

Review of grapevine trunk/vascular diseases




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In addition to what we have discussed in search, there are several key elements that you need to consider during the winter.

- ▶ There are Trunk/Vascular diseases that infect grapevines throughout the year.
 - ▶ Note! Some of these can be controlled through good vineyard management.
- ▶ Botrytis necrotic canker (Botrytis)
- ▶ EsCA (Eutypa canker)
- ▶ Ring rot
- ▶ Crown gall



They do not cause immediate damages to the vines, why do we care?

- ▶ With our current vineyard replanting and infection control practices, we can limit these diseases to a few vines per acre. But it can be a problem if you have a high density vineyard.
- ▶ However, if you are planning to have a vineyard for 30 years, then you need to consider that the cost of vineyard is \$10,000/acre.
- ▶ In addition, if you have a high density vineyard, infection is a big concern. It can be a big problem if the vine is replaced at the end of the life.
- ▶ Plus, it is better to be prepared.

Botryosphaena canker (Bot canker)

- ▶ Probably the most common trunk disease in VA
- ▶ Dead nut
- ▶ Stunted shoot
- ▶ Warty dies (Warty Die)




Botryosphaella canker

- ▶ Relatively rare but the most common trunk disease in VA
- ▶ Warty dies (Warty Die) - corky, warty growths
- ▶ The warty cankers are often found on young vines with very little wood
- ▶ Several different Botryosphaella species
- ▶ Symptoms include:
 - Warty cankers
 - Corky growths
 - Gummosis
 - Warty die




ESCA or Petri Diseases or "Black Goo"

- ▶ The most prevalent trunk disease on grapevines
- ▶ Symptoms include:
 - Stunted growth
 - Dieback
 - Gummosis
 - Warty die
 - Black ooze



ESCA or Petrified Diseases

- ▶ Most common in Europe
- ▶ Results in wilting and death of the plant
- ▶ Symptoms include:
 - ▶ Yellowing and wilting of leaves
 - ▶ Dieback of twigs and branches
 - ▶ Bark necrosis
- ▶ Several fungi are associated with ESCA:
 - ▶ *Botryosphaeria dothidea*
 - ▶ *Phaeoacremonium aleuticum*
 - ▶ *Phaeoacremonium annosum*
 - ▶ *Phaeoacremonium minimum*
- ▶ Other fungi associated with ESCA



Eutypa dieback

- ▶ Typical wedge-shaped necrotic growth
- ▶ Very common in CA and it kills the plant
- ▶ Symptoms include:
 - ▶ Dieback of twigs and branches
 - ▶ Yellowing and wilting of leaves
 - ▶ Bark necrosis
- ▶ Caused by *Eutypa* spp.



Cultural Practice against Bot canker, ESCA, and Eutypa

- ▶ Keep garden weeded
- ▶ Prune properly
- ▶ Wait for warm weather for field pruning
- ▶ Keep away old leafy debris
- ▶ Sanitize pruning equipment
- ▶ Consider covering the trunk and restriction (loop for a night)

Chemical options for Bot canker, ESCA, and Eutypa

- ▶ Topical fungicides (e.g., copper fungicides) are used to protect and reduce the incidence of Bot canker
- ▶ Systemic fungicides (e.g., benzimidazole derivatives) are used to protect and reduce the incidence of ESCA and Eutypa
 - ▶ These fungicides are used to protect and reduce the incidence of Bot canker
- ▶ Treat with fungicides (e.g., copper fungicides) to protect and reduce the incidence of Bot canker

When these fungicide application need to be made?

- ▶ Preliminary results from field trials in 2012/13 showed little or no effect on Bot canker incidence (applying chemical fungicides during the period)
- ▶ Control of Bot canker is not possible with a single application
- ▶ Fungicide application should be made at intervals of 2-3 weeks during the period
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Based on our ongoing research, the level of control is low with copper and very low

- ▶ With a single application of copper fungicide, the level of control is low
- ▶ With a single application of copper fungicide, the level of control is very low
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Another disease to be considered during early spring... Phomopsis!

- ▶ Phomopsis is a wood-boring pathogen that causes woody tissue rot in a variety of woody plants.
- ▶ It is a common cause of dieback in grapevines, especially in the case of seedlings (USDA/ARS) and in older vines.
- ▶ However, it is also a cause of stem rot in many other woody plants, including ornamentals, shrubs, and trees (e.g., birch, larch, spruce, fir, pine, etc.).



Crown gall

- ▶ Typical sign is the formation of a gall.
- ▶ Other signs include distorted growth, stunted plants, and wilting.
- ▶ Caused by a bacterium called *Agrobacterium tumefaciens*, which is transmitted by soil and insects.



Crown gall pathogen inserts a piece of DNA (Ti-DNA) to grape DNA to create a tumor (gall)

- ▶ The DNA normally causes growth of cells and a regular, but uncontrolled, proliferation of cells.
- ▶ Sometimes you can see a gall on a grapevine, which is a tumor-like growth that is caused by the bacterium *Agrobacterium tumefaciens*.



Cultural practices for crown gall management

- ▶ Site selection: Avoid planting vines in poorly drained and heavy soils
- ▶ Site preparation: Remove crown gall susceptible plants at crown gall
- ▶ Hillock up young vines to protect graft union (time and cost issue)
- ▶ Avoid over-irrigation and/or over-fertilization of the vine (i.e. make a healthy vine that grows quickly at the end of the season in order for the vines to stand up to winter)
- ▶ Be careful with your water control (a relatively common way to cause damage to your vines)

Cultural Practices against crown gall (cont.)

