Department of Agriculture
STATE OF HAWAII

NEW PEST ADVISORY

No. 20-02 **Issued July 2020**

Orchid fleck virus (OFV)

INTRODUCTION

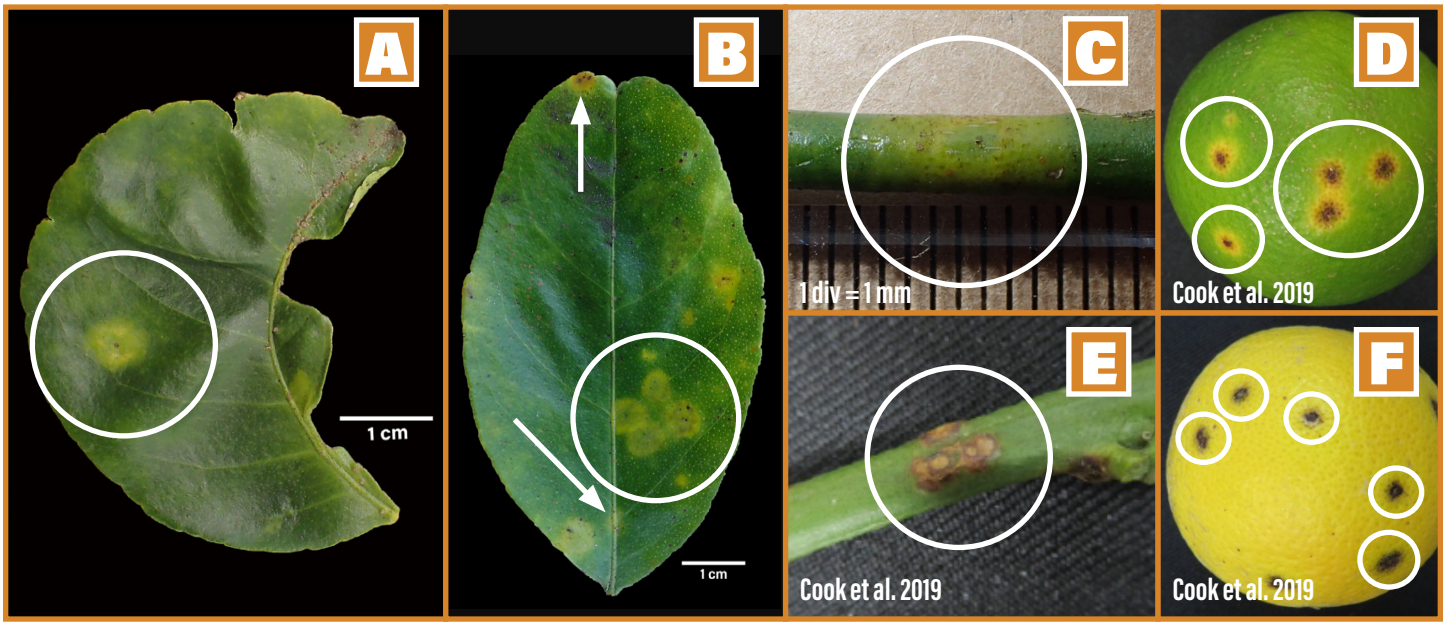
Orchid fleck virus (OFV) causing yellow lesions on leaves and stems was found infecting rough lemon and mandarin orange trees in February 2020 on Hawai'i Island. The virus causes yellow or black leaf lesions on a wide variety of hosts. In 1977, OFV was first described infecting *Cymbidium* sp. leaves in Japan (Doi et al. 1977). Since then, OFV has been reported worldwide infecting more than 70 plant species (Peng et al. 2013).

FIRST REPORT

Leaf and twig samples collected at the University of Hawai'i, College of Tropical Agriculture and Human Resources (UH-CTAHR), Waiākea Research Station were examined by UH-CTAHR researchers who found them to be infected with OFV. This finding was confirmed by scientists at the United States Department of Agriculture (USDA) in Beltsville, MD, who further characterized the virus as OFV orchid strain 2 (OFV-orc2). This confirmation represents new records for Hawai'i and the United States. All known infected trees have been destroyed, and the area will be monitored for any signs of recurrence.

SYMPTOMS

The most notable symptom of OFV are yellow or black bullseye lesions on leaves (images A & B) , twigs (images C & E), and fruits (images D & F). These lesions are mostly circular (image A) and can fuse if close together (image B). As lesions age they may change in color from yellow to brown or black. Each lesion represents a feeding site by *Brevipalpus* mites (flat mites) that carry and transmit the virus. Symptom development and display differs between hosts and varieties (Cook et al. 2019; Peng et al. 2013).



