

Timely Viticulture

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"Timely Vit" is designed to give those in the Maryland grape industry a timely reminder on procedures or topics they should be considering in the vineyard.

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Red Leaves in the Vineyard—Diagnosis and Management

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It is not uncommon to walk a vineyard row and find some vines with red leaves somewhere in the canopy. Red leaves can appear at any time in the growing season and are caused by many biotic (viruses, bacteria and fungus) and abiotic (nutrient deficiencies, cold injury and damage to root systems, etc.) stresses. Anything that can cause blockage or stress in the vascular system, where water and nutrients are transported, can result in the development of red leaves. Because of the variability in timing and pattern of appearance and the overlapping of the symptoms, it may be difficult to identify the cause based solely on visual symptoms. The best strategy is to get the vines tested for accurate diagnosis as soon as possible. The following are examples of abiotic and biotic stresses that are often associated with red leaves on grapevines.

Nutrient Deficiencies

Potassium (K) deficiency develops when vines receive less K than what is required for normal growth or with low soil pH levels that decrease availability.

- Potassium is a mobile nutrient so when it is deficient the upper or younger leaves receive K at the expense of the lower/older leaves.
- Symptoms typically appear in early to late summer, and are often transient due to too much or too little water.
- Red grape varieties leaves turn red to purple between the veins starting from the edges (Figure 1). White grape varieties deficient leaves turn chlorotic (pale yellow or white).
- Monitor K with bloom petiole analysis and match with soil tests. In the unlikely case of a deficiency in soil and vines, first adjust soil pH to the correct range. Then apply potash (KOH) fertilizer either foliar or to the soil depending on the urgency.
- Be very conservative with K applications as they can influence fruit quality.

Magnesium (Mg) deficiency symptoms resemble K deficiency; the central portion of leaves remains green giving wedges of discoloration (Figure 2).

- In red varieties, interveinal chlorosis becomes red to brown. In white varieties, the chlorosis remains yellowish.
- To correct the Mg deficiency, if your soil is acidic, apply dolomitic limestone (Mg containing limestone) as it will also raise the pH.
- Magnesium salt ($MgSO_4$ - Epsom salts) can be applied to the foliage or soil if soil pH does not require adjustments.



Figure 1. Potassium (K) deficiency
Photo: Hemant Gohil



Figure 2. Magnesium (Mg) deficiency
Photo: Hemant Gohil

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Pre-Bloom thru Post Harvest

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Phosphorous (P) deficient leaves show interveinal reddening while white varieties show chlorosis.

- Initial chlorosis appears around leaf margins, which turn reddish in red varieties (Figure 3).
- As always, first adjust the soil pH if it is lower than the optimum to improve P uptake.
- Application timing of P is flexible as it is less mobile and does not leach readily.



Figure 3. Phosphorous (P) deficiency Photo: Gary Pavlis

Diseases

- **Viruses** of grapes such as leaf roll and red blotch can also cause red leaves and result in reduced vine vigor, poor fruit set, reduced fruit quality, and early decline of vines.
- Since there is no cure available for viruses once vines are infected, the only way to cure the infected vineyard is roguing out of infected vines, and replanting with virus-tested planting materials from dependable nurseries.

Grapevine leafroll disease symptoms typically appear around (the onset of fruit ripening) and spread as the season progresses.

- In red varieties, red to purplish discoloration is observed on interveinal areas of the leaf, but the veins stay green (Figure 4).
- In white varieties, the interveinal area becomes pale green and veins turn yellowish.
- Typically leaves cup downward or curl from the edges (Figure 5).



Figure 4. Leafroll disease symptoms Photo: Mizuho Nita



Figure 5. Leafroll disease symptoms Photo: Mizuho Nita

- Leaf discoloration will often develop randomly within the vine canopy.
- In contrast to nutrient deficiencies there is no upward or downward movement of the discoloration.

Grapevine red blotch disease is a recently recognized virus disease that has existed for a long time.

- As the name suggests blotches of red pigment appear randomly on leaves of infected vines.
- It can be detected at any stage of vine growth and in any part of vine.
- It can easily be mistaken for potassium deficiency or leaf roll virus especially when leaves cup or roll (Figure 7).
- There is little known of mechanism of how (or if) it spreads in vineyards.
- For the two viruses mentioned above, and any other viruses, the infected vines will be infected for the rest of their lives and must be rogued.
- As always, it is recommended to obtain virus-tested materials from reputable nurseries when establishing a vineyard.



