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Assessment of Suspicious Grapevines

Hemant Gohil
County Agent
RCE of Gloucester County

Wine Grape Twilight Meeting
May 20, 2020

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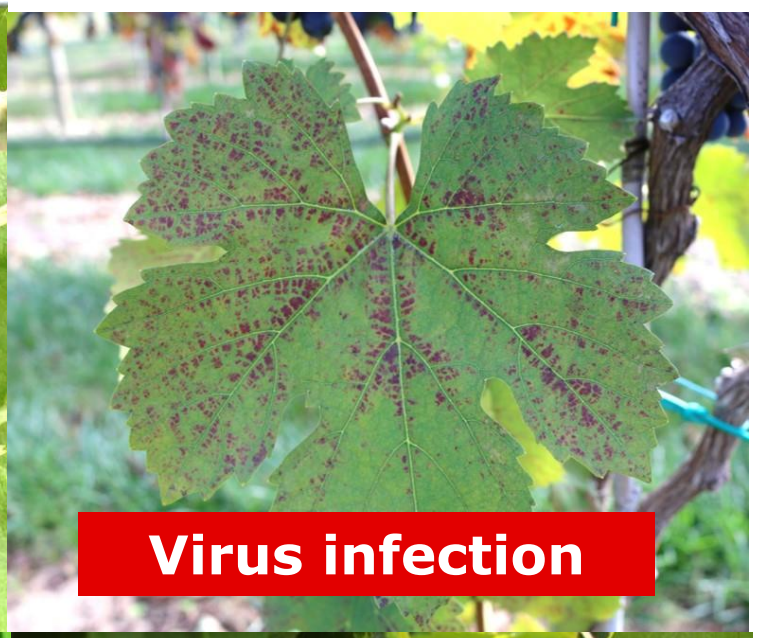
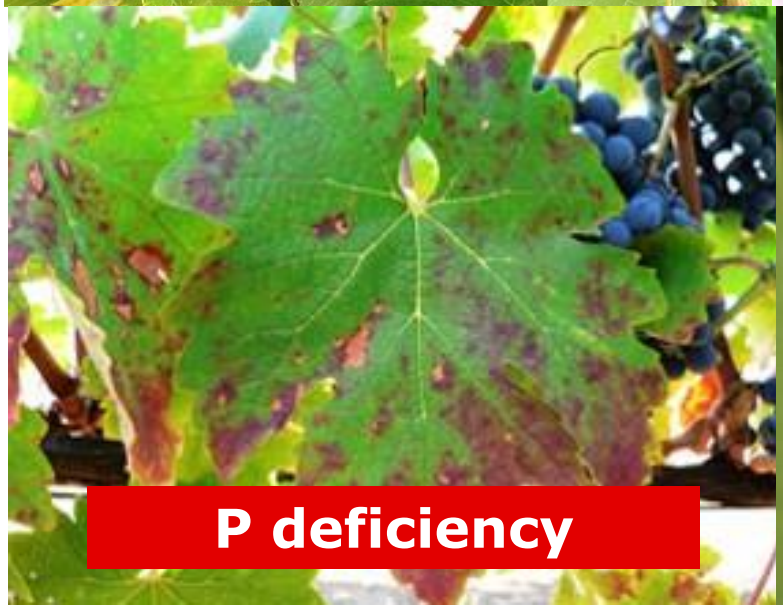
Visual assessment could be very deceptive





