Australian Government
Wine Australia

VINEHEALTH AUSTRALIA

GRAPEVINE PINOT GRIS VIRUS INFORMATION EXTENSION PROGRAM

Extension of current knowledge of Grapevine Pinot Gris virus and management options to the nursery and vine improvement sector

FINAL REPORT TO WINE AUSTRALIA

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List of abbreviations

AGWI:	Australian Grape & Wine Incorporated
GPGV:	Grapevine Pinot Gris virus
MIAVIS:	MIA Vine Improvement Society
PEQ:	Post entry quarantine facility
RSG:	Restricted Spring Growth
SAVIA:	South Australian Vine Improvement Association
VAMVVIA:	Victorian and Murray Valley Vine Improvement Association
VI:	Vine Improvement
VINA:	Vine Industry Nursery Association

1.0 Background

Grapevine Pinot Gris virus (GPGV) is a relatively new-to-science virus that was first described in 2012 (Giampetruzzi *et al*., 2012). It was associated with a disease called grapevine leaf mottling and deformation (GLMD) in the cv. Pinot Gris in Italy. Significant yield losses have been observed in GLMD-affected grapevines where GPGV was also detected.

GPGV was first detected in Australia in 2016. In early 2018, it was deemed to not be technically feasible to eradicate and is no longer regulated at the Australian border. The impact of the virus on production of nursery material and fruit in Australia is unknown.

A recently completed project, 'A comprehensive review of *Grapevine Pinot Gris virus* (GPGV) (WA Project Number: VHA 1701), including recommendations for future research, development and extension work in Australia, identified the nursery and vine improvement (VI) sector as key to minimising further spread of GPGV through infected propagation material. Communication of key and emerging biosecurity issues, such as GPGV, to nursery and VI is critical because of the risk of supplying infected propagation material to wine grape, table grape and dried fruit industries throughout Australia.

The nursery and VI sectors are the main suppliers of planting material to vineyards in the wine grape, table grape and dried fruit sectors, and are critical in the distribution of high health, virus tested material. The VI sector hold the virus-tested material in a number of formats that includes original virus-tested germplasm (often three vine plots) and larger multiplication rows (one to twenty, or up to a few hundred vines) in collections derived from the germplasm vines. Larger source blocks (hundreds of vines) are ideally derived from multiplication rows and are generally on commercial vineyards. Multiplication rows and source blocks managed by VI are inspected for disease and a small amount of active testing for key pathogens is generally done. Nurseries purchase cutting material from the VI organisations; rootstocks from multiplication rows, *V.vinifera* from source blocks. They then grow these on, on own roots or as grafted rootlings, for subsequent distribution to commercial growers. Some nurseries hold their own source blocks, a few have their own multiplication rows, or own private material as germplasm.

2.0 Project Aims

The aim of this project was to extend the learnings from the aforementioned project to the nursery and VI sector as the key producers of new planting material for the grape and wine industries.

This extension aimed to ensure knowledge on GPGV could be integrated into their decision-making and operations to produce high health planting material for the industry. Importantly, it focussed on what we know and don't know about GPGV, and how and when to conduct on-ground surveillance for the virus in propagation material.

3.0 Project Outputs

3.1 Information pack and presentation

As part of the extension program an information pack on GPGV, including a power point presentation and handouts, was developed. Refer to Section 6.0 Appendices for information developed for this extension program.

3.2 Extension of material to nursery and vine improvement representatives

The nursery and VI sector extension program consisted of three face-to-face meetings in central geographic areas for the sector (Griffith, Mildura and Barossa Valley) by the project researchers Fiona Constable and Libby Tassie. In addition, one teleconference was held for industry representatives in Western Australia, Queensland, New South Wales and Tasmania, who were unable to attend one of the presentations in person.

The content delivered focused on:

- current understanding of GPGV – including its mode of infection, potential symptoms,
- current knowledge of distribution overseas and in Australia, and its agronomic impact,
- current knowledge on field sampling and laboratory detection methods,
- management strategies in the short term to minimise spread through propagation material, and
- outstanding GPGV information gaps that need to be addressed through future research.

