



NEW ZEALAND WINE
PURE DISCOVERY

The New Zealand Institute for Plant & Food Research Limited

Plant & Food
RESEARCH

RANGAHAU AHUMĀRA KAI



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

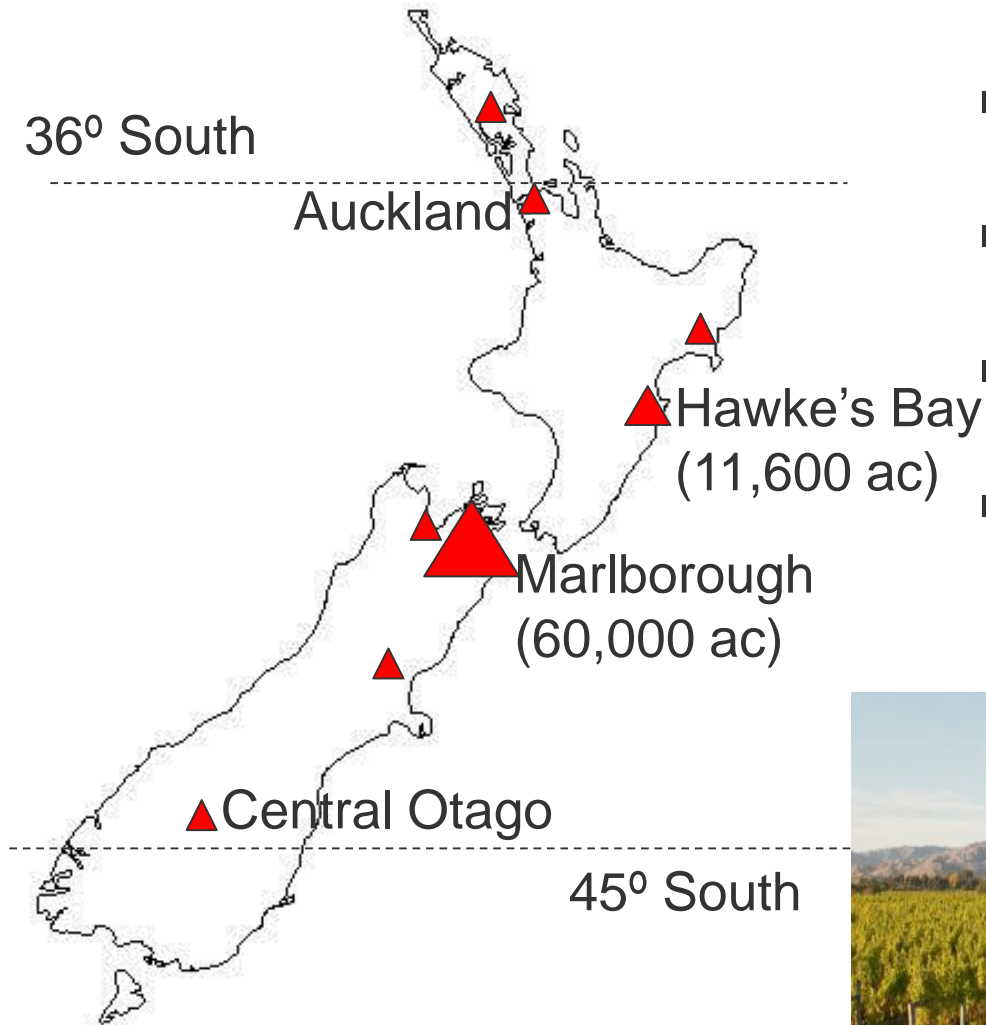
Vaughn Bell and colleagues.

Vaughn.Bell@plantandfood.co.nz

...nothing without people



New Zealand wine production



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



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?