Figure 7. Red Blotch disease symptoms Photo: Prashant Swami

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Pre-Bloom thru Post Harvest

Crown Gall is caused by a bacterium (*Agrobacterium*)

- Severe winters or early spring temperature fluctuations can damage bark and vascular tissues and allow infection.
- Other wounding events, such as physical damage to the trunk can also encourage the infection.
- Typical symptoms are formation of galls on the trunk (Figure 9); these can be very small, and may be formed under the bark. Therefore, crown gall could be mistakenly identified as a nutrient deficiency, as red leaves result from the stressed vascular system are readily visible (Figure 10).
- Symptoms often appear when water, heat, and fruit load stress is high in August.
- Train new uninfected canes to replace infected canes.
- Training multiple trunks and hilling up to prevent graft unions damage are other preventative strategies.



Figure 9. A series of small crown gall formed under the bark. Photo: Mizuho Nita



Figure 10. Red foliar discoloration caused by crown gall. Photo: Mizuho Nita

Canker diseases (*Botryospheria*; *Eutypa*) colonize mature wood (trunks; cordons) and constrict flow of nutrients and water.

- As the disease progresses in the wood, it can result in reduced vigor, decline, and death of vines.
- When diagnosed early, management is similar to crown gall; train uninfected canes to replace infected wood.
- Treating large pruning wounds is the best preventative.

Assessment of suspicious vines

- The cause of red leaves can be very difficult to accurately identify; see “triage”/troubleshooting flowchart (Figure 11).
- First inspect trunks for integrity.
- Then perform petiole analysis.
- If trunk diseases and nutrient deficiencies are ruled out, send out samples for virus testing (for leafroll, red blotch, and others); as this can be expensive save for last.

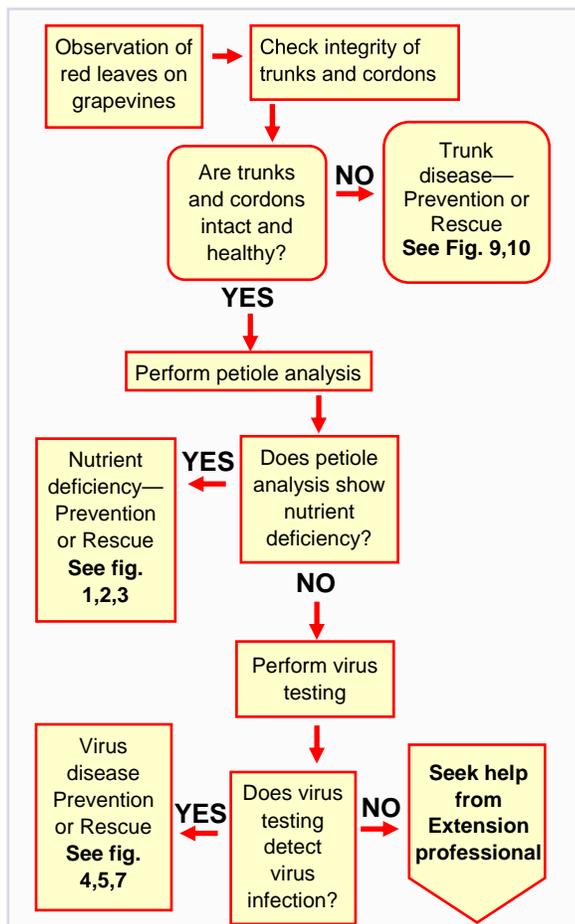


Figure 11. Red Leaf troubleshooting protocol

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Testing Laboratories

Go to <https://go.umd.edu/testinglabs> to obtain the list of grapevine tissue, soil, nematode, virus and disease testing laboratories. Communicate directly with several of them as each company has different pricing.

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References Cited:

¹Mark Fuchs. 2013. News and Information about the programs at Foundation Plant Services.
<http://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=12241>

²Tony Wolf (ed.) 2008. Wine Grape Production Guide for Eastern North America, Plant and Life Science Publishing. NRAES 145.

³Hemant Gohil, Gary Pavlis and Daniel Ward. 2015. Evaluate your planting material before planting your grapevine. Rutgers NJAES cooperative extension Factsheet #1260.

⁴Adib Rowhani and Deborah Golino. 2010. Grapevine Disease Testing Protocol 2010. FPS Grape Program Newsletter, October 2010.

⁵Stephen Vasquez and Jodi Creasap Gee. 2013. Grown Gall: *in* Grape Pest Management third edition, UCANR publication. Pp. 71-74.

⁶Bruce Perrygo, Dr. Joseph Fiola, Wade Hampton, Dean Jones, Ashley Mulloy, Ron Wates, and Bob White. 2016. A Sustainable Practices Workbook For Wine Grape Growing In Maryland, Maryland Grape Growers Association publication.