Grapevine Crown Gall: Current understanding and research updates

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CGCN Webinar: Crown Gall and Grapevine Trunk Diseases

Canadian Grapevine Certification Network
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Presentation Outline

- Grapevine Crown Gall (GCG)
  - Cause, symptoms, impact
- Recent updates in GCG research
  - Spread of disease
  - Disease management
- Areas that still require more research

Grapevine Crown Gall: “Plant cancer”

Grapevine Crown Gall (GCG)

- GCG is a prevalent disease in cold climate grape-growing regions
- Caused by bacterium *Allorhizobium vitis*
- Symptoms include tumor (gall) growth and root necrosis
- Impaired growth, poor fruit quality, vine death

Photo by S Poojari

Healthy grapevine

Crown gall-infected grapevine

Gall formation

- Following infection, galls form at external wound sites:
  - Pruning wounds
  - Agriculture tools/machines
  - Grafting
  - Cold damage
- Galls form mainly on the trunk, can appear on canes (above ground)

Grapevine Crown Gall (GCG)

- Can be extremely costly
- One study (2004, Pennsylvania) estimated that GCG was responsible for a loss of approximately $46,500 USD per 0.4 hectare vineyard over a 6 year period

Filo et al., 2013

Chateau Grand Traverse vineyard (Old Mission Peninsula, Michigan)

Spread of Disease

- Introduced into vineyards either when:
  - Infected vines are planted into “clean” soil
  - GCG-free vines are planted into infected soil
- Primarily spread through asymptomatic nursery material
- GCG bacterium is soil-borne and can survive in soil for at least two years after diseased vines are removed → can reinfect vines planted into the same soil

Photo by H Gohil

Nematodes can facilitate infection

- GCG infection increased following parasitism by a plant-parasitic nematode (northern root-knot nematode)
- Increased infection = higher chance of developing galls = larger impact of disease symptoms
- Plant-parasitic nematodes can be prevalent in vineyard soil (root-lesion, dagger, and ring)

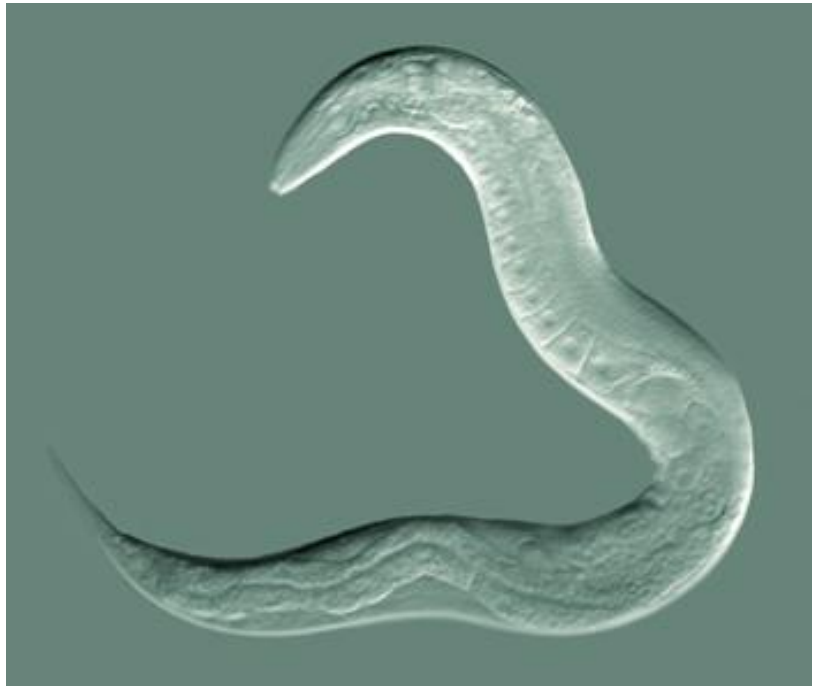

Photo by B Goldstein
UNC Chapel Hill

Spread of Disease – **Recent finding**

- Infection can be spread through **pruning tools**
- Can spread infection within and between vineyard sites
- Suggest disinfecting pruning shears between vines

Photo by B Young
Jordan Winery

Spread of Disease – **Recent finding**

- **Water splashing** (such as from rain or irrigation) from infected to non-infected vines contributes to higher incidence of GCG in vineyards compared to planting in infected soil alone

Photo by A Radosavljevic

Spread of Disease – **Recent finding**

- GCG pathogen can **overwinter in galls** and may be a source of infection for the subsequent growing season (regardless of cultivar)
- GCG pathogen has been detected on the **snow covering galls** during the winter

Spread of Disease – **Recent finding**

- Based on a recent study of pathogenic *A. vitis* strains in the Okanagan Valley:
  - There is evidence of disease spread between vineyard sites
  - Spread within and between nurseries has also been suggested

➢ **GCG is spread easily between and even within vineyard sites and is very difficult to manage once it is present**

GCG Disease Management – **Current Recommendations**

- **No commercial chemical or biological control product currently available**
- Reduce vine injury and/or pathogen spread:
  - Choosing ideal vineyard site (well-drained soils, good air drainage)
  - Manage irrigation, fertilization, and over-cropping to slow growth
  - Hill up soil around graft union
  - Train multiple trunks
  - Remove dead/infected vines
  - Avoid mechanical injury

GCG Disease Management

- Several methods can reduce pathogen number, but do not eradicate systemic infection:
  - Hot water treatment of dormant cuttings
  - Copper treatment
- Note that crown gall treatments for other tree crops does not work for grapevine

© Multiplants nursery, Vétroz, Switzerland

GCG Disease Management – **Recent updates**

- Biological control is considered to be the best bet for future disease management
- Promising candidates, but no commercial product yet
- Various bacterial and several fungal species have been studied
- Non-pathogenic *A. vitis* strains **ARK-1**, VAR03-1

GCG Disease Management – **Recent finding**

- Recent study (2025, Okanagan Valley) tested organic compost application as a means of suppressing simultaneous plant-parasitic nematodes and GCG infection
  - Compost improved soil fertility parameters
  - Two nematode populations were reduced following compost application
  - No reduction in GCG severity
  - No significant improvements on plant performance or crop quality

What we still don’t know about GCG

- How GCG is spread within nurseries → important for stemming worldwide spread
- Patterns and significance of secondary infections
- How/if a reliable biological control product can be produced
- How various nematode species affect GCG infection and disease development
- How does compost affect the onset/progression of disease in young vines planted into infected soil

Conclusions

- GCG is spread primarily through asymptomatic nursery material
- GCG can be spread between vineyard sites and within vineyard sites (pruning sheers, water splashing, snow, re-planting into infected soil)
- No biological or chemical control products are commercially available
- Promising results in recent biological control studies
- Crown gall research is still ongoing and requires funding!


Thank you!

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