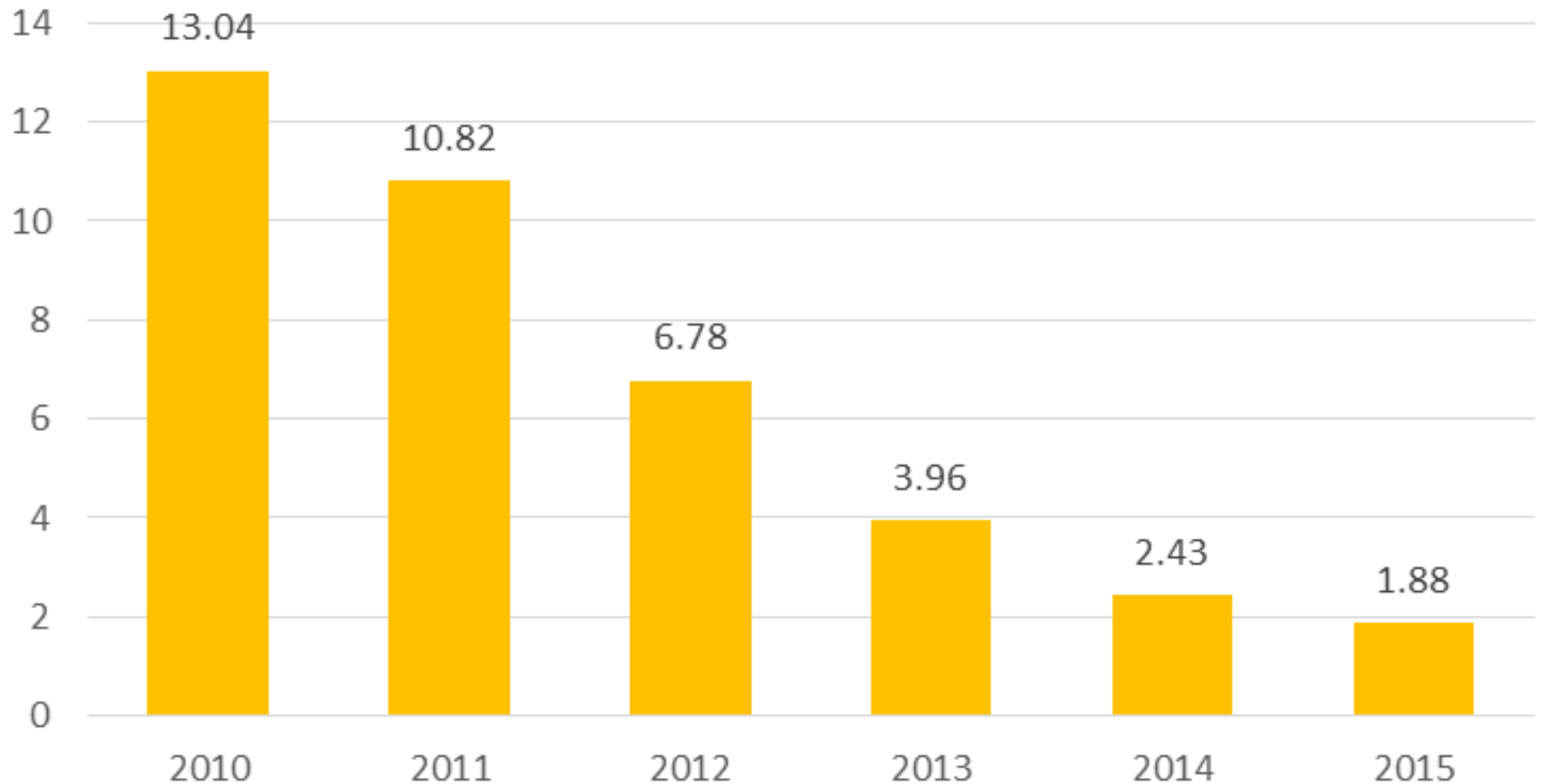
- Phloem-limited viral pathogen
- Spread by insects & grafting (not mechanically)
- Negatively alters yield, berry & wine quality
- *Vitis* limited (but new research is looking at this)
- Multiple leafroll virus variants affecting all cultivars
- Foliar symptoms in red cultivars; symptomless white cultivars,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

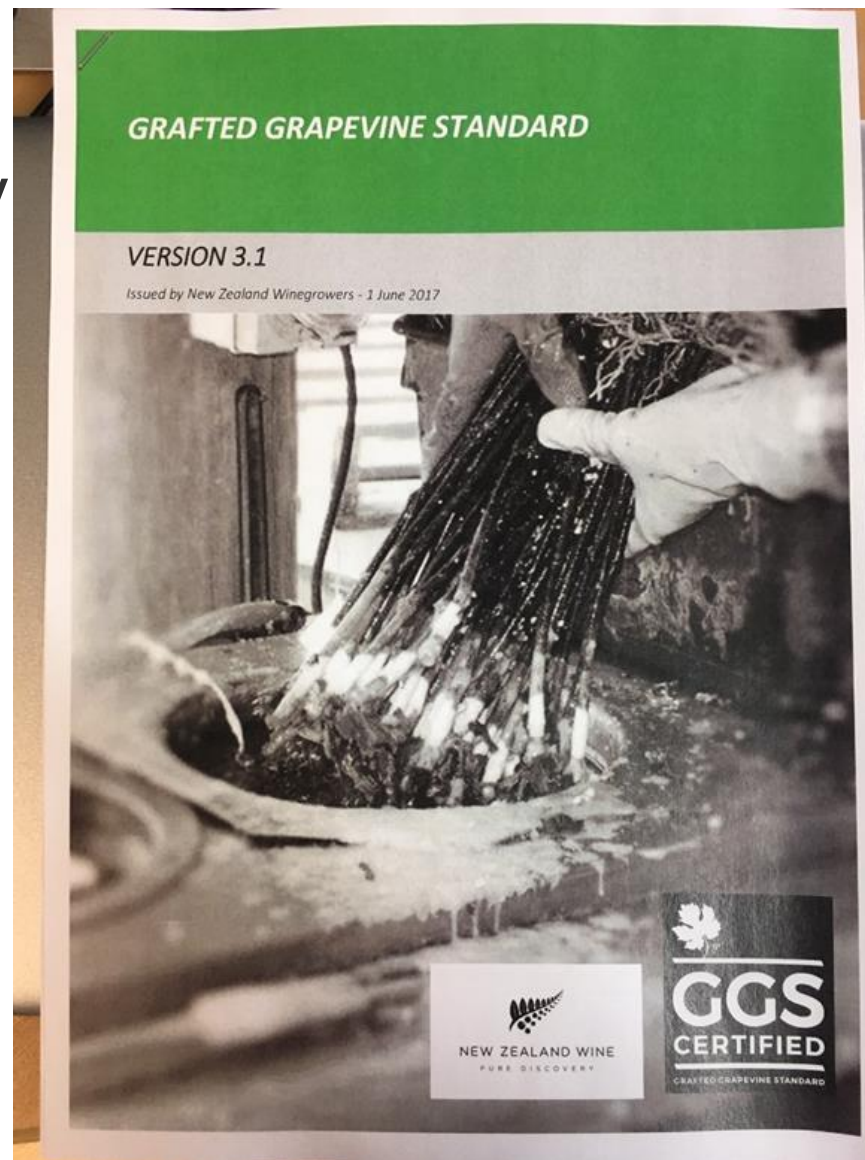
Grapevine leafroll virus incidence (%)



