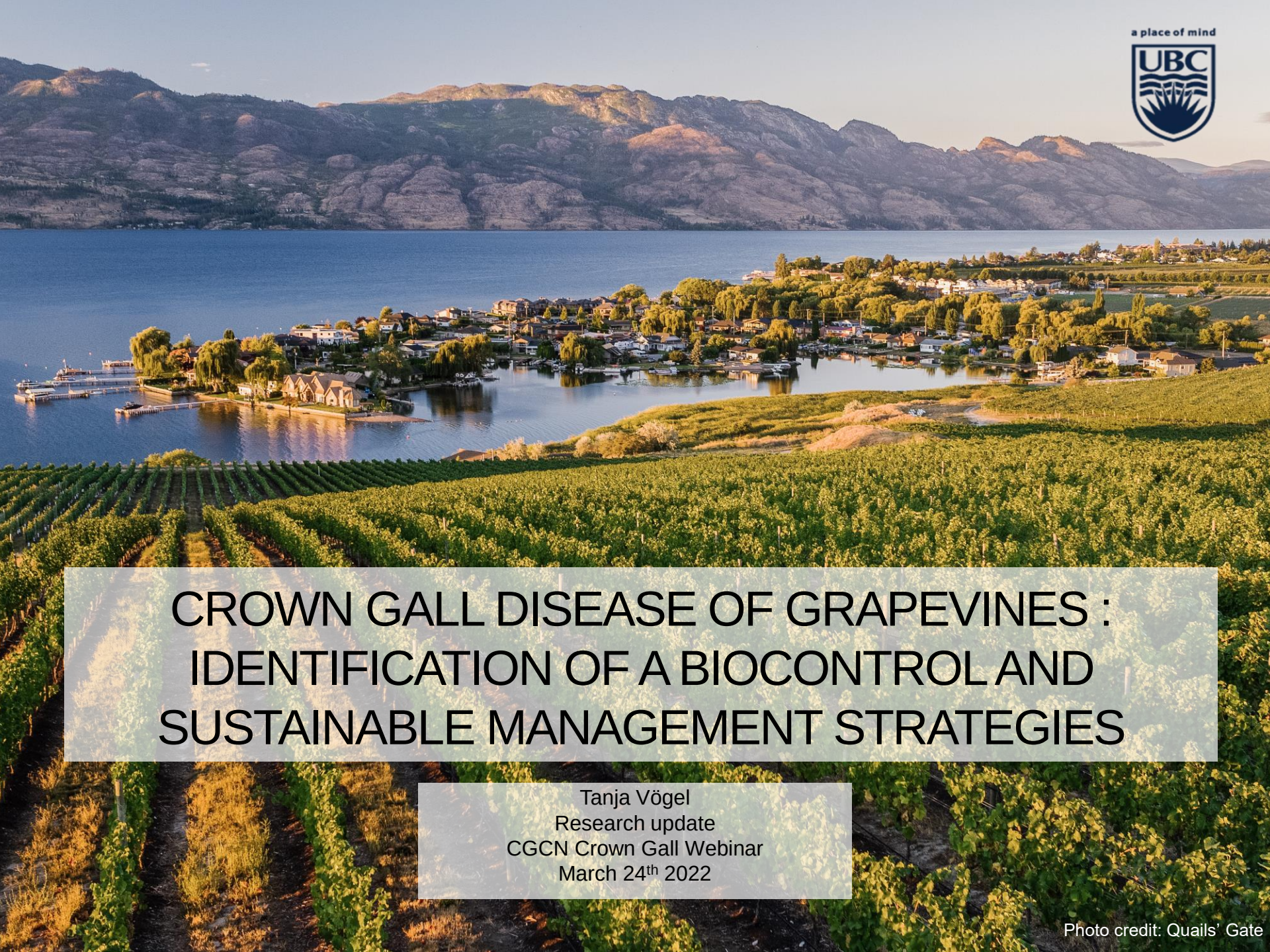

CROWN GALL DISEASE OF GRAPEVINES : IDENTIFICATION OF A BIOCONTROL AND SUSTAINABLE MANAGEMENT STRATEGIES

Tanja Vögel

Research update

CGCN Crown Gall Webinar

March 24th 2022

Photo credit: Quails' Gate


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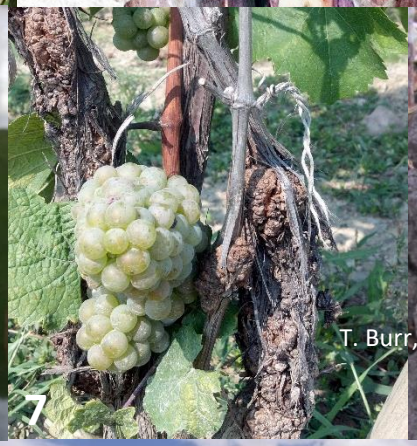
T. Burr, Cornell
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S. Poojari, Brock


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T. Burr
Cornell

Activity 20
Objectives

- **1: Testing of dormant grapevine nursery stock for abundance of *A. vitis***
- **2: Isolation of potential biocontrols for *A. vitis* from vineyards in British Columbia and Ontario**
- 3: Evaluation of potential biocontrols to prevent crown gall in a greenhouse assay
- 4: Evaluation of compost treatments to prevent or suppress crown gall in a greenhouse assay
