A path to leafroll virus management: the New Zealand experience.

Vaughn Bell and colleagues.

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...nothing without people
New Zealand wine production

- Cool Climate producer
- Young; innovative
- 94,000 ac planted
- Exports CAN$1.5 b
- Premium quality.

- Marlborough (60,000 ac)
- Central Otago
- Hawke’s Bay (11,600 ac)

36° South
45° South
Grapevine leafroll-associated virus 3 (leafroll virus)

- The why, where, what & how
Grapevine leafroll-associated virus 3 (leafroll virus)

- Results; future considerations
Grapevine leafroll-associated virus 3 (leafroll virus)

- Important lessons.
Remembering Dr Rod Bonfiglioli (& Alfie).
What is leafroll virus?

- Phloem-limited viral pathogen
- Spread by insects & grafting (not mechanically)
- Negatively alters yield, berry & wine quality
- *Vitis* limited (but new research is looking at this)
- Multiple leafroll virus variants affecting all cultivars
- Foliar symptoms in red cultivars; symptomless white cultivars, rootstocks, & hybrids.
NZ wine motivated to find solutions

- In 2008, leafroll recognised & acknowledged
- **Owner-instigated** regional response formulated
- Pulled together a team of people with variable skills
- In 2009, secured multi-year research funding
- Two study components: regional & block-specific...
- **Objective:** To develop & test an integrated (multi-tactic), practical response to reduce & maintain incidence at <1% pa.
The regional perspective (2,100 ac)

Grapevine leafroll virus incidence (%)
NZW Grafted Grapevine Standard

- A critical platform (CGCN*)
- 7 members of Vine Industry Nursery Association (VINA)
- An assurance of ‘high health’ vines
- Screens for leafroll virus (GRBV not detected in NZ)
- Reduced risk of virus-infected material being planted.

*Canadian Grapevine Certification Network
Considerations for Canada?

- The CGCN will be Canada-specific & fit-for-purpose
- Screen for leafroll virus, GRBV & GPGV
- Nurseries & growers reliant on support of the other
- Available & standardised across Canada
- Provides owners with the confidence to begin a rogue & replant response.
Visual symptom identification

Leafroll-infected Pinot noir

Mg deficient Pinot noir
Visual symptom identification

- Tested in New Zealand & South Africa
- 114,782 vines visually inspected & laboratory tested
- The two methods were in agreement for 114,701 vines (99.93%).

Conclusions – visual symptom identification

- Quick & reliable in red berry cultivars in NZ & SA
- Comparable with laboratory testing, avoiding test-related costs & delays
- Relies on trained personnel undertaking well timed inspections
- Distinguish leafroll from unrelated, benign conditions
- Challenge remains to diagnose leafroll in white berry cultivars reliably in the vineyard.
Considerations for Canada?

- With training, no logical reason why VSI should not also be effective in Canada but…

- Are there unique variables confounding VSI?

- Timing of symptom expression

- Cultivars

- Virus variants

- Climate (e.g. consider frosts).
Vine removal (roguing)

- A 20% incidence threshold
- Roguing individual infected vines or small clusters of infected vines
- Roguing is part of an integrated response.
y=2013
Optimising the roguing response

- Effectiveness of variable management responses
- At initial incidence of 0.4 to 20%, roguing response resulted in <1% annual incidence from years 2 to 20, but only where mealybug numbers were ‘low’.
- EAA Costs + lost income? CAN$113 to $790 / ha
- ‘High’ mealybugs? CAN$3,400 to $4,600 / ha
- No action & ‘High’ mealybugs?
- At 0.4 & 20% initial incidence, 90% of vines infected after 14 & 8 years, respectively
- CAN$5,900 to $7,500 / ha.
Conclusions – roguing

- In red berry cultivars, roguing is a viable response
- Within 2-3 years, incidence was <1.0% when roguing was part of an integrated management plan
- Removing symptomatic vines slowed virus spread
- ‘First’ vines can and should be retained
- For many NZ vineyards, roguing is the ‘new normal’.
Considerations for Canada?

- While roguing works, it relies on low vector abundance. That position unlikely to differ in Canada.
- A 20% (or 25%?) incidence threshold for roguing?
- What are the patterns of virus spread? Vector driven or a planting legacy?
- Can roguing symptomatic vines only contain the disease successfully?
- Obstacles to roguing? e.g. mortgage providers?
- Canadian Grapevine Certification Network
- Awareness of the problem & possible solutions?
Leafroll virus spread by insect vectors

- Underestimate the vectors at your peril
- Vine – virus – vector interaction
- To understand the vector ensures better virus management.
Mealybugs & soft scale insects

- Up to 3 generations / year
- Climatic extremes?
- Feed on virus-infected *Vitis*
- Crawlers are small, mobile & efficient vectors
- Often hidden (cryptic)
- Vector management -
  - Biological control
  - Insecticides.

Longtailed mealybug, *Pseudococcus longispinus*

Citrophilus mealybug, *P. calceolariae*
Insecticide use: a weak link

- In NZ, some reluctance to use insecticides
- Product timing, coverage, vine wetting, & run-in
- Measuring effectiveness.
Vector conclusions

- Low vector abundance needed for effective control
- Evidence of some tolerance
- Better implementation of…
  - vector monitoring
  - insecticide best practice.
Considerations for Canada?

- Knowing the vectors: biology (e.g. no. of generations), species diversity, presence, regional variation…
- Willingness to use insecticides, even as a short-term response? Product range & availability?
- Synchronise messages; partner with chemical companies / retail distributors (interact with growers)
- Broad-spectrum chemistry detrimental to biological control – IPM & compatibility?
What’s next?

- A willingness to pursue new research opportunities
- Groundcover for mealybugs (NZW, PFR)
- Virus Reservoir (BRI)
- Optimal roguing response (NZW & MBIE)
- Mealybug biological control (NZW & PFR)
- Mealybug synthetic sex pheromones (PFR) and…
- Mealybug taskforce, mealybug ‘spray days’, minerals & mealybug attraction to vines (all BRI) …
Some final thoughts for Canada

- Pull together an effective team with a varied skill set
- Extension is critical
- Engage with funders for Canada-specific research
- Talk with neighbours – act regionally, not locally
- Trained staff looking / responding to virus & vectors
- Accept that virus management is here to stay.
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Topics warranting some discussion

- A step by step ‘how to’ for VSI, tagging, mapping, roguing…
- Mealybug monitoring - pheromones in Canada?
- Virus testing in whites – a practical, useful protocol for Canada?
- An optimal roguing response. Glossed over in presentation but this is something Canada should evaluate in more detail – vector pressure?
- Spatial overlapping of old & new plantings (white vs red, roguing 1+2, remnant vine roots)
- Engaging with industry body – at Provincial and national level. Critical.
- VSI & other training. Critical.
- Vineyard hygiene. Critical.
A decision support tree for vector spray programme & response to leafroll virus

White berry cultivars

- Default position is to adopt vector best practice recommendations under all circumstances
  - Develop plan to test all plantings to estimate virus incidence
  - Vector abundance is high?
    - Adopt full vector spray programme
    - Rogue symptomatic vines annually
  - Vector abundance is low?
    - May limit insecticides to E-L 17-25; rogue symptomatic vines annually

Red berry cultivars

- Virus incidence is <5%
  - Adopt full vector spray programme; rogue symptomatic vines annually
- Virus incidence is 6-20%
  - In the absence of formal monitoring, assume vector abundance is high
  - Adopt full vector spray programme
  - Rogue symptomatic vines annually
- Virus incidence is >20%
  - Assess fate of block & redevelopment prospects
  - Adopt full vector spray programme