Crown Gall

Over the last 12 months I have observed crown gall becoming more apparent in some vineyards. In some vineyards infected with crown gall, close to 100% of the vines are infected. In these vineyards the most likely explanation for such a high incidence of infection is infected planting material. Based on my observations vineyards with high incidence of infection by Crown gall have been grafted grapevines. This is certainly not always the case as I have also observed non-grafted Chambourcin vineyards with a very high incidence of infection by Crown gall. Regardless of the cultivar infected there are methods to manage Crown gall. However, first you need to understand how the disease develops to help you limit or ameliorate the disease.

Crown gall (*Agrobacterium vitis*) is caused by a bacterium. The most noticeable symptom is the formation of corky galls that often form on infected plants on the trunk (Figure 1). Galls may also form on the cordons. The formation of galls is dependent on the grapevine being injured and initiating a wound response to the injury. The injury can be the result of winter cold damage, mechanical injury from vineyard equipment or from the process of grafting the scion wood to the rootstock. Although pruning can be considered a mechanical injury, pruning does not seem to result in crown gall initiating the infection process. In regards to dormant pruning this makes sense since the grapevines are not physiologically active to initiate a wound response. An injured grapevine wound response is to release sugars and phenolics at the site of injury. This process attracts the bacterium and the infection cycle begins. The bacterium incorporates a segment of its genetic material into the grapevines genetic material. You can think of this as natural genetic engineering.
The bacterium DNA incorporated into the grapevines DNA results in the overproduction of plant hormones (auxin and cytokinin) which results in the production of galls. As the galls enlarge and proliferate the grapevines vascular system becomes girdled and over time the grapevine will eventually lose vigor and succumb to the disease.

The bacterium is ubiquitous in the environment and has the ability to survive both in dead and live grape material as well as in the soil. It is not uncommon to find the bacterium in vineyards not expressing symptoms of crown gall. The bacterium can live epiphytically on grape tissues such as leaves, shoot tips and tendrils. The bacterium mainly overwinters in the root system and during the spring the bacterium is swept upward in the xylem as a result of root water pressure.

One of the more interesting aspects of crown gall is that plants can be infected with the bacterium but the plants never develop symptoms (asymptomatic infection). This likely results in grapevines being propagated from what appears to be healthy plants. In turn this results in the spread of Crown gall through planting material. This can also be true in the propagation of grapevines grown for rootstocks. Therefore, in grafted grapevines there is likely greater potential for crown gall since either the scion or the rootstock material may be infected with crown gall and a mechanical injury is part of the grafting process.

Recent research has shown that Crown gall is harbored by wild grapevines. Wild feral grapevines are readily apparent throughout Missouri. There are eight native grapevine species found in Missouri. It would be difficult challenge to remove feral grapevines from many areas in Missouri. Although wild feral grapevines are a source of the bacterium, a more likely source of the bacterium is contaminated propagation material.

Some nursery providers are using assorted methods to provide planting stock that is Crown gall free. Hot water treatments are being used to eliminate the Crown gall bacterium. The hot water treatments are not 100% effective but the process does eliminate a lot of the bacterium.

Research continues on biological control of Crown gall. Some products are currently on the market, although it is unknown how these products perform in Missouri. Tom Burr at Cornell has been working with a strain of bacterium, A. vitis (nontumorigenic) that does not allow A. vitis to initiate gall formation. Another strain is K1086 which is genetically modified and has the trade name NoGall. This is a preventative product and is not curative of vines already expressing Crown gall symptoms.

Soil-borne nematodes have also been implicated in contributing to the incidence of Crown gall. In Hungary, grapevines infected with Root knot nematodes Meloidogyne hapla had a higher incidence of Crown gall. In Missouri 9 of 48 soil samples collected in vineyards had Root knot nematodes (Volenberg, unpublished) Some rootstocks are highly resistant to Crown gall. These include C3309, 101-14 Mgt, and Riparia Gloire. There is evidence that rootstocks resistant to Crown gall may impart some resistance to the scion.
There is differences in grape cultivar susceptibility to Crown gall. Most *Vitis vinifera* are highly susceptible whereas *Vitis labrusca* and hybrids have increased resistance to Crown gall. Recent research has shown that there is a grape genotype by Crown gall strain response. Whereas a certain grape cultivar may be resistant to one strain of *A. vitis* but highly susceptible to another strain of *A. vitis*.