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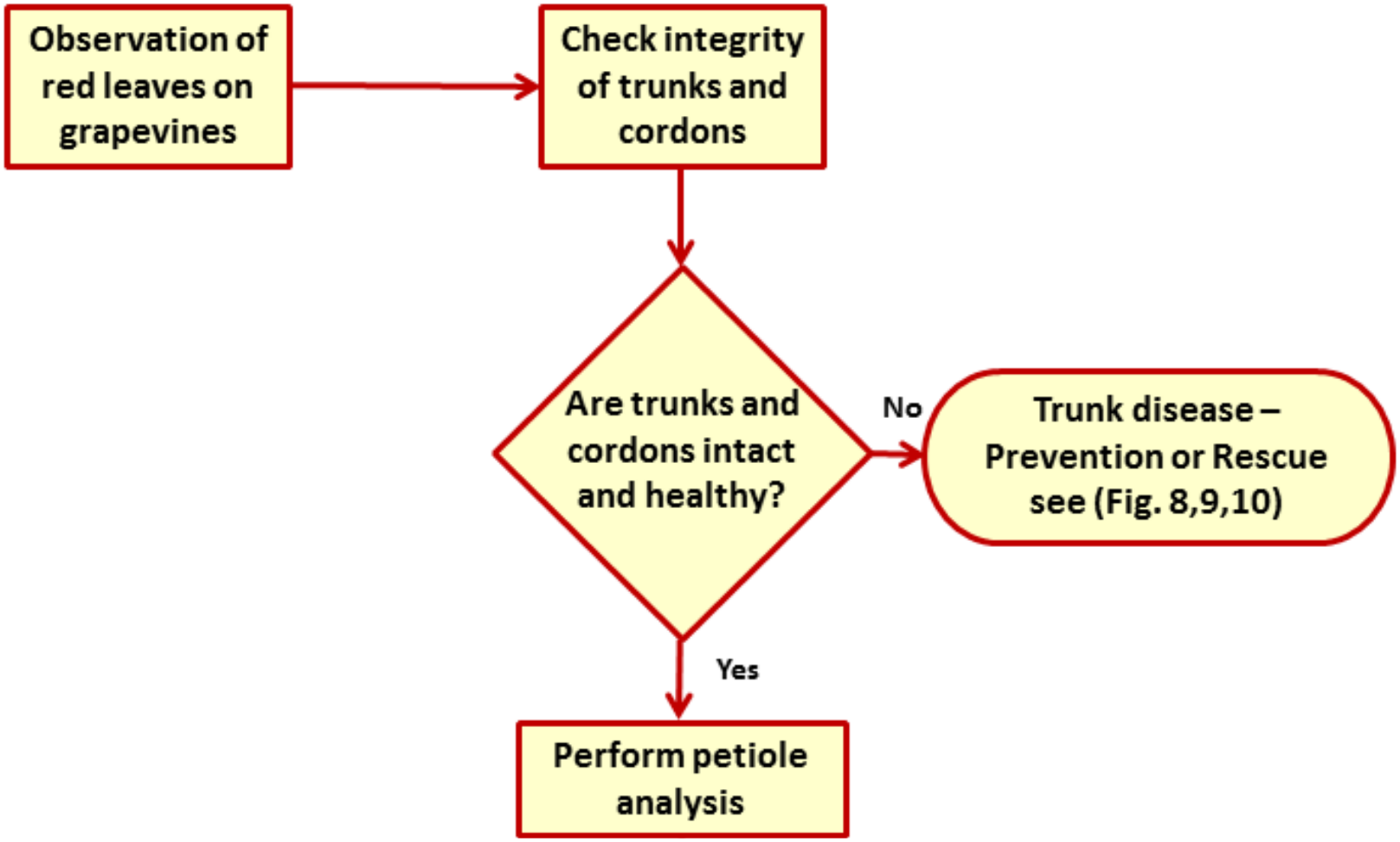
Do not rely on guesswork, get the vines tested for accurate diagnosis



Info available in FS 1260: Red Leaves in the Vineyard

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Foliar and Trunk symptoms of crown gall

Red foliar discoloration caused by crown gall. Photo by Mizuho Nita

A series of small crown gall formed under the bark of Merlot. Photo by M. Nita

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Red Leaves in the Vineyard: Biotic and Abiotic Causes

Fact Sheet FS1260

Figure 1. Potassium (K) deficiency in Cabernet Franc. Note leaves turning red in between the vein.

Figure 2. Magnesium (Mg) deficiency in Chambourcin. Note wedges of discoloration, starting from edges.

Figure 3. Phosphorous (P) deficiency in Zinfandel. Note the reddening progression from the leaf margins.