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%).
- Bell *et al.* 2017. *Journal of Plant Pathology* 99(2): 477-482.

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).

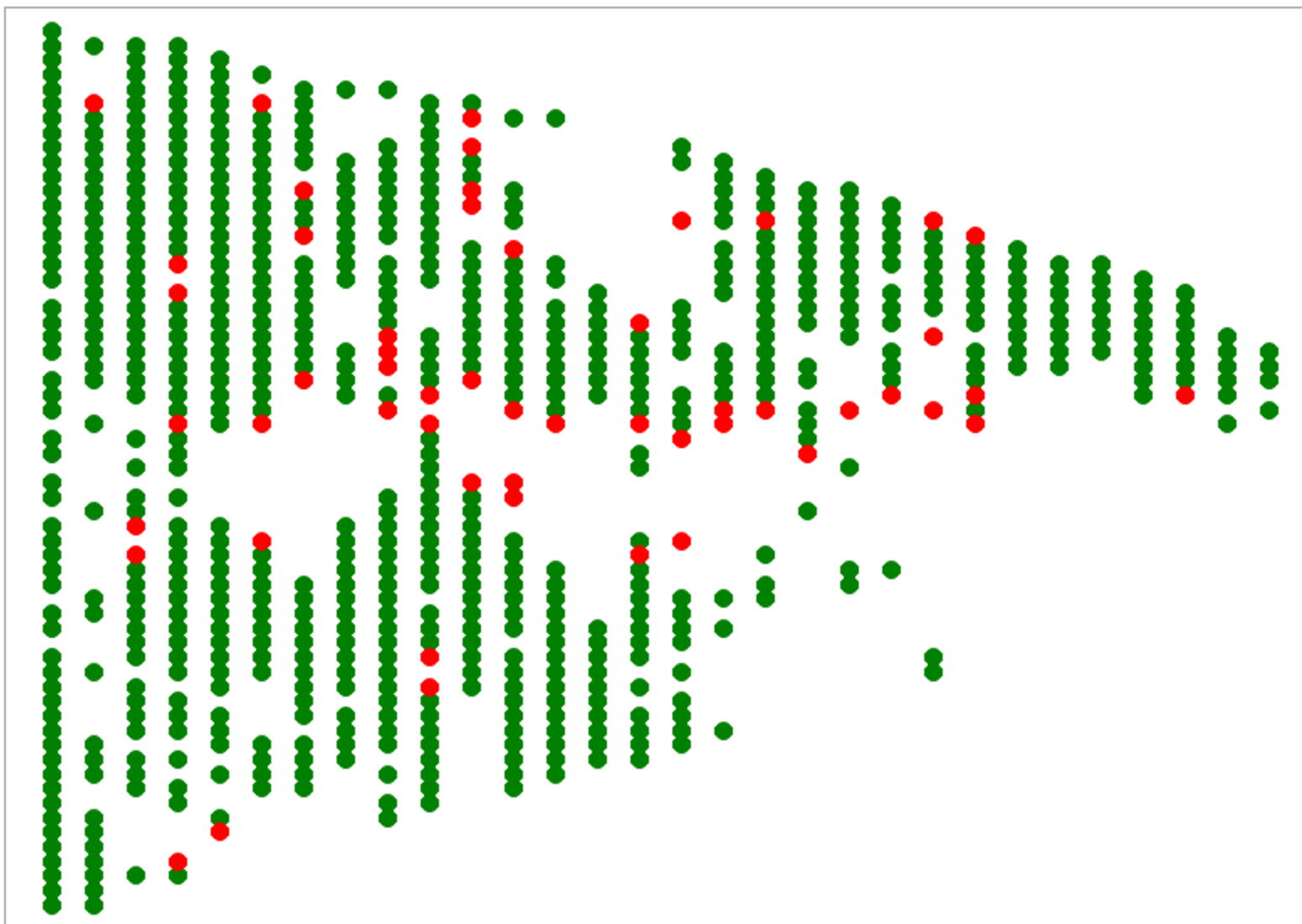
Vine removal (roguing)