- **5: Evaluation of compost treatments to suppress crown gall in a commercial vineyard**
- 6: Evaluation of compost treatments and soil mounds to prevent crown gall in an experimental vineyard

OBJECTIVE 1
Testing of dormant nursery stock for abundance of *A. vitis*

Photo credit:Quails' Gate

BACKGROUND

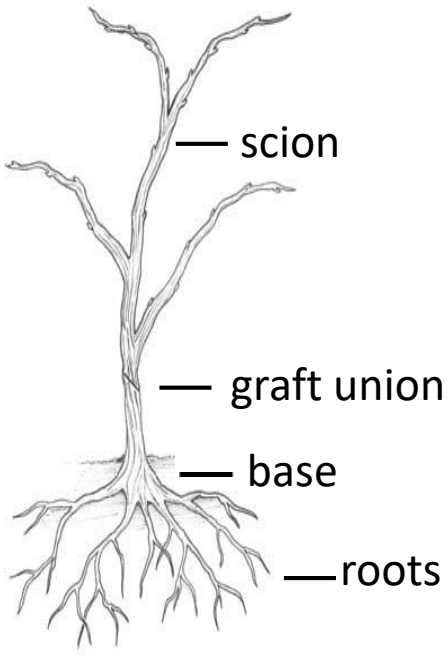
- Importance of testing before planting
- No grapevine crown gall certification program exists
- ddPCR methodology:

Plant Disease • 2018 • 102:2136-2141 • https://doi.org/10.1094/PDIS-02-18-0342-RE

Quantification of *Agrobacterium vitis* from Grapevine Nursery Stock and Vineyard Soil using Droplet Digital PCR

Tanja M. Voegel[†] and **Louise M. Nelson,** Department of Biology, University of British Columbia Okanagan, Kelowna, BC, V1V 1V7, Canada