These forums also included a question and answer session and provided an opportunity for the VI and nursery sector to promote steps it has taken thus far in addressing GPGV in the production of propagation material in Australia.

3.3 Workshop feedback

The following table outlines the feedback received at each of the four extension sessions. The questions raised during these sessions were addressed on the day and based on knowledge gained during the comprehensive review of GPGV (WA Project Number: VHA 1701).

The issues and questions raised by attendees varied between the table and wine grape industries, and between regions. They also varied according to audience experience with viruses generally or GPGV specifically, especially where GPGV is thought to be an issue in their industry or region, and the perceived quantum of a problem presented by GPGV infection.

Workshop location	Date	Attendees	Key questions /issues raised

Griffith	3.4.19	15, including representatives from two nurseries and from the MIAVIS committee	• Need national propagation spokesperson
			• Nurseries buy vines where available; short supply now, in particular rootstocks
			• VI have tested rootstock source areas but highlighted low confidence in sampling protocol used for virus detection and therefore lack of overall confidence in the results on a block level
			  ○ Current sampling rate is 5 vines/1000 – what should this be?
			  ○ Currently sample 1 shoot per vine – what should this be?
			  ○ When is the best time of the year to sample?
			• Pinot Gris in the region is showing restricted spring growth (RSG)-type symptoms but unsure of the underlying cause
			• Unsure if GPGV is in the region
			• Is GPGV an issue – what is the impact in Australia?

Mildura	15.4.19	14, including representatives from nurseries, VAMMVIA, Table grapes, Dried fruit	• What should we be doing with infected vines in nurseries that are ready for sale this season?
			• What do growers know about GPGV and its impact?
			• Potential GPGV symptoms on table grapes – need to verify and determine impact
			• Question that the onus be put on growers to pay for testing of material
			• There is a need to review Vine Industry Nursery Association (VINA) standards to better define acceptable guidelines for their source material (often from VIs)
			• Need more information on:
			  ○ managing vectors and alternative hosts
			  ○ can hot water treatment be used to reduce mite population?
			  ○ what are the alternative hosts in Australian conditions?
			  ○ is it in ‘long crimson seedless’, or in the Western Australian crimson seedless clones?
			• Certification
			  ○ National standards required for certified material

Workshop location	Date	Attendees	Key questions /issues raised
			○ Process required for growers to request virus testing ○ Sampling protocols and confidence, per vine and per block. Current sampling rate of 5 vines/1000 – is potentially inadequate in cases • Surveillance ○ High-health rootstocks are critical in Sunraysia ○ What is the GPGV presence in germplasm and is this a VI project to determine incidence? ○ Should the table grape and dried vine fruit levy fund some surveillance? ○ Should a surveillance project be submitted to Hort Innovation? • Who drives all of the GPGV work?
Barossa SARDI, Nuriootpa	7.5.19	14, including representatives from VI, SAVIA, nurseries, Wine Australia, Vinehealth Australia, Australian Grape and Wine	Questions on: • How best to undertake surveillance for GPGV – best sample size per vine and per block? • Original project has highlighted the need for additional work on sampling and testing – how many vine tissue samples (shoots or leaves and petioles) can be pooled without compromising detection in the laboratory? • What is our current confidence level in field sampling and laboratory testing? • What do we know of symptom expression in different varieties, impact and thus economic issues associated with GPGV? • What should the nursery/vine improvement sector do with GPGV positive material? • How will we determine the extent of GPGV in vineyards now? • What is the place of ELISA vs PCR diagnostic tests? • Discussion on lack of testing for endemic plant pests at PEQ, that are not on propagation distribution list • Review of accreditation process/transition process to management with greater information to inform decisions

Workshop location	Date	Attendees	Key questions /issues raised
			• A greater need to improve awareness and better dissemination of biosecurity issues generally to nurseries