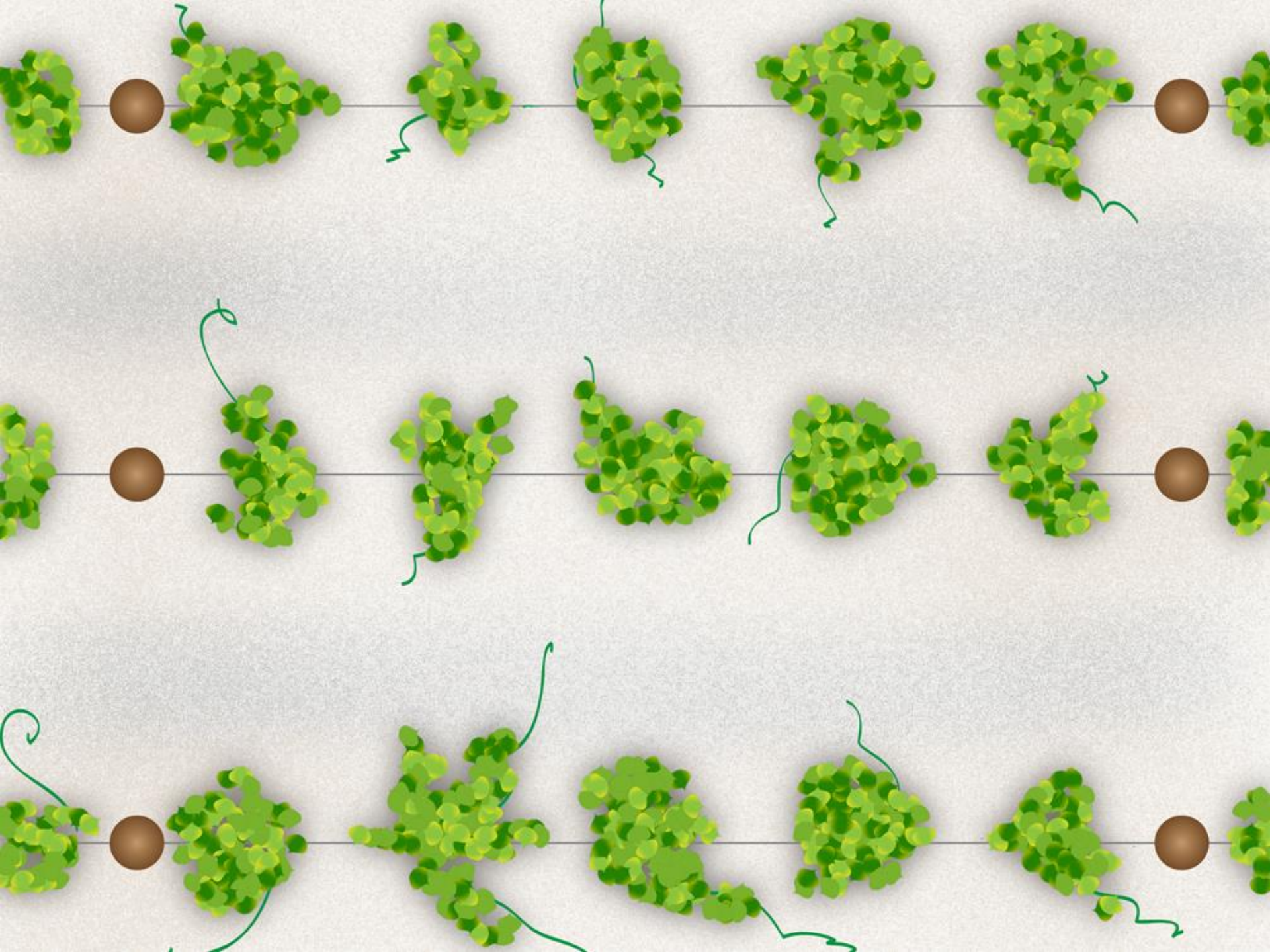
- A 20% incidence threshold
- Roguing individual infected vines or small clusters of infected vines
- Roguing is part of an integrated response.