METHODS



DNA isolation

José Urbez-Torres, SuRDC

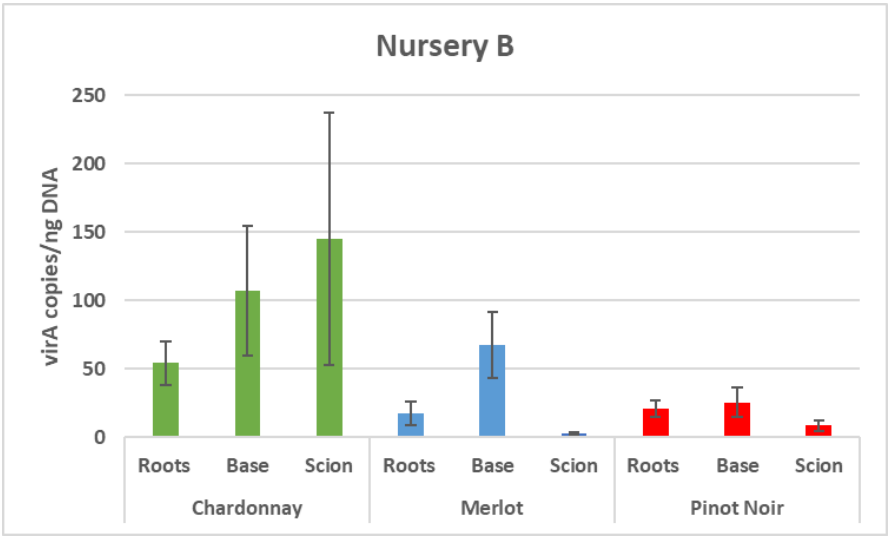
ddPCR

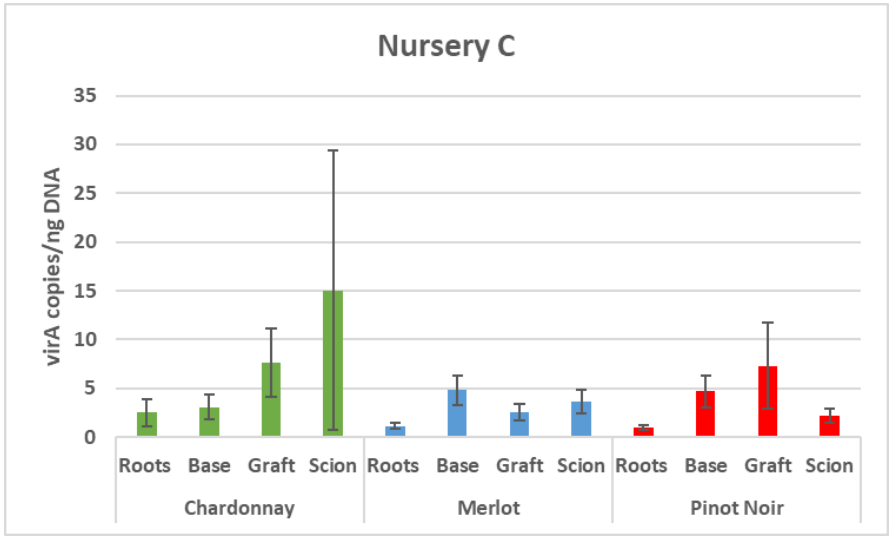
- 4 nurseries (B, C, D, E)
- 3 cultivars (Chardonnay, Merlot, Pinot Noir)
- 10-15 replicates