Cooperative Extension

Hemant Gohil, Gloucester County Agricultural Agent
Gary C. Pavlis, Atlantic County Agricultural Agent
Daniel Ward, Extension Specialist in Pomology
Mizuho Nita, Assistant Professor and Extension Grape Pathologist, Virginia Polytechnic Institute and State University

Red leaves in the vineyard are caused by many biotic (viruses, bacteria, and fungus) and abiotic (nutrient deficiencies, cold injury, 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. Though the timing, pattern of appearance, and spread could be different, the overlapping of the symptoms, especially the reddening of leaves, makes it very difficult to identify the cause based only on visual symptoms.[1] The best strategy therefore is not to rely on guesswork, but to get the vines tested for accurate diagnosis as soon as possible.

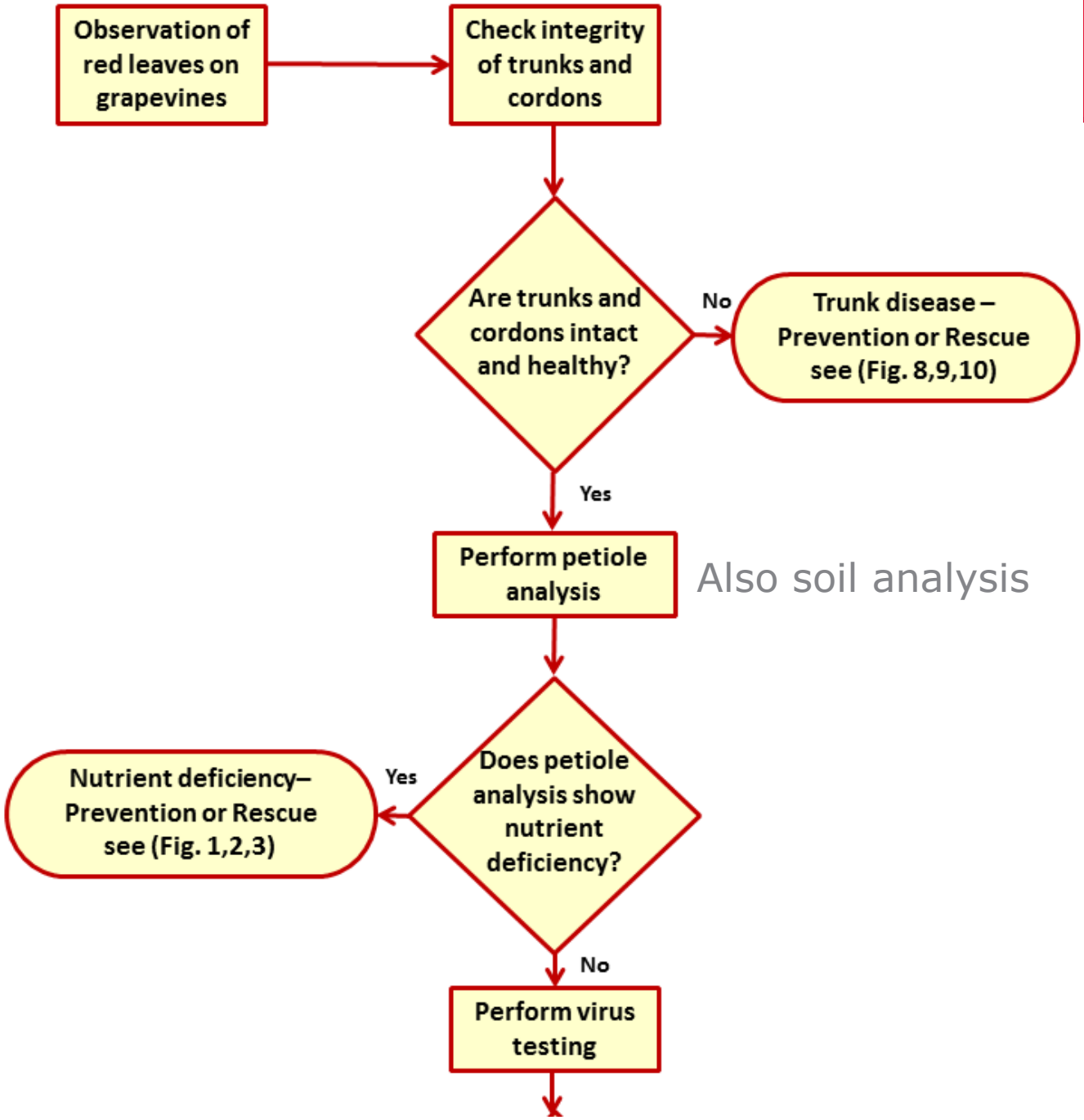
Below are examples of abiotic and biotic stresses that are often associated with red leaves on grapevines.