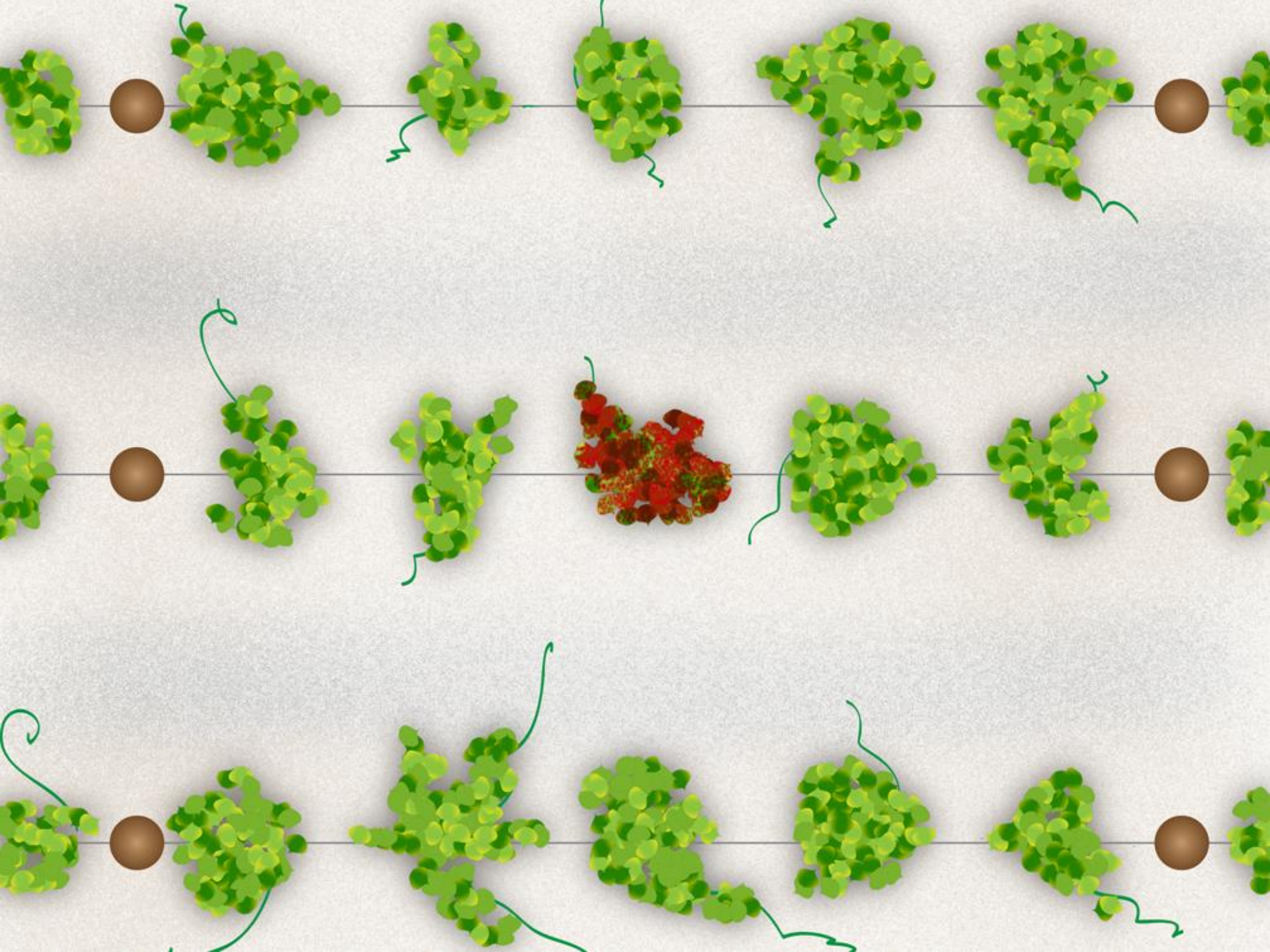


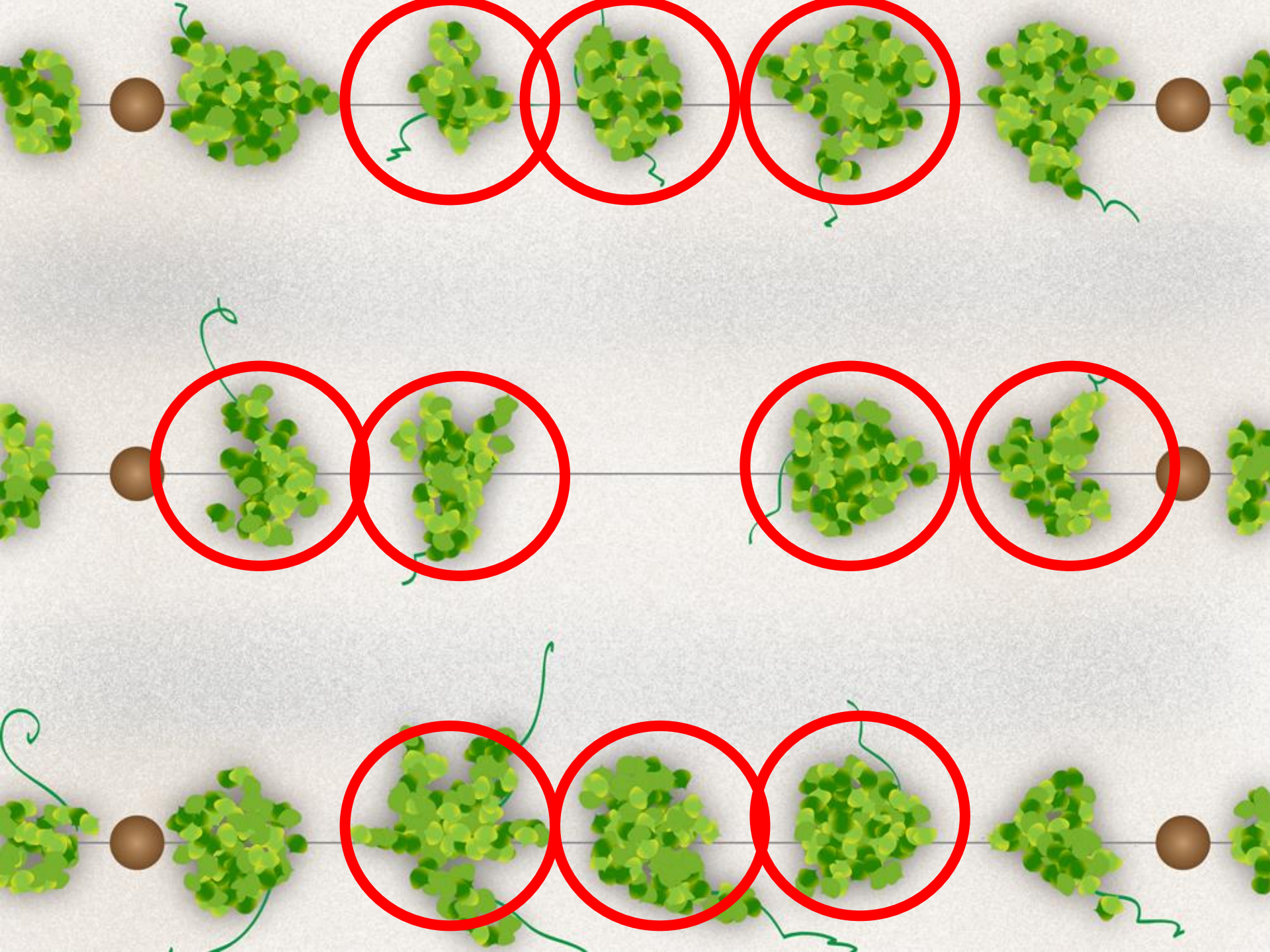