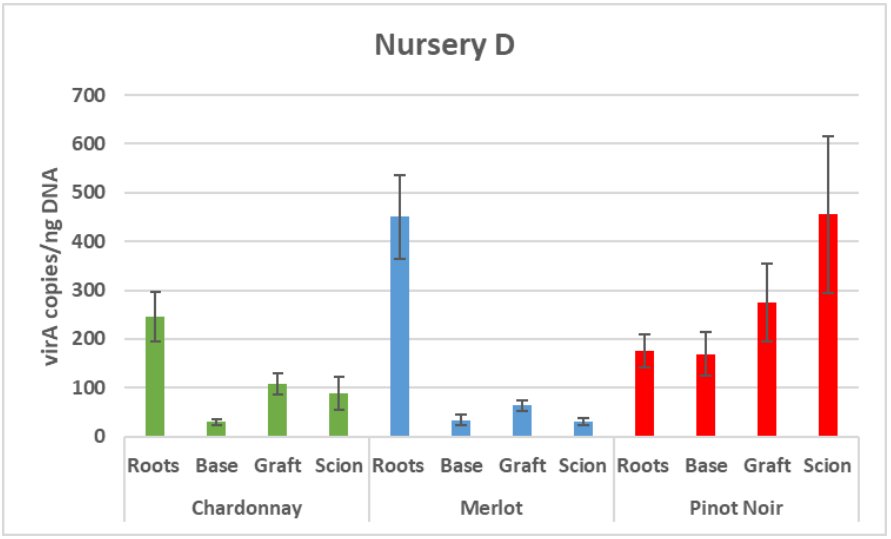


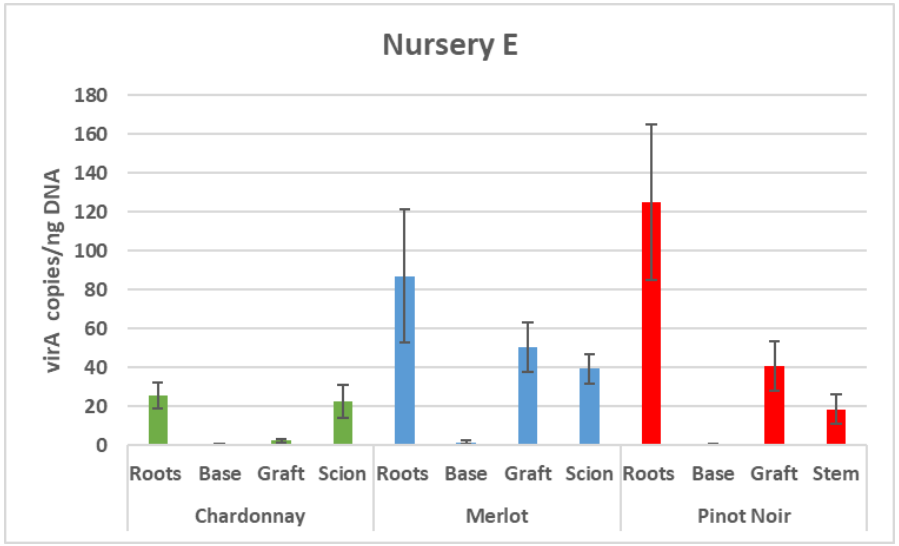


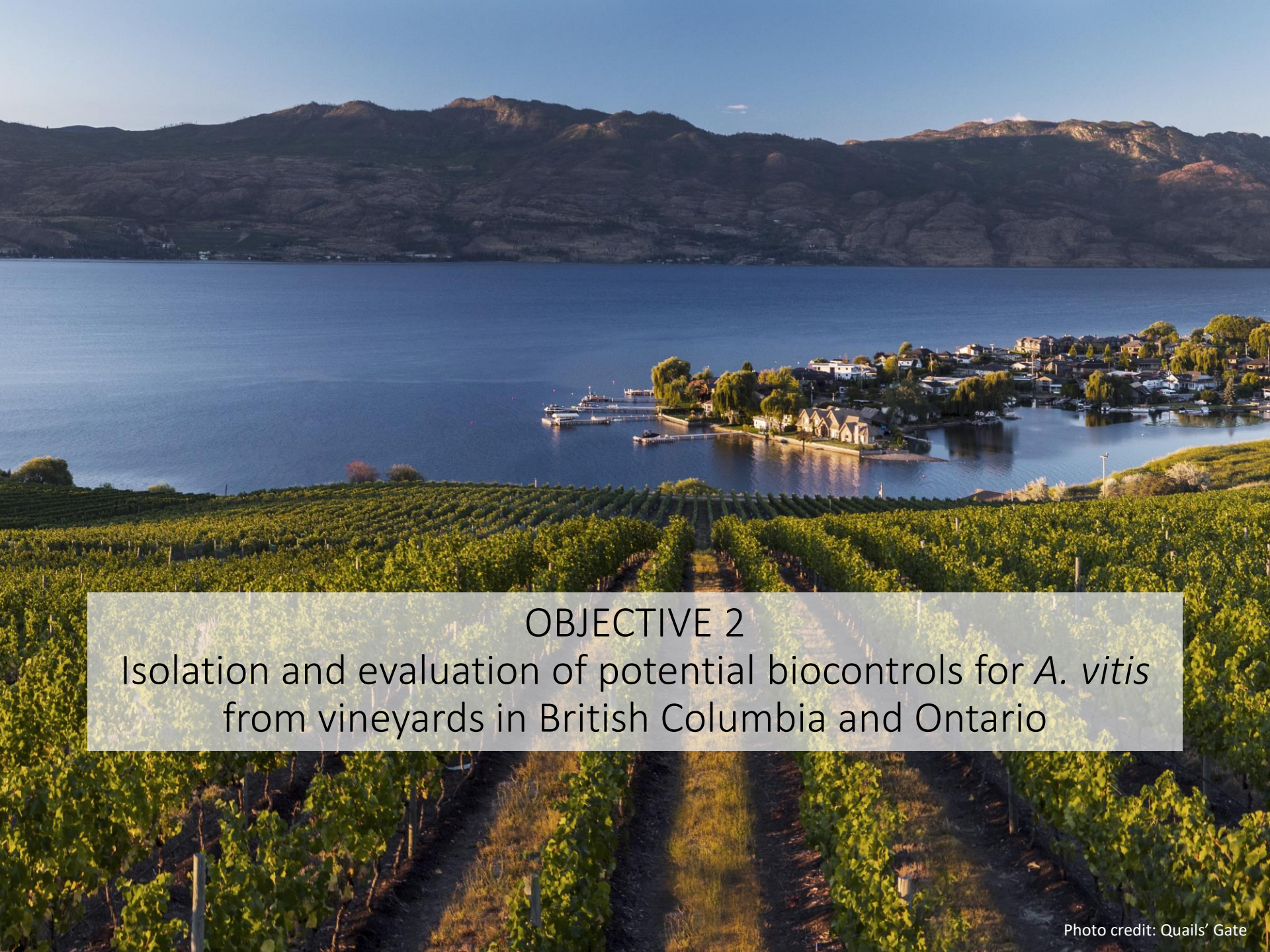

RESULTS
A. vitis abundance in dormant nursery material











OBJECTIVE 2
Isolation and evaluation of potential biocontrols for *A. vitis* from vineyards in British Columbia and Ontario

Photo credit: Quails' Gate

BACKGROUND

Biocontrol:

A method to control pests and plant diseases by using other organisms

Example:

