



Tomato Ringspot Virus in Grapevines  
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I wasn't sure what Dr. Jim Travis had up his sleeve when he walked into the room during the recent PWA annual meeting with a large trunk of something, clearly too big to be a grape vine unless he recently visited an ancient Zinfandel vineyard in California. It turned out to be the stump/trunk of an apple tree that had died from Tomato Ringspot Virus (ToRSV). This orchard in York County had noticed a pattern of decline and called Jim to investigate and he diagnosed the culprit to be ToRSV. It turns out that this nasty virus is far more widespread than I had previously known, not just in vineyards but other crops as well. Jim told us that grafting is not a preventive measure against ToRSV, that it quite easily crosses the union, although there seems to be some debate about this (see grape disease compendium).

Viruses are more insidious than the pathogenic fungi and bacteria that also affect vines but all are part of the vine decline complex that troubles Eastern vineyards. Along with cold injury, they are responsible for the premature decline of vines, lack of uniformity and sustainability in vineyards and compromise of wine quality. But the greatest damage may be to the psyche of the grower and the economics of growing wine. ToRSV is particularly harmful to two of our most important varieties, Chardonnay and Vidal Blanc, both can be considered indicator plants for the virus in their particular category. As an industry, this is particularly troubling. Classic symptoms of ToRSV in vines are poor set with lots of hens and chicks, stunted shoots of varying length, fan shaped and/or chlorotic leaves and overall weak vine size and growth, and possibly death of the vine. Jim speculates that ToRSV may be present to some extent in every vineyard in Pennsylvania and that the SE and southcentral regions may be particularly affected. It certainly gave me pause and a cause for concern.

The most common hosts for ToRSV in a vineyard are broadleaf weeds and he cited the dramatic example that as many as 90% of the dandelions in a vineyard may be infected. Of course, that would not a problem if the virus stayed in the weeds but it doesn't. The vector for ToRSV is the dagger nematode, a microscopic eel-shaped roundworms that use a stylus to penetrate the roots of weeds and vines to transmit the virus. The penetration of the cell wall by the dagger stylus is so fine and unobtrusive that does not affect the integrity of the cell thus maintaining a perfect environment for the virus to begin its spread. Nematodes feed on the fine, tender roots of the host plant. It can take 3-4 years from infection to the time that a vine will become symptomatic. While nematode root feeding itself can harm grapes, it is usually the transmission of virus that causes the most

damage. This is particularly distressing to new vineyard owners because just as vines are coming into production, the virus can start compromising the health and productivity of the vines. Knowing the source and the host is a big plus for growers in trying to get control over this problem but it involves considerable effort.

Nematodes are generally not evenly distributed in the soil. There can be “hot spots” in certain areas of any vineyard. Nematodes move between soil particles and their dispersal can be greatly enhanced by soil water flow as well as run-off, farm equipment, animals and even mud on your boots. This makes it hard to accurately sample for nematodes. Dr. John Halbrecht at the Fruit Research and Extension Center in Biglerville is a virologist and is our resident nematode expert. He does testing of samples for nematode counts and has specific instructions for collecting samples for analysis. Sampling kits cost \$15 and can be ordered by contacting the lab at 717- 677-6116. Jim recommends that all fields be tested, even those that do not have a history of fruit trees or vines and particularly fields with a previous history of vines or fruit trees. He cited the case of an orchard planted into a corn and soy bean field that later became infected with ToRSV.

Rootstocks are only a partial solution to the nematode problems. Some stocks demonstrate resistance against specific nematodes but no rootstock resists dagger nematodes. Grape researchers at USDA are working hard to find rootstock varieties that will resist nematode attack. Another effort that is developing to control ToRSV is a foundation plant service that will provide virus free materials to grape nurseries. It is not known how many vineyards are planted with infected vine materials but this is certainly an important source of cleanliness. Some varieties are able to tolerate ToRSV better than others. Growers planting a vineyard, especially in sites previously planted to fruit trees or vines, should test the soils for nematodes and develop a treatment strategy if necessary. There are a variety of nematicides that can be used to reduce nematode populations. Bio-remediation control of nematodes involves the planting of rapeseed, a mustard plant whose roots exude a toxin that can help lower dagger populations. Two crops of rapeseed are planted in spring and summer and turned under just before flowering. The ground should be left fallow for at least a year. Jim suggested that compost may also help to relieve a nematode problem, mainly by changing the soil microbial population and promoting beneficial fungi and nematodes that may help to reduce dagger counts. Controlling broadleaves will help to reduce the number of host plants available to the virus. This can be done by planting dense cover crops that will choke out broadleaf weeds and keeping vine rows clean by tillage or herbicide. 2,4-D herbicide products can be used to kill broadleaves in row-middles in the fall. These practices may interfere with sustainable and/or organic practices so, as is always the case in vineyards, it is always a matter of compromise.

Scout your vineyard for symptoms of ToRSV, paying particularly close attention to Vidal. If you see it, flag the vine for removal during the winter because it is a host for the virus. Replant with mycorrhizal fungi and fertilizer and do everything possible to get the vine off to a good start, including the best plant material you can possibly find. Jim suggested using the bio-remediation program in the vine row where replants are going but this would be difficult to cultivate into the soil.

*I would like to thank Dr. Travis and Dr. John Halbrendt for providing the information for this article.*

Reference resources:

1. Penn State Nematode Diagnostic Service Information Leaflet. Dr. John Halbrendt. Penn State University.
2. Compendium of Grape Diseases. By Roger Pearson and Austin Goheen. 1988. APS Press. pp 49-50.
3. Graft-Transmissible Diseases of Grapevines: Handbook for detection and diagnosis. G.P. Martelli. 1993. Food and Agriculture Organization of the UN.

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