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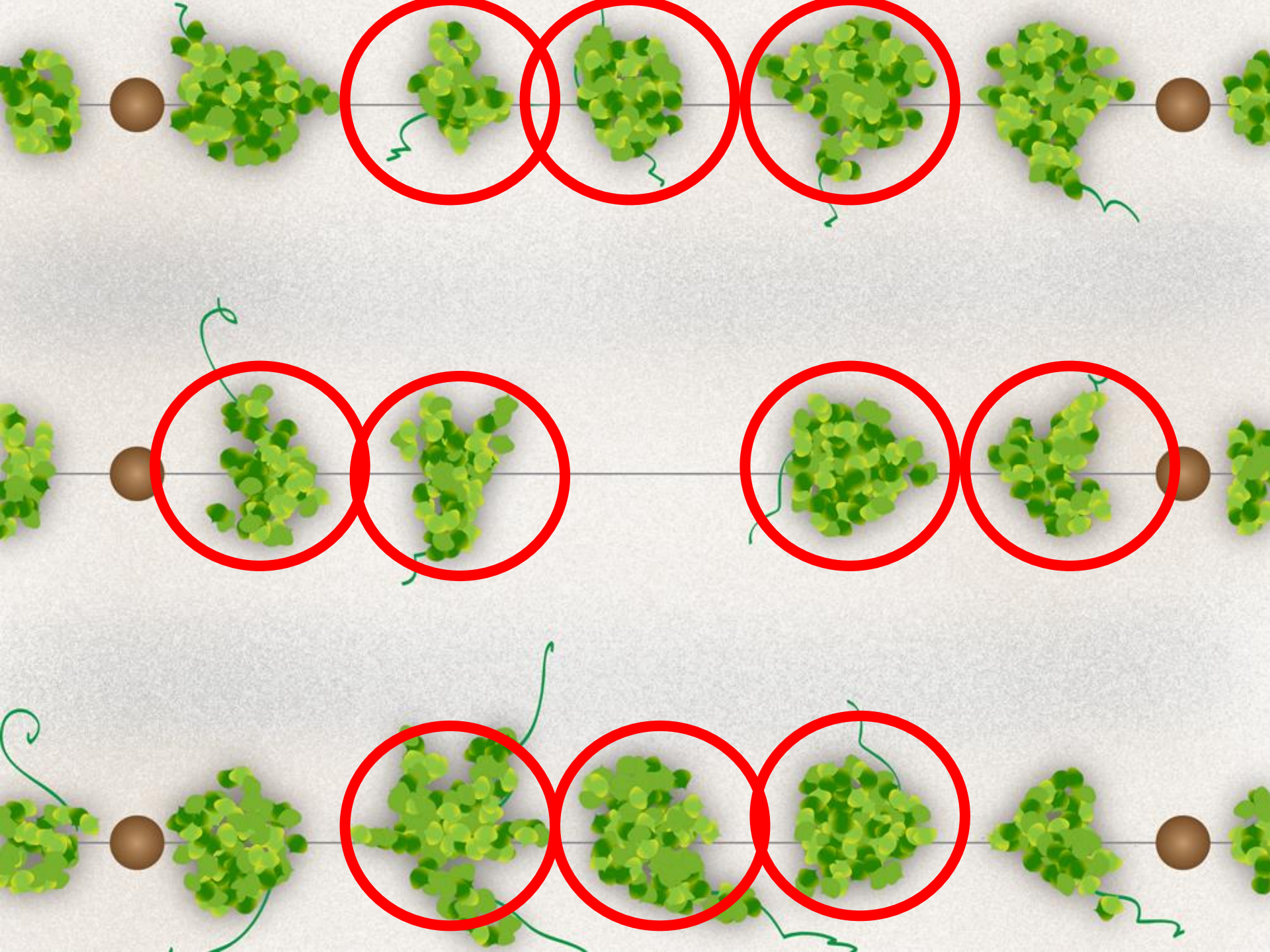