- Crown Gall of stone fruit trees caused by *Agrobacterium tumefaciens*
- *Rhizobium rhizogenes* strain K84 (K1026) produces an antibiotic
- DYGALL®, NOGALL®™, GALLTROL-A®
- GALLEX®

Will not work for grapevines!

Considerations:

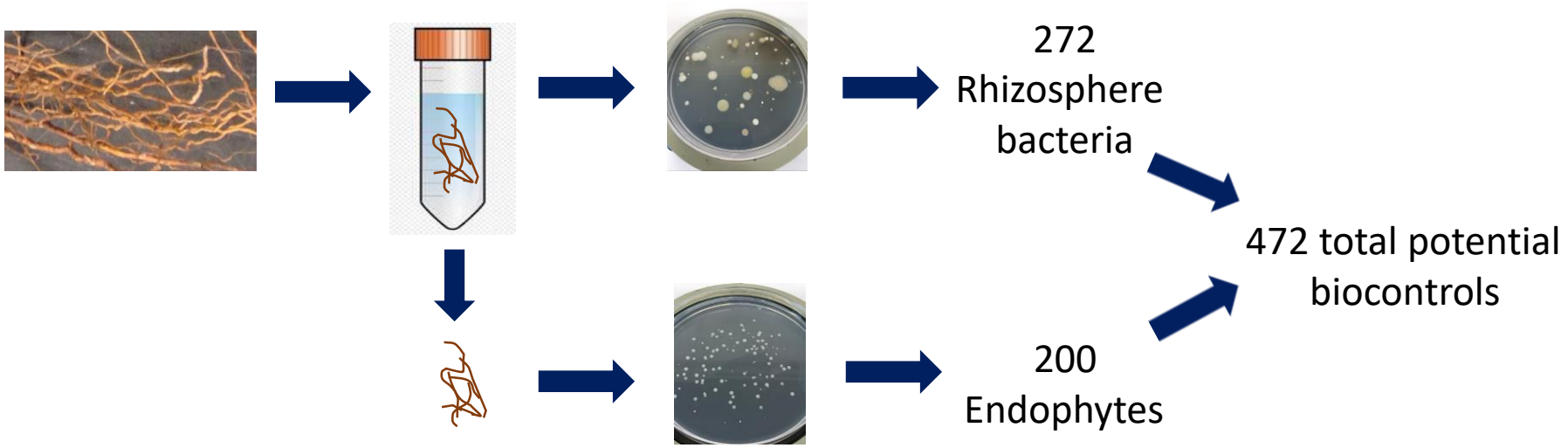
- Biocontrol needs to be culturable
- Biocontrol needs to grow in plant environment (xylem, soil, root)
- Biocontrol needs to grow in local environment
- Many biocontrol studies exist: F2/5 (Dr. Tom Burr), ARK-1 (Dr. Akira Kawaguchi)