OFV lesion symptoms on citrus. A, Rough lemon leaf with solitary lesion (circle); B, Rough lemon leaf with solitary (arrows) and fused (circles) lesions; C, Rough lemon stem with yellow lesion; D, Unripe Delta Valencia orange with lesions (circles) ; E, Delta Valencia orange stem with brown lesion (circle); F, Ripe Midknight Valencia orange with lesions (circles).

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Plant Pest Control Branch
HAWAI'I DEPARTMENT OF AGRICULTURE

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BIOLOGY

Depending on the host, the virus may spread throughout the plant or remain where mites have fed (Kondo et al. 2003; Peng et al. 2013). For OFV to spread, both infected material and mites need to be present. *Brevipalpus* mites carry and transmit the virus between hosts (including between different host species). Mites acquire the virus by feeding on infected plants. Spread of OFV by garden tools has not been recorded outside of experimental settings (Cook et al. 2019).

High infestations of mites carrying OFV can be detrimental to host health like in the case of citrus. Citrus infected with OFV have the disease leprosis. Other viruses can also cause leprosis in citrus. Leprosis can reduce citrus yields and fruit quality, cause premature fruit drop, and in some instances kill trees (Bastianel et al. 2010; Roy et al. 2015). This disease is considered one of the major diseases impacting citrus production in Central and South America (Cook et al. 2019).

HOSTS

Although OFV was reported on only two hosts (rough lemon and mandarin orange) in Hawai'i, outside of Hawai'i, the virus has also been reported infecting sour orange, sweet orange, grapefruit, lime, royal lemon, and sweet lime (Beltran-Beltran et al. 2020; Roy et al. 2020). Additionally, other citrus varieties may also be susceptible to OFV. At this time, surveys conducted by HDOA and UH-CTAHR in Hawai'i have not detected OFV in hosts other than citrus. This includes but is not limited to known hosts elsewhere, i.e. orchids and ti (*Cordyline fruticosa*) (Dietzgen et al. 2018).

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SELECTED REFERENCES

Bastianel, M., Novelli, V. M., Kitajima, E. W., Kubo, K. S., Bassanezi, R. B., Machado, M. A., & Freitas-Astua, J. (2010). Citrus leprosis: Centennial of an unusual mite–virus pathosystem. *Plant Disease, 94*(3), 284-292.

Beltran-Beltran, A. K., Santillán-Galicia, M. T., Guzmán-Franco, A. W., Teliz-Ortiz, D., Gutiérrez-Espinoza, M. A., Romero-Rosales, F., & Robles-García, P. L. (2020). Incidence of *Citrus leprosis virus C* and *Orchid fleck dichorhavirus* citrus strain in mites of the genus *Brevipalpus* in Mexico. *Journal of Economic Entomology, 113*(3), 1576-1581.

Cook, G., Kirkman, W., Clase, R., Steyn, C., Basson, E., Fourie, P. H., Moore, S. D., Grout, T.G., Carstens, E., & Hattingh, V. (2019). Orchid fleck virus associated with the first case of citrus leprosis-N in South Africa. *European Journal of Plant Pathology, 155*(4), 1373-1379.

Dietzgen, R. G., Tassi, A. D., Freitas-Astúa, J., & Kitajima, E. W. (2018). First report of orchid fleck virus and its mite vector on green cordyline. *Australasian plant disease notes, 13*(1), 11.

Doi, Y., Chang, M.U., & Yora, K. (1977) Orchid Fleck Virus. CMI/AAB descriptions of plant viruses No. 183

Kondo, H., Maeda, T., & Tamada, T. (2003). Orchid fleck virus: *Brevipalpus californicus* mite transmission, biological properties and genome structure. *Experimental & Applied Acarology, 30*(1-3), 215-223.

Peng, D. W., Zheng, G. H., Zheng, Z. Z., Tong, Q. X., & Ming, Y. L. (2013). Orchid fleck virus: an unclassified bipartite, negative-sense RNA plant virus. *Archives of virology, 158*(2), 313-323.

Roy, A., Hartung, J. S., Schneider, W. L., Shao, J., Leon, G., Melzer, M. J., Beard, J.J., Otero-Colina, G., Bauchan, G.R., Ochoa, R., & Brlansky, R. H. (2015). Role bending: Complex relationships between viruses, hosts, and vectors related to citrus leprosis, an emerging disease. *Phytopathology, 105*(7), 1013-1025.

Roy, A., Stone, A. L., Otero-Colina, G., Wei, G., Brlansky, R. H., Ochoa, R., Bauchan, G., Schneider, W. L., Nakhla, M.K., & Hartung, J. S. (2020). Reassortment of genome segments creates stable lineages among strains of orchid fleck virus infecting citrus in Mexico. *Phytopathology, 110*(1), 106-120.

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