Nutrient Deficiencies

and in the case of deficiency, the upper (younger) leaves receive K rather than the lower (older) leaves, therefore reddening the leaves in the lower part of the canopy first.

Symptoms typically appear in early to late summer.[2] In red grape varieties, leaves turn red in-between the veins starting from the edges, and as deficiency gets severe, they turn purple (Figure 1). In white grape varieties, deficient leaves turn chlorotic (pale yellow or white), due to insufficient chlorophyll.

To monitor plant K status, it is advisable to perform petiole analysis every 2–3 years, ideally during bloom. The target K level in petioles should be between 1.5% to 2.5% if sampled during bloom, and 1.2% to 2.0% if sampled 70 days after bloom. Apply potash (KOH) fertilizer either foliar or to the soil, depending on the urgency. When there is chronic potassium deficiency, laboratory soil testing for nutrient and pH levels should


Observation of red leaves on grapevines
Check integrity of trunks and cordons
Are trunks and cordons intact and healthy?
No
Trunk disease – Prevention or Rescue see (Fig. 8,9,10)
Yes
Perform petiole analysis
Also soil analysis
Does petiole analysis show nutrient deficiency?
Yes
Nutrient deficiency– Prevention or Rescue see (Fig. 1,2,3)
No
Perform virus testing

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Potassium Vs Magnesium Deficiencies

Potassium (K) deficiency in Cabernet Franc. Photo by Hemant Gohil

Mg deficiency in Cayuga

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To correct K deficiency…

- The target K level in petioles.

  1.5% - 2.5% (if sampled during bloom)
  1.2% - 2.0% (if sampled 70 days after bloom)

- Apply potash (KOH) fertilizer either foliar or to the soil depending on the urgency.

- If K deficiency is chronic after correction laboratory soil testing for nutrient and pH levels ASAP.

Info available in FS 1260: Red Leaves in the Vineyard

To correct the Mg deficiency…

- Add Magnesium salt, $MgSO_4$ (Epsom salts) if soil pH does not require adjustments.

- Target Mg level in petioles:

  0.3% - 0.5% at bloom; or 0.35% to 0.75 % if sampled 70 days after bloom.

- If your soil is acidic, apply dolomitic limestone (Mg containing limestone) as it will also raise the pH, improving the rate of Mg uptake.

Info available in FS 1260: Red Leaves in the Vineyard

Nutritional Deficiencies: Phosphorous

Phosphorous (P) deficiency in Zinfandel. Note the reddening progression from the leaf margins. Photo by Gary Pavlis.