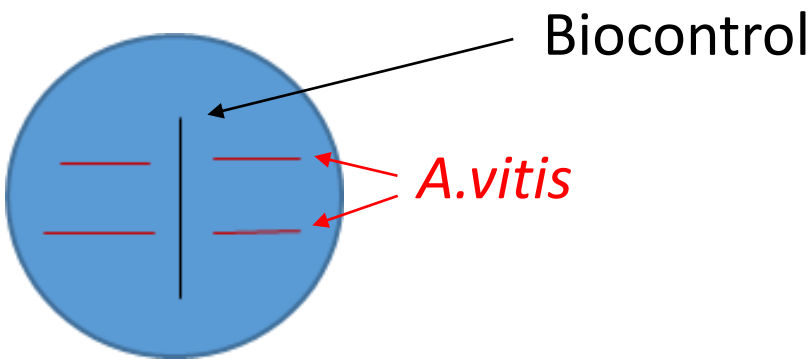



METHODS

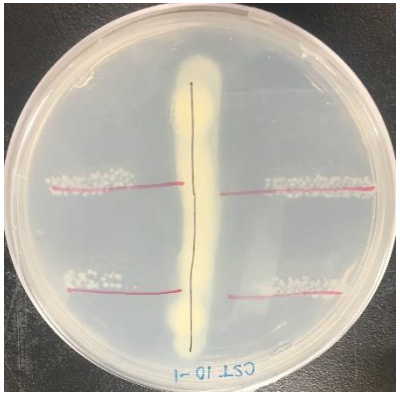
1. Isolation of roots from BC and ON vineyards



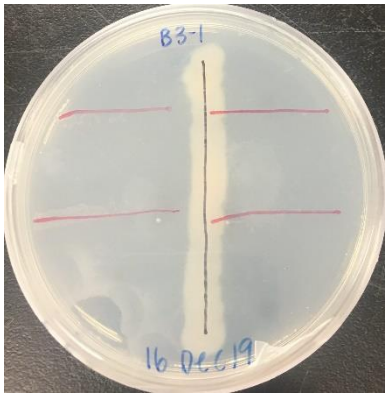
2. Plate inhibition assays



RESULTS



Weak inhibition



Strong inhibition

Potential bacterial biocontrols

Isolate name	Collection location	Original Host	Identity
B1-6	Ontario	Grape	*Bacillus mobilis*
BF5-4	BC	Grape	*Bacillus mycoides*
C3-5	BC	Grape	*Pseudomonas chlororaphis*
EN63-1	BC	Apple	*Bacillus subtilis*
Roper	California, USA	Grape	*Pseudomonas fluorescens*

→ *In-planta* assays in greenhouse

Trichoderma

OBJECTIVE 5
Evaluation of compost treatments to suppress crown gall in a commercial vineyard

Photo credit: Quails' Gate

BACKGROUND

Benefits of compost:

- Sustainable
- Improves soil
- Higher yield and better crop quality
- Suppresses soil-borne disease
- Compost treatment suppresses root-lesion and stubby-root nematode populations in cherry orchards in the North Okanagan
- *A. vitis* root infection increased by root-knot nematodes

METHODS

- Chardonnay est. 2014, East Kelowna, infected
- Composts applied yearly in spring at 25 kg N/hectare
- 4 years

