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Dr. Washington Luís da Silva
Department of Plant Pathology and Ecology
The Connecticut Agricultural Experiment Station
123 Huntington Street, P. O. Box 1106
New Haven, CT 06504

Phone: (203) 974-8546
Fax: (203) 974-8502
Email: Washington.daSilva@ct.gov
Website: https://portal.ct.gov/caes

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Grapevine Fanleaf Degeneration/Decline Disease

Grapevine fanleaf degeneration/decline is one of the most serious virus diseases of grapes. This disease complex occurs in all major grape-growing regions in the world. In the United States, it has been reported in California, Maryland, Michigan, Missouri, New York, Pennsylvania, and Washington state. In 2018, we confirmed the presence of the disease in commercial vineyards in Connecticut and Rhode Island.

Causal Agents and Symptoms. Grapevine fanleaf virus belongs to a group of viruses called nepoviruses, which are vectored by nematodes. Several species of nepoviruses have been shown to cause grapevine fanleaf degeneration/decline disease (Table 1). Vines infected with one or more of those viruses eventually show decline overtime. Plants become stunted compared to healthy plants, and ultimately die. Fruit quality and winter hardiness are reduced. Berries become smaller and ripen irregularly in fewer clusters, which can lead to yield reductions of up to 80%. The fanleaf degeneration is the most common symptom, which is caused by an abnormal concentration of primary veins along with a widely open petiolar sinuses (area where the leaf attaches to the petiole). The resulting distorted shape gives the appearance of the fan-like leaf shape (Figure 1-A). Other symptoms are unusual chlorotic patterns on leaves such as a yellow mosaic or yellow veins (Figure 1).

The Host Range of nepoviruses varies by the virus species. While GFLV has a narrow host range, ToRSV, TRSV, BLMoV, PRMV, ArMV, CLRV, RpRSV, and TBRV can infect several small fruit plants (e.g. black elderberry, blueberry, currants, raspberry, and strawberry) (Table 1). Some of those viruses can also infect apricot, birch, cherry, hops, peach, plum, soybean, tobacco, and some common weeds including Bermuda grass, broadleaf plantain, dandelion, knotweed, and wild raspberry.

Table 1. Species of nepoviruses that cause fanleaf degeneration/decline disease. In bold are the two species found in Connecticut.

***Tobacco ringspot virus* (TRSV)**	*Grapevine chrome mosaic virus* (GCMV)
***Tomato ringspot virus* (ToRSV)**	*Grapevine deformation virus* (GDefV)
Arabis mosaic virus (ArMV)	*Grapevine fanleaf virus* (GFLV)
Artichoke Italian latent virus (AILV)	*Grapevine Tunisian ringspot virus* (GTRSV)
Blueberry leaf mottle virus (BLMoV)	*Peach rosette mosaic virus* (PRMV)
Cherry leafroll virus (CLRV)	*Raspberry ringspot virus* (RpRSV)
Grapevine Anatolian ringspot virus (GARSV)	*Strawberry latent ringspot virus* (SLRSV)
Grapevine Bulgarian latent virus (GBLV)	*Tomato black ring virus* (TBRV)

Figure 1. Typical fanleaf degeneration/decline disease symptoms. (A) fan-like morphology and leaf vein clearing, (B) leaf distortion and chlorosis, and (C) small and uneven developed berries in short clusters.

Transmission. Most nepoviruses are transmitted by dagger nematodes (*Xiphinema spp.),* which results in a patchy distribution of the disease in the field. Among other nematode species, ToRSV and TRSV are transmitted by *X. americanum*, which has been found in Connecticut. Within a vineyard, nematodes are the major vector that spreads the disease from plant to plant. Almost all nepoviruses are seed transmitted, which can be important in weed hosts, but less relevant for grapevines as grapes are mainly vegetative propagated. Consequently, grafting and dissemination of infected propagation materials are the main form of spreading of these grape viruses over long distances.

Management. To date, only ToRSV and TRSV have been found in Connecticut vineyards and therefore, current management measures concentrate on these viruses. Unfortunately, there is no viricides available to control plant viruses. Once vines are infected, they cannot be cured, and removal of infected plants is the only alternative for the disease control. Avoidance is the best strategy to control grapevine fanleaf degeneration/decline when establishing vineyards. Thus, only virus-tested-certified, clean planting material should be used for new vineyards or when replanting vines in older vineyards. All cultivars of *Vitis labrusca* are resistant to ToRSV and TRSV and some interspecific hybrids (DeChaunac, Baco noir, Vidal blanc, and Vincent) have some level of resistance to TRSV, but are susceptible to ToRSV. The hybrids Aurore (Siebel 5279), Seyval Blanc, and Vidal 256 show some resistance to ToRSV. Growers could consider grafting the susceptible scions onto the ToRSV-resistant rootstock 5A, 5C, 18-815, 41B Millardet et de Grasset, 44-53 Malegue, 110 Richter, 1616C, Clinton, Sanona, Shakoka, *V. riparia* Gloire, and *V. rupestris* St. George in areas infested with nematode vectors. Host resistance to GFLV has been identified, but it is not commercially available yet. Rootstocks resistant to the nematode vectors are available and should be taken into consideration during pre-planting stages in areas known to be infested by nematode vectors. Studies have shown that it is nearly impossible to eliminate established nematode vector populations in vineyards. In summary, Connecticut grape growers should be aware of the confirmed presence of TRSV and ToRSV in the state and of the potential for other nepoviruses that can cause fanleaf degeneration/decline to be introduced and become established in Connecticut vineyards. **Growers should only buy certified virus free planting material!!!**