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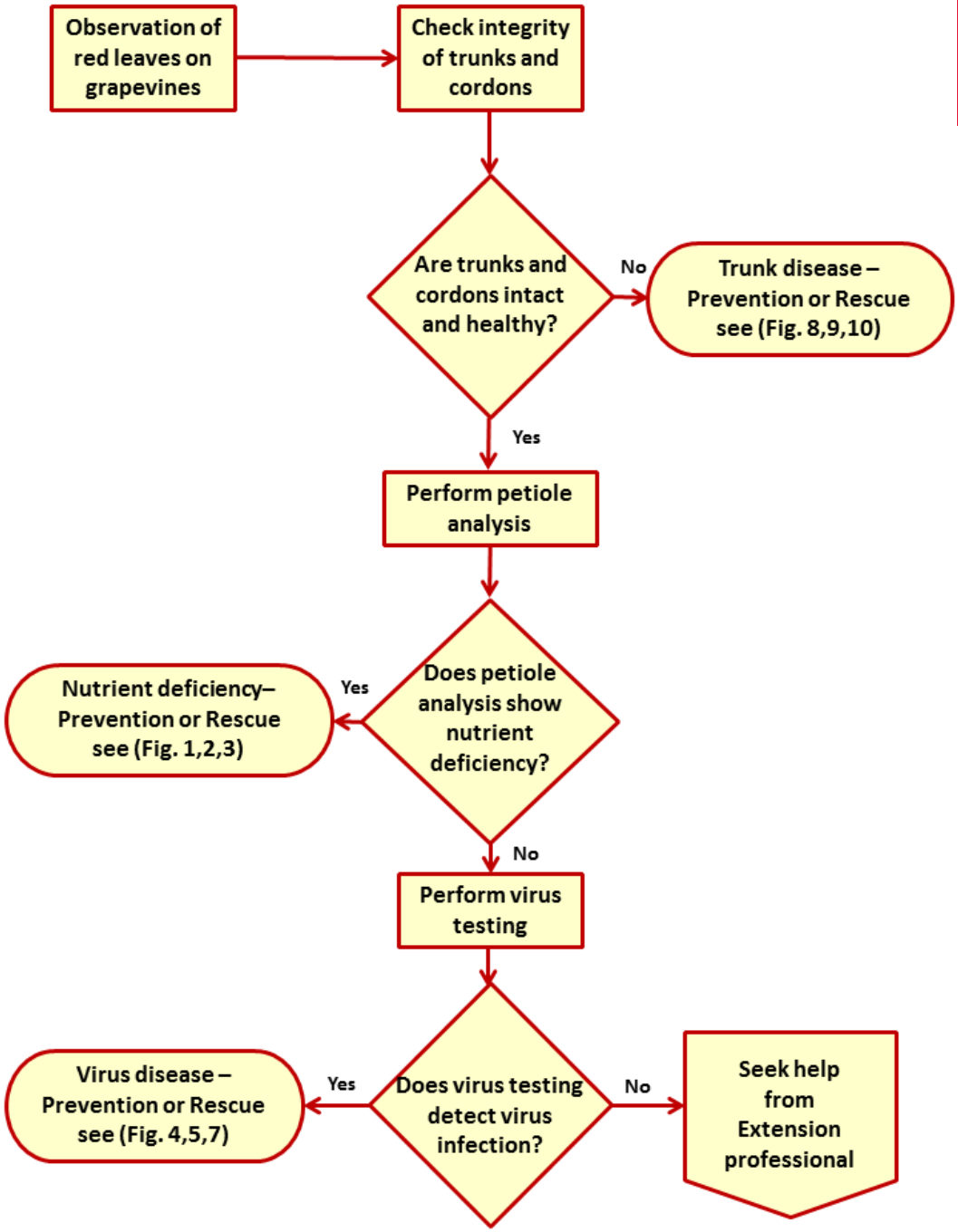
To correct the P deficiency…

- The target P level for leaf petiole 0.13% - 0.30 %
- Mono-ammonium phosphate (MAP) and di-ammonium phosphate (DAP) are common sources of P fertilizer.
- P offers greater flexibility in terms of timing of application as it is less mobile in soil and does not leech away easily.
- Adjust the soil pH if it is lower than the optimum to improve P uptake.

Info available in FS 1260: Red Leaves in the Vineyard



Schematic by Dan Ward

Sample collection

During the season

✓ Collect leaf samples along with petioles

In Winter

Collect cane samples with 3-4 nodes

✓

Do not collect small bits of canes

✗

Naidu Lab, WSU

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Use proper labeling to determine any pattern of virus spread

Sr. #	Row	Sec	Plant	Cultivar	Symptoms	Red blotch	Leafroll-3
1	2	3	14	Petit verdot	Symptomatic	negative	negative
2	8	2	2	Petit verdot	Symptomatic	negative	negative
3	1	2	2	Cab franc	Symptomatic	positive	negative
4	3	18	2	Cab franc	Symptomatic	positive	negative
5	5	6	4	Cab franc	Symptomatic	positive	negative
6	5	3	1	Cab franc	Non-symptomatic	negative	negative
7	7	16	2	Cab franc	Symptomatic	positive	negative
8	9	11	1	Cab franc	Symptomatic	positive	negative
9	11	11	4	Cab franc	Symptomatic	positive	negative
10	11	17	2	Cab franc	Non-symptomatic	negative	negative

Courtesy, Prashant Swamy, WSU

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Leaf Roll Virus vs. Red Blotch virus

Grapevine leafroll disease symptoms on Cab Sauvignon. Photo by Mizuho Nita

Grapevine red blotch symptoms on Merlot. Photo by Prashant Swamy

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Leaf roll virus in Chardonnay