- 3 different composts applied randomly:

Glengrow	**Weston**	**Commercial Winery**
Yard waste	Peat, Yard waste	Agricultural Waste

METHODS

Plant performance

grapevine phenology
leaf greenness
yield and cluster counts
pruning weights

Berry quality

Brix, TA, pH
Berry weight

Disease severity

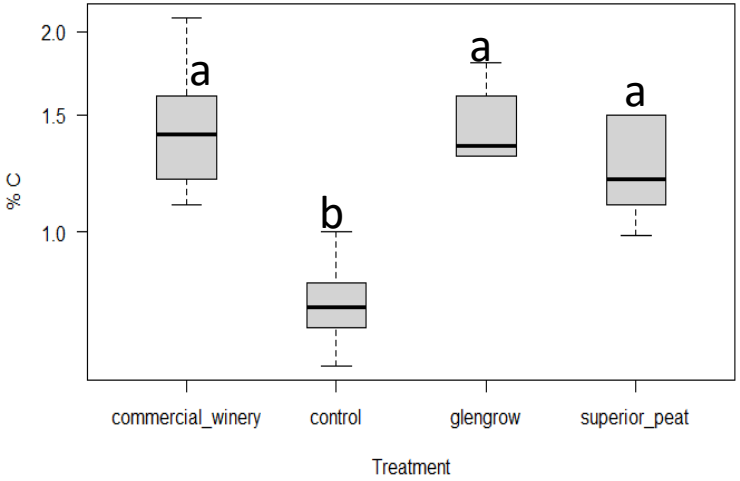
Visual rating (% trunk affected by galls)
A. vitis abundance in soil
Nematode populations (Dr. Tom Forge)