- ▶ Graft unions will be damaged if you do not happen with your vines in winter (i.e. if you graft in the summer, you will still deal with crown gall, but you will have more time to deal with the crown gall infection before you start to graft in the winter)
- ▶ Spend time to deal with crown gall at other issues
- ▶ If you do not know what crown gall is

Cultural Practices against crown gall (cont.)

- ▶ If the site is not suitable, you can use a small area and you can avoid planting your vines to be trained to vines
- ▶ When replacing the old vines for new vines, the vine and a much better way to deal with crown gall and other problems. It is important to apply phosphate onto the vines (don't spray during the season)
- ▶ Make sure to use certified vines from a reputable source. Ask them if they use a hot water bath to treat the vines

Other tactics against crown gall

- ▶ We strain it
 - ▶ Salford (UK) and others (2015) (ICI 44) Results/Clade provide water and nitrogen
 - ▶ As you can imagine, some of the other likely candidates (e.g. Methylotrophic) may also be susceptible to crown gall. Avoid planting these in the same area as the infected plants.
- ▶ Chemical control
 - ▶ Antibiotics used to prevent or slow down the crown gall. Some of the researchers had tried to remove gall, and they may cut the vascular tissue from the other part of the infected vine.

Biological control against crown gall?

- ▶ There are some candidates for biological control of *Agrobacterium tumefaciens* (e.g. *Agrobacterium tumefaciens* which may attack plants to *A. vitis*)
- ▶ Idea here is to promote competition on space and resources (plus, in some cases, the crown gall bacteria may interfere with *Agrobacterium tumefaciens*)
- ▶ However, this is not necessarily workable (e.g. *Agrobacterium tumefaciens*)
- ▶ As with other control methods, environmental conditions, as well as the type of plant, may play a big role on their efficacy.


Future direction..

- ▶ I am in a process of setting up a research project with a research fellow who is doing a PhD on pathogenic strain of *A. vitis* (ARV1), which showed high capacity of gall formation in plants as yet.




Trunk disease diagnostic aid application

- Available for Android and iOS
- Available for download on the Google Play Store and the Apple App Store
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Tree and trunk diseases.org

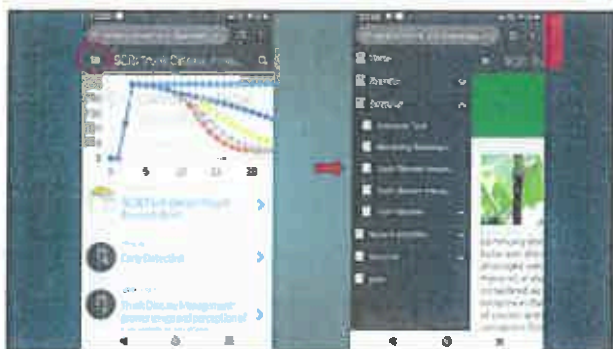




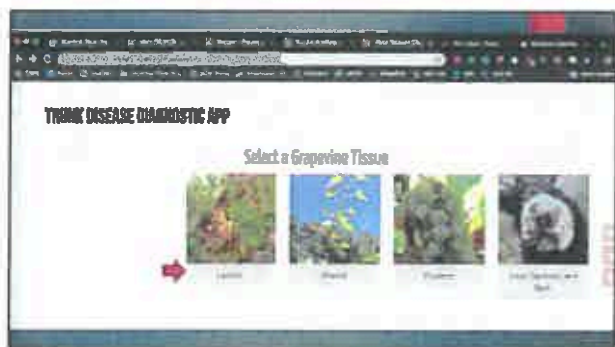
Detect **pathogen** in young trees

adoption

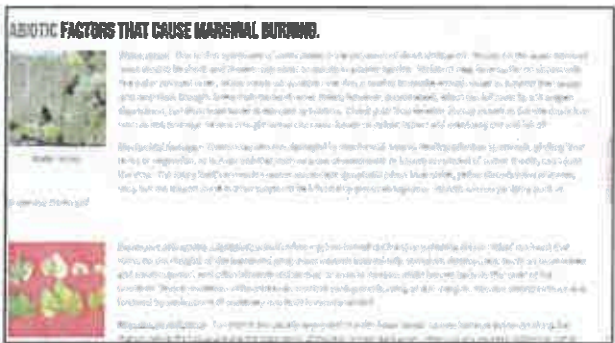
pathogen

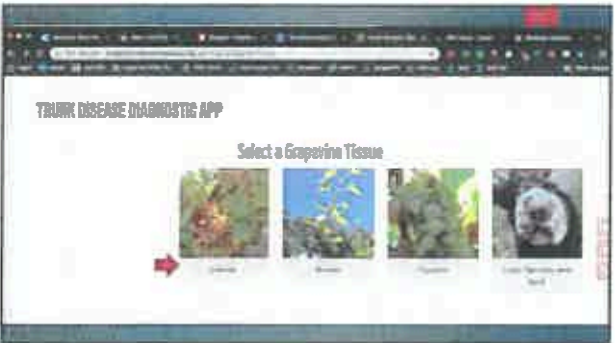












FOLIAR SYMPTOM GALLERY

Select the leaf symptom that best resembles yours.



Magnesium deficiency
Green veins, yellowed tissue


Nitrogen deficiency
Uniform yellowing

Iron deficiency
Yellowing between veins

Chlorotic spots
Small yellow spots

LEAF SYMPTOMS

Do these symptoms resemble your vine?



Necrosis

YES NO

DO YOU SEE ONE OR MORE OF THESE SYMPTOMS?

Click the image above



YES NO