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Virus Testing Labs

Agri-Analysis LLC: 930 Riverside Parkway, Suite #30, West Sacramento, CA 95605 Phone: 800-506-9852 Email: info@agri-analysis.com
AL&L Crop Solutions: 7769 N. Meridian Rd., Vacaville, CA 95688 Phone: 530- 759-9460 Email: info@allcropsolutions.com
Eurofins STA Laboratories: 7240 Holsclaw Road, Gilroy, CA 95020 Phone: 888-782-5220 Email: juditmonis@eurofinus.com
Sunburst Plant Disease: Clinic 677 East Oliver Avenue, Turlock, CA 95380 Phone: 209-667-4442 Email: slivingston@sunburstpdcinc.com
WSU ELISA Virus Testing Lab: 24106 N. Bunn Rd., Prosser, WA 99350 Phone: 509-786-9382 Email: Tina_Vasile@wsu.edu

Info available in FS 1260: Red Leaves in the Vineyard

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Certified Planting Material is the most effective strategy to prevent introduction of virus diseases

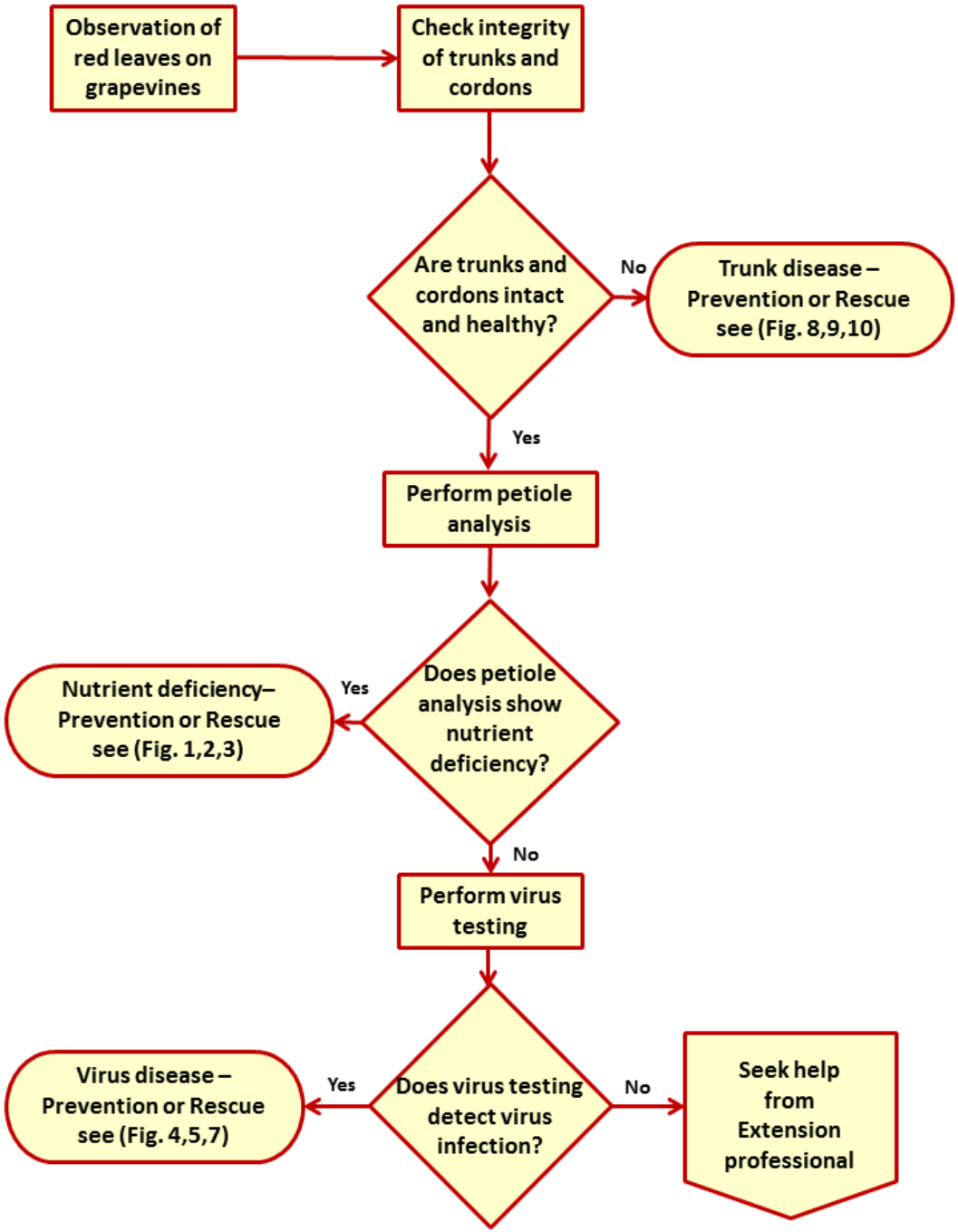
Foundation Plant Services Available Tests for Protocol 2010

Group	Pathogen	Symbols	ELISA	qPCR	PCR	Herb. Index	Woody Index
Nepoviruses	Grapevine fanleaf virus	GFLV	X	X	X	X	St. George
	Tomato ringspot virus	ToRSV	X	X	X	X	
	Tobacco ringspot virus	TRSV		X	X	X	
	Arabis mosaic virus	ArMV	X		X	X	
	Strawberry latent ringspot virus	SLRSV		X	X	X	
	Blueberry leaf mottle virus	BLMV		X	X	X	
	Raspberry ringspot virus	RpRSV		X	X	X	
	Tomato black ring virus	TBRV		X	X	X	
	Grapevine deformation virus	GDefV		X	X	X	
	Artichoke Italian latent virus	AILV				X	
Closteroviruses	Grapevine leafroll associated virus 1	GLRaV-1	X	X	X		Cab. Franc
	Grapevine leafroll associated virus 2	GLRaV-2	X	X	X		Cab. Franc
	Grapevine leafroll associated virus 2RG	GLRaV-2RG		X	X		
	Grapevine leafroll associated virus 3	GLRaV-3	X	X	X		Cab. Franc
	Grapevine leafroll associated virus 4	GLRaV-4	X gen	X	X		Cab. Franc
	Grapevine leafroll associated virus 5	GLRaV-5	X gen	X	X		Cab. Franc
	Grapevine leafroll associated virus 6	GLRaV-6	X gen	X	X		Cab. Franc
	Grapevine leafroll associated virus 7	GLRaV-7		X	X		
	Grapevine leafroll associated virus 9	GLRaV-9	X gen	X	X		Cab. Franc
	Grapevine leafroll associated virus 10	GLRaV-10		X	X		Cab. Franc
	Grapevine leafroll associated virus 11	GLRaV-11	X		X		Cab. Franc
	Grapevine leafroll associated virus Car.	GLRaCV	X gen	X	X		Cab. Franc
Vitiviruses	Grapevine virus A	GVA		X	X		Kober 5BB
	Grapevine virus B	GVB		X	X		LN33
	Grapevine virus D	GVD		X	X		
	Grapevine virus E	GVF		X			
	Grapevine virus F	GVE		X			
Foveavirus	Grapevine rupestris stempitting associated virus (all strains)	GRSPaV		X	X		St. George
Maculavirus	Grapevine fleck virus	GFkV	X	X	X		St. George
	Grapevine redglobe virus	GRGV		X	X		
Marafiviruses	Grapevine syrah virus-1	GSyV-1		X	X		
	Grapevine vein feathering virus	GVFV		X	X		
	Grapevine asteroid mosaic virus	GAMV		X	X		
DNA Viruses	Grapevine red blitch associated virus	GRBaV		X	X		
	Grapevine vein clearing virus	GVCV		X	X		
Phytoplasma	Universal detection	Phyto		X	X		
Pierce's Disease	*Xylella fastidiosa*	PD		X	X		

Key:
X Test performed at FPS.
X = test is available;
X gen.= ELISA using generic antibody which detects GLRaVs-4, 5, 6, 9 and Car in a single test;
qPCR= quantitative PCR= real time RT-PCR with TaqMan probe; PCR= will include RT-PCR for RNA viruses.

Source, Foundation Plant Service, UC Davis

Seek the help of Extension Professionals



Thank You!

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