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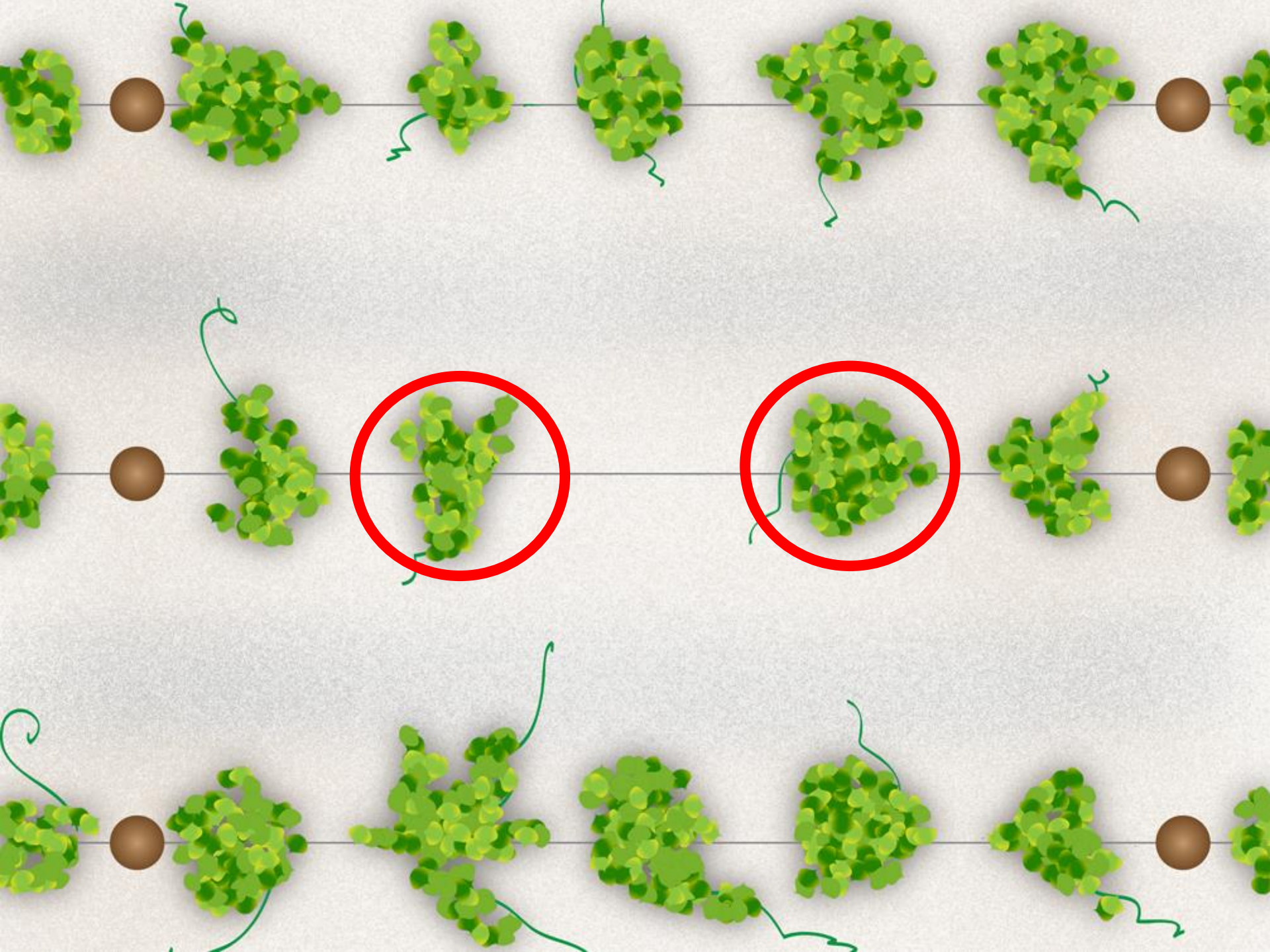