Teleconference	7.5.19	4 including representatives from: QLD, NSW, WA (industry and virologist from Department of Agriculture and Food)	Questions/information needed –
			• Understood the importance of not spreading GPGV any further
			• What to tell growers, including the relative risk?
			• Impress on industry to buy high health status material
			• What is the GPGV prevalence in nursery/VI material at present?
			• What is the GPGV distribution generally in vineyards?
			• Table grape industry is outside the VI program; many new varieties are from private source/nurseries
			  • Leafroll virus 1 and 3 are also impactful; the current level of spread and presence across the industry is unknown
			  • Who is the driver for research and development/extension of information; unsure of the information mechanisms in other sectors (table and dried grapes)

3.4 Actions to understand and manage GPGV in Australia

3.4.1 Action taken prior to workshop

Actions by the VI sector and some parts of the nursery sector included:

- Testing of propagation material for GPGV.
    - The volume and timing of testing for GPGV varied between VIs, nurseries and across winegrape, table grape and dried fruit sectors due to the inconsistent dissemination of information about the virus.
    - The winegrape sector was more proactive, particularly in South Australia after the initial detections. Discussions, communications and specific workshops regarding management of GPGV and the best way forward, were undertaken with Vinehealth Australia and a core group from VI and some nurseries.
- Financially supporting the preliminary sampling trial that was part of the recently completely WA Project Number: VHA 1701, to improve diagnostic capability for GPGV in Australian laboratories.
- Improving management strategies, for example, some VIs and nurseries ceased the distribution of infected planting material.

3.4.2 Action taken post workshop

Importantly, the discussions at workshops and information provided prompted further testing for GPGV by several VIs and nurseries. As a result, GPGV has been found in multiple rootstock sources. This finding will provide greater insight into the potential distribution of GPGV within Australia and possible time span of that distribution.

It has also been pleasing to note the number of requests for further information on GPGV by workshop participants, demonstrating that people are continuing to assess their management of the virus.

3.4.3 Research questions identified in workshops

A number of gaps in knowledge of GPGV were identified in the workshops that need to be addressed to enable effective management of the virus, and other pathogens, by the propagation sector:

- Improved surveillance and diagnostics for GPGV specifically, and vine health issues generally.
    - Validation of field sampling procedures (intensity, composite make up, sample type) for the confident detection of all viruses, including GPGV.
    - Development and validation of accurate and cost effective laboratory procedures for detection of GPGV and other pathogens.
    - A means to ensure all laboratories provide equivalent testing and results.
- Identification of incidence and rate of spread of GPGV in Australia.
- Verification of impact of GPGV in Australia.

3.5 Summary of industry concerns relating to GPGV and other biosecurity risks

The workshops identified risks and concerns that affect the ability of the propagation sector to manage GPGV and other significant pests and diseases:

- Globalisation is increasing biosecurity risk to the wine grapes, table grapes and dried fruits industries through increased movement of plant materials. There is a need for a stronger biosecurity communication and engagement network amongst all Australian grape industries, government and biosecurity stakeholders to ensure the timely dissemination of relevant information to prevent or respond to a pest or

disease outbreak and to develop ongoing management strategies that mitigate pest and disease risk in all parts of the production chain from VI to growers.

- There is a need for greater investment by the table and dried grape industries for domestic biosecurity research and development to support the day to day management and provision of high health planting material to minimise the risk of pest and disease to the Australian winegrape, table grape and dried fruit industries.
- The structure and business models of VI organisations and germplasm management for the industry have changed over the last two decades, away from primarily state government based VI organisations with germplasms managed on government land. This has resulted in reduced resources – personnel, research and development programs and germplasm development – and an increasingly fragmented approach to vine improvement and germplasm management and development Australia wide.
- The changes in demand for planting material across the wine grape, table grape and dried fruits industries associated with planting booms and plateaus affects the sustainability of VIs and, specifically, their pathogen testing programs. There is a need to improve business models and risk management strategies to accommodate the boom-bust cycