in symptomatic *E. heterophylla* has been known in Homestead, Florida, for many years (5), EuMV is the first virus to be associated with those disease symptoms.

DNA-A and DNA-B clones of EuMV-[US:Fl:PF:313:1993] were successfully inoculated to passionfruit 'Liliko'i' and *Phaseolus vulgaris* 'Topcrop' (6). Symptoms in *P. edulis* began as a mild mottling followed by necrotic spots, leaf deformation, and flower abortion. These symptoms are similar to those described for *Passionfruit severe leaf distortion virus* (from Brazil) but different from those of two other partially characterized begomoviruses (7–9). Symptoms in *P. vulgaris*, severe leaf distortion and stunting, were similar to

Received 19 December 2016 **Accepted** 23 December 2016 **Published** 2 March 2017

Citation Polston JE, Londoño MA, Cohen AL, Padilla-Rodriguez M, Rosario K, Breitbart M. 2017. Genome sequence of *Euphorbia mosaic virus* from passionfruit and *Euphorbia heterophylla* in Florida. *Genome Announc* 5: e01714-16. <https://doi.org/10.1128/genomeA.01714-16>.

Copyright © 2017 Polston et al. This is an open-access article distributed under the terms of the [Creative Commons Attribution 4.0 International license](https://creativecommons.org/licenses/by/4.0/).

Address correspondence to J. E. Polston, jep@ufl.edu.

* Present address: M. A. Londoño, Universidad Distrital Francisco José de Caldas, Bogotá, Colombia; A. L. Cohen, Department of Microbiology and Immunology, University of California, San Francisco, San Francisco, California, USA; M. Padilla-Rodriguez, Department of Cellular and Molecular Medicine, University of Arizona, Tucson, Arizona, USA.

those described for EuMV-YP from Mexico (10). Whitefly adults (*Bemisia tabaci* Genn. MEAM1) successfully transmitted EuMV from bean to bean, but not from passionfruit to either bean or passionfruit (11). *P. edulis* has been reported to be a poor colonization host for the MEAM1 whitefly (12).

Surveys of passionfruit in Homestead, Florida, from 2011 to 2012 failed to identify any EuMV-infected passionfruit plants, although EuMV-infected *E. heterophylla* plants with whiteflies were readily found. EuMV-[US:Fl:PF:313:1993] may have been transmitted from *E. heterophylla* to passionfruit by a whitefly that was later displaced by *B. tabaci* MEAM1, which first appeared in Florida in the mid-1980s (13, 14).

To our knowledge, this is the first report of EuMV as the causal agent of a disease in passionfruit and the first report of EuMV in the United States.

Accession number(s). The sequences of EuMV-[US:Fl:PF:313:1993] were deposited in GenBank under the accession numbers [KJ647290](#) and [KJ647291](#) (DNA-A and DNA-B, respectively), and the sequences of EUMV-[US:Fl:Eu4] were deposited in GenBank under the accession numbers [JQ963887](#) and [JQ963888](#).

ACKNOWLEDGMENT

We thank H. Capobianco for technical assistance.

REFERENCES

- King AMQ, Adams MJ, Carstens EB, Lefkowitz EJ. 2011. Virus taxonomy: 9th report of the International Committee on Taxonomy of Viruses. Academic Press/Elsevier, London.
- Polston JE, Londoño MA, Capobianco H. 2014. The complete genome sequence of the New World jatropha mosaic virus. *Arch Virol* 159: 3131–3136. <https://doi.org/10.1007/s00705-014-2132-1>.
- Muhire BM, Varsani A, Martin DP. 2014. SDT: A virus classification tool based on pairwise sequence alignment and identity calculation. *PLoS One* 9:e108277. <https://doi.org/10.1371/journal.pone.0108277>.
- Fiallo-Olivé E, Navas-Castillo J, Moriones E, Martínez-Zubiaur Y. 2012. Begomoviruses infecting weeds in Cuba: increased host range and a novel virus infecting *Sida rhombifolia*. *Arch Virol* 157:141–146. <https://doi.org/10.1007/s00705-011-1123-8>.
- Kim KS, Fulton RW. 1984. Ultrastructure of *Datura stramonium* infected with an euphorbia virus suggestive of a whitefly-transmitted geminivirus. *Phytopathology* 74:236–241. <https://doi.org/10.1094/Phyto-74-236>.
- Guenoune-Gelbart D, Sufrin-Ringwald T, Capobianco H, Gaba V, Polston JE, Lapidot M. 2010. Inoculation of plants with begomoviruses by particle bombardment without cloning: using rolling circle amplification of total DNA from infected plants. *J Virol Methods* 168:87–93. <https://doi.org/10.1016/j.jviromet.2010.04.022>.
- Ferreira SS, Barros DR, de Almeida MR, Zerbini FM. 2010. Characterization of passionfruit severe leaf distortion virus, a novel begomovirus infecting passionfruit in Brazil, reveals a close relationship with tomato-infecting begomoviruses. *Plant Pathol* 59:221–230. <https://doi.org/10.1111/j.1365-3059.2009.02205.x>.
- Brown JK, Bird J, Fletcher DC. 1993. First report of passiflora leaf mottle disease caused by a whitefly-transmitted geminivirus in Puerto Rico. *Plant Dis* 77:1264. <https://doi.org/10.1094/PD-77-1264C>.
- Novaes QS, Freitas-Astua J, Yuki VA, Kitajima EW, Camargo LEA, Rezende JAM. 2003. Partial characterization of a bipartite begomovirus infecting yellow passion flower in Brazil. *Plant Pathol* 52:648–654. <https://doi.org/10.1046/j.1365-3059.2003.00878.x>.
- Hernández-Zepeda C, Idris AM, Carnevali G, Brown JK, Moreno-Valenzuela OA. 2007. Molecular characterization and experimental host range of euphorbia mosaic virus-Yucatan Peninsula, a begomovirus species in the *Squash leaf curl virus* clade. *Plant Pathol* 56:763–770. <https://doi.org/10.1111/j.1365-3059.2007.01652.x>.
- Polston JE, Capobianco H. 2013. Transmitting plant viruses using whiteflies. *J Vis Exp* 81:e4332. <https://doi.org/10.3791/4332>.
- Nunes ES, Brown JK, Moreira AG, Watson G, Lourenção AL, Piedade SMS, Rezende JAM, Vieira ML. 2008. First report and differential colonization of *Passiflora* species by the B biotype of *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodidae) in Brazil. *Neotrop Entomol* 37:744–746. <https://doi.org/10.1590/S1519-566X2008000600021>.
- Hoelmer KA, Osborne LS, Yokomi RK. 1991. Foliage disorders in Florida associated with feeding by sweetpotato whitefly, *Bemisia tabaci*. *Fla Entomol* 74:162–166. <https://doi.org/10.2307/3495258>.
- McKenzie CL, Hodges G, Osborne LS, Byrne FJ, Shatters RG, Jr. 2009. Distribution of *Bemisia tabaci* (Hemiptera: Aleyrodidae) biotypes in Florida—investigating the Q invasion. *J Econ Entomol* 102:670–676. <https://doi.org/10.1603/029.102.0227>.