Since *A. vitis* is systemic in a grapevine it is often spread through contaminated planting stock. Recent research has shown that *A. vitis* can be found in leaves, shoot tips and woody material. Previous research, demonstrated that shoot tip cuttings were free of Crown gall. However, magnetic real-time PCR with higher levels of detection shows that an Crown gall is systemic throughout infected grapevines.

Prevention is your best practice in managing Crown gall. Demand Crown gall free planting material from your grapevine suppliers. Try to select grape cultivars that are resistant to Crown gall. Prevent mechanical damage to trunks in the vineyards from lawn mowers, weed eaters, and tractors. Select rootstocks that have resistance to Crown gall. Prior to planting a new vineyard block determine if soil borne nematodes are present.

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**Announcement**

The **Grape Exchange** on the Grape and Wine Institutes Web Page will begin to take listings on Monday, August 3, 2020.

Please submit your listing to Karissa King at kingkari@missouri.edu. Please submit the following information: varietal, tons, and contact information

The Grape and Wine Institute is also initiating an **Equipment Exchange** that includes equipment in the vineyard and winery. These items can also be submitted to Karissa King as above. Please submit the following information: equipment type, and contact information.
ISU/UMN Joint Research and Winemaking Webinar Series:

Proper & Practical Use of SO2
In the second 1-hour webinar the importance of sulfur dioxide, and good SO2 management in the winery, will be presented and discussed by Dr. Gavin Sacks (Cornell University) and Katie Cook (Scott Laboratories) on August 18, 2020 at 3PM Central Time.

Coming Up Next Tuesday. Mark Your Calendars for 3 PM Central Time. See Next Page for registration.
These two free webinars are co-organized by Dr. Aude Watrelot, Assistant Professor of Enology at Iowa State University and Drew Horton, Enology Specialist at the University of Minnesota’s Grape Breeding & Enology Project.

Two 1-hour webinars scheduled as follows:

- **August 4th 2020: Winery Cleaning and Sanitizing**
  - 20-minute presentation of the practical aspects of cleaning and sanitizing in a winery by Luke Holcombe from Scott laboratories.
  - 20-minute presentation of a recent work carried out at UC Davis by Cory Marx under the supervision of Dr. Anita Oberholster. This presentation will focus on a method for optimizing the use of chemical agents for cleaning and sanitation.

To register: https://iastate.webex.com/iastate/onstage/g.php?MTID=ef1fa65a9a75d6bcacb28617892594c91

- **August 18th 2020: Practical Management of Sulfur Dioxide**
  - 20-minute presentation on the definition of sulfur dioxide, the forms of sulfites, differences between free, bound and total SO2, the importance of SO2 in winemaking and a new method to measure SO2 by Dr. Gavin Sacks from Cornell university.
  - 20-min presentation on the practical aspects of the management of sulfur dioxide in a winery by Katie Cook from Scott laboratories.

To register: https://iastate.webex.com/iastate/onstage/g.php?MTID=e98abcc780dd31e367335e36914084d1e

For further details or any questions, check out the Wine Industry Events in Dr. Watrelot’s website https://faculty.sites.iastate.edu/watrelot/ or contact us at watrelot@iastate.edu and dhorton@umn.edu
Cumulative Growing Degree Days (base 50) for the Seven Grape Growing Regions of Missouri from April 1 to August 8, 2020.

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<tr>
<th>Region</th>
<th>Location by County</th>
<th>Growing Degree Days¹</th>
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<tr>
<td></td>
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<td>2020</td>
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<td>Augusta</td>
<td>St. Charles</td>
<td>2358</td>
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<td>Western</td>
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¹Growing degree days at base 50 from April 1 to August 8, 2020. Data compiled from Useful and Useable at https://mrcc.illinois.edu/U2U/gdd/. Click on link below to determine growing degree days in your area.

To determine the number of growing degree days accumulated in your area since April 1. Use this tool.

Weather Outlook for Weekend
- Seasonal weather on Saturday
- Cold front moving through on Sunday

August 17-21
- Below normal temperatures, mid 70’s to lower 80’s
- Below normal chance of precipitation

For the period of July 13 to August 11
- Gasconade County has had over 17-inches of rain
- Most of Missouri has received above normal rainfall except areas in Southwest and the Bootheel of Missouri

Please scout your vineyards on a regularly scheduled basis in an effort to manage problem pests. This report contains information on scouting reports from specific locations and may not reflect pest problems in your vineyard. If you would like more information on IPM in grapes, please contact Dean Volenberg at 573-882-0476 or 573-473-0374 (mobile) or volenbergd@missouri.edu