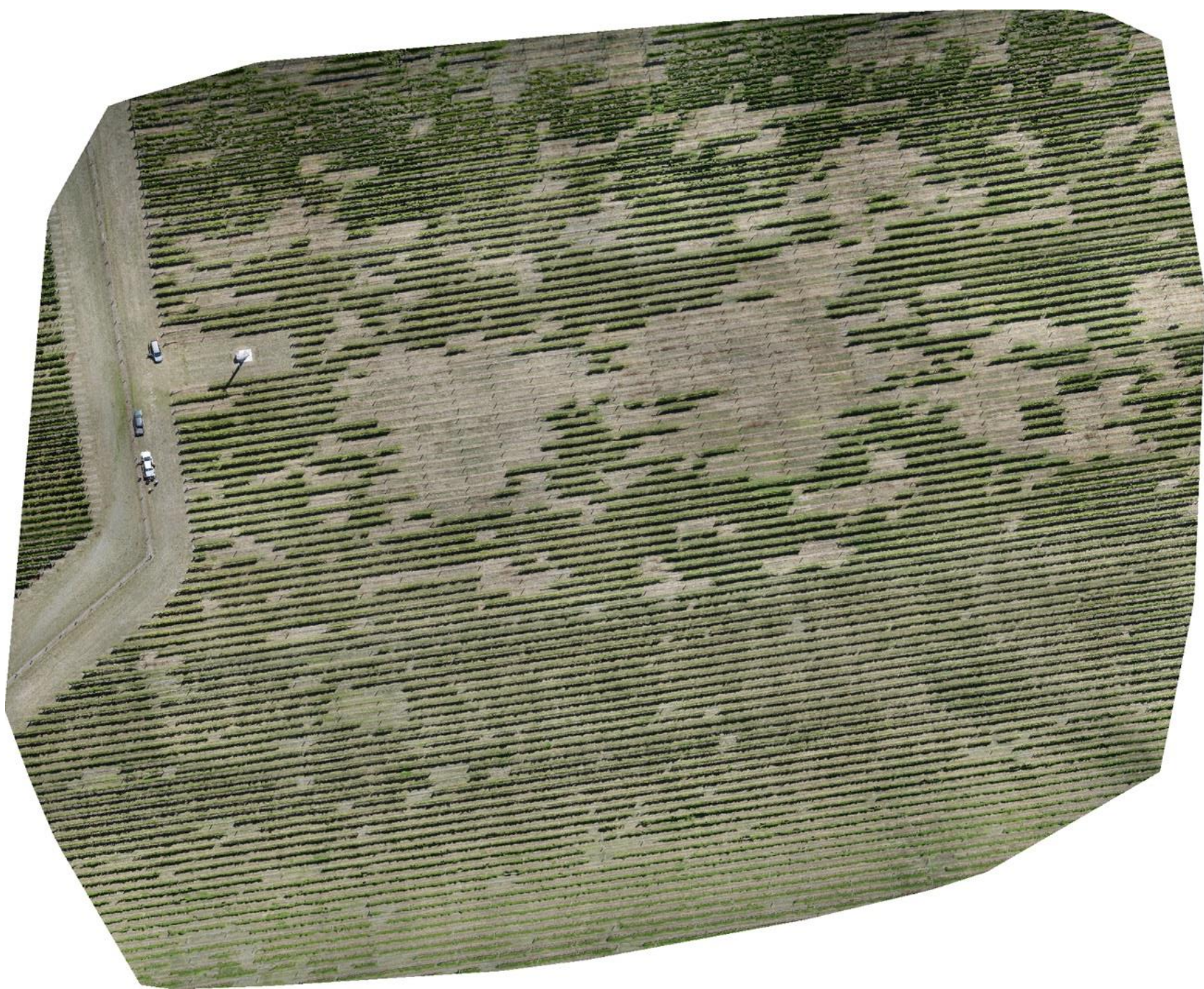




Photo: Dr Rod Bonfiglioli

3 11 2008

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 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?

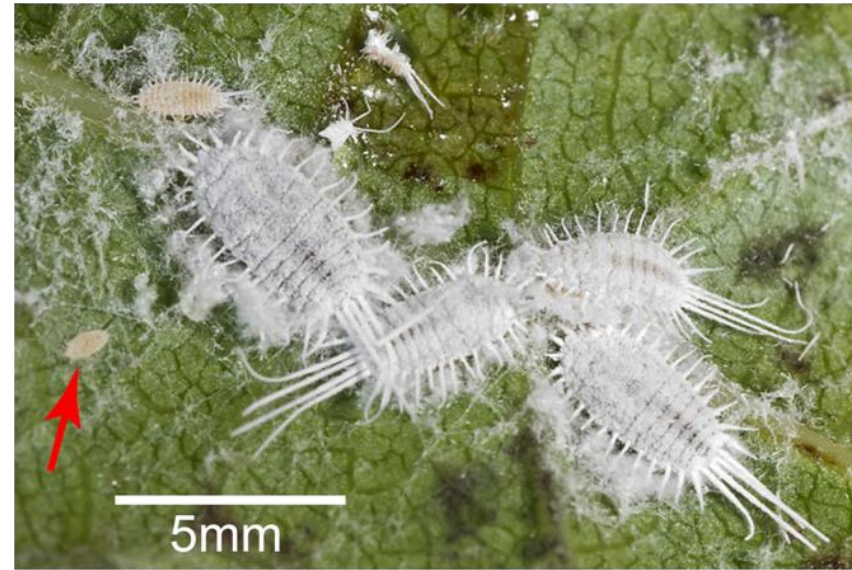
Leafroll virus spread by insect vectors

- 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.

My sincere thanks to...

- Dr Donald & Elaine Triggs
- Cool Climate Oenology & Viticulture Institute and Brock University including:
 - Dr Debbie Inglis, Barb Tatarnic, & Dr Kevin Ker
- BASF Canada, VineTech Canada, & the BC Wine Grape Council for their longstanding support of the lecture series, the Summerland Research and Development Centre for hosting this public lecture; hosts & audience at the field-day events
- New Zealand Winegrowers, Ministry for Primary Industries (Sustainable Farming Fund), vineyard owners & their staff for all their support over many years
- Plant & Food Research and my PFR colleagues
- And to the audience, thank you.



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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

