- The GM citrus tristeza viruses in question expresses spinach proteins that are intended to protect citrus trees from a bacterial disease. A GM virus approach is one of many being developed to control a bacterial disease of citrus trees that entered the USA in 2005. Infections by this bacteria has resulted in a 60% reduction in Florida orange production, the bacterial disease is called 'citrus greening ' or Huanglongbing (source)

- The reported transmissibility of the GM virus in the environment is low, being spread between trees by intentionally grafting an infected piece of plant material onto a tree (insect viral transmission, the wild-type mode, is "*unlikely*"). There is limited or no direct dual-use concern in these circumstances.

- GM virus or transgenic proteins have not been reported from fruit - consequently it may be argued that the fruit from GM virus infected trees need not be considered as genetically modified by US regulators (though fruit may have not been tested, Jan 2018).

- *"Based on greenhouse studies, the best guess is that somewhere between 70 and 80% of trees would retain the foreign sequence for perhaps 10 years. Afterwards, however, the inserted sequences will be recombined out and the plants would be infected with a CTV* [citrus tristeza virus] *isolate identical to that which is already endemic in the state. "* W. O. Dawson, in Plant Viral Vectors (Springer, Berlin, Heidelberg, 2011; https://link.springer.com/chapter/10.1007/82_2011_182), Current Topics in Microbiology and Immunology, pp. 1–18.

- The current 400 acre experiment in Hendry and Polk Counties, FL (running until August 31, 2019) included this text in the original 2016 permit application about fruit from GM virus infected trees *"This fruit will* **not be allowed to enter the food or feed chain** *without establishment of an* **exemption** *from the requirement of a tolerance (on a temporary basis)."* An **exemption** was subsequently granted by the EPA in 2016 until 2020 (and again in 2018 until 2021). The '*Preliminary Pest Risk Assessment'*, written by the USDA for the pending multisite 513500 acre permit **USDA 17-044-101r**, does not include any indication on whether oranges from GM infected trees **might enter the food or feed chain**, including in its '*Draft Permit Conditions'*(page 22, source).

- I am unaware of any public data on the effectiveness of this GM virus approach in protecting citrus trees in experimental field trials ongoing since 2010 (it is presumably part of some of the 9 issued USDA permits that are not currently public *(source))*.

- *"Florida produces more than 70 percent of the United States' supply of citrus, with major overseas export markets including Canada, Japan, France and the U.K."(source)*

- There is a persistent outward attraction of using genetically modified viruses in the environment, due to their perceived speed and flexibility. There have been at least 5 programs to develop GM viruses for use in the environment that have either been funded for >10 years or progressed to limited experimental field trials (n=4). None has ever been approved for widespread applied use; **Citrus tree protection might prove to be a global first for an applied use of GM viruses in the environment.**

- Much of the regulatory process necessary for oranges from trees infected with GM viruses to be commercialised has been completed. look out for either (1) publication in the Federal Register of a *'Final EIS*' and *'ROD'* related to Docket ID: *APHIS-2017-0018*, OR *(2) approval of a pending release permit* USDA 17-044-101r *that could cover approximately 10% of the 74 million orange trees in Florida (source)- if approved this would be the largest experimental permit ever issued by the USDA (based on records going back to Feb 1985).*

Background articles -note despite some confusion, this GM virus has no gene editing capacity i.e. CRISPR is not expressed by viruses.

Molteni, M. Florida's Orange Trees Are Dying, But a Weaponized Virus Could Save Them.2017, Wired Magazine

Ledford, H. Geneticists enlist engineered virus and CRISPR to battle citrus disease. *Nature News* **2017**, *545*, 277, doi: 10.1038/545277a.

Blake Bextine program manager of DARPA *Insect Allies*, appearing to link citrus tree GM virus protection with their program. "*When it comes to mature plants like citrus trees, often times the only effective solution to halting the spread of a threat requires destroying plants through slash-and-burn techniques within a given radius.*" George Dvorsky 4th Oct 2018, Gizmodo