Soil analysis

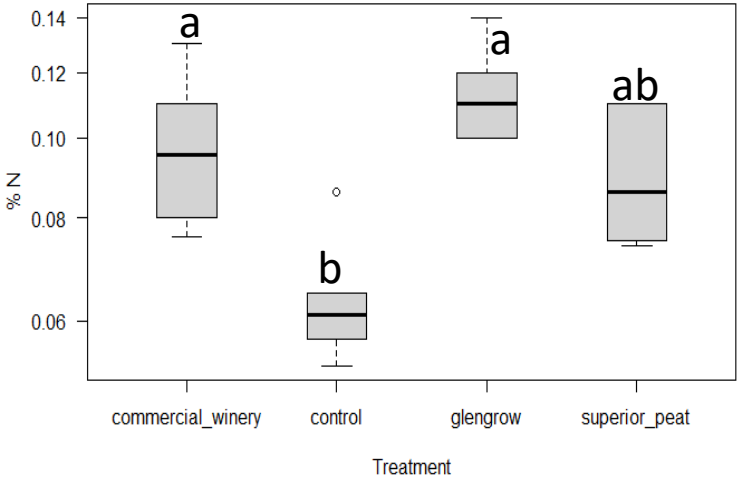
Total C/N, OM, pH, micronutrients

RESULTS

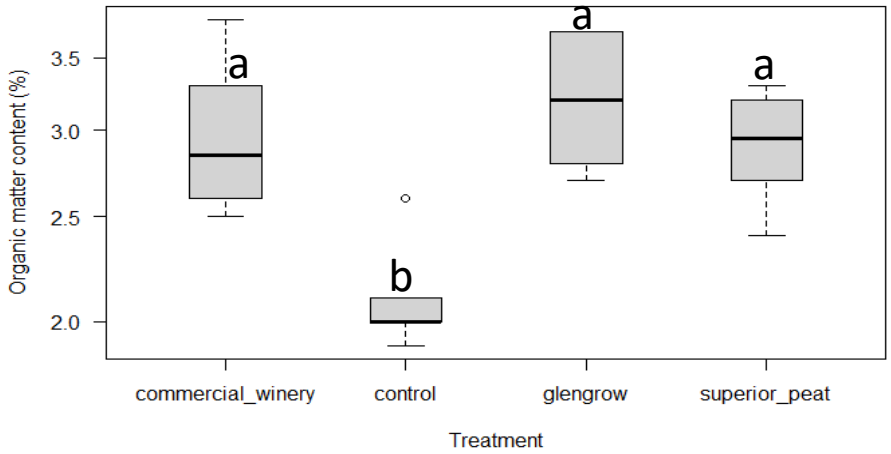
Soil carbon content



Soil nitrogen content

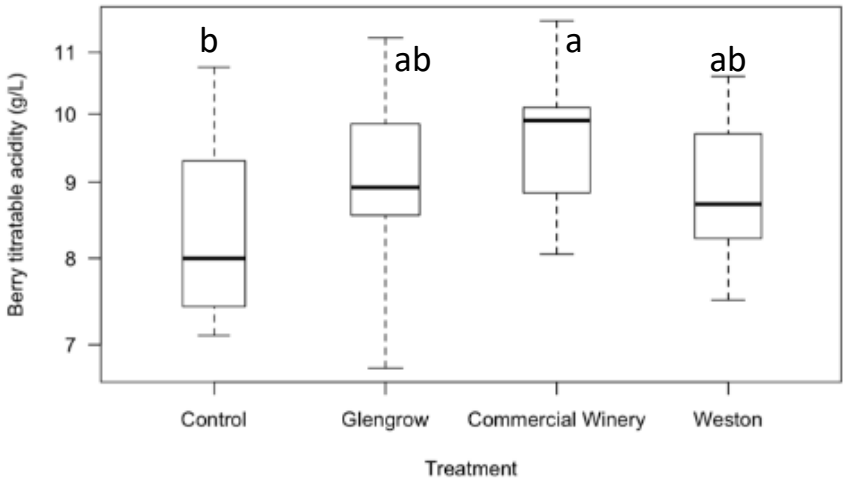


Soil organic matter content

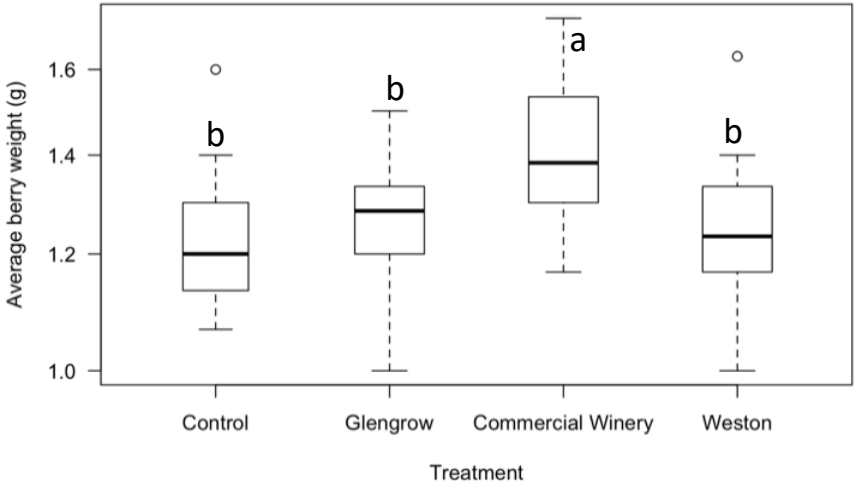


RESULTS

Berry TA ↑



Berry weight ↑



RESULTS

	Effect
→ Galls	X
A. vitis soil population	
→ Ring nematodes	↑
→ Pin nematodes	↓
→ Dagger nematodes	↓

Summary

- *A. vitis* likely present in most nursery material
- Biocontrol works
- Compost does not reduce *A. vitis* but improves soil and vine health
- Compost reduces nematode populations

THANK YOU!

Portiaa McGonigal (UBCO)
Louise Nelson & laboratory (UBCO)
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José Urbez Torres & laboratory (SuRDC)
Carl Bogdanoff (SuRDC)
Wendy McFadden-Smith & Jim Willwerth (Brock)
Lynn Bremmer (Mount Kobau Wine Services)

Participating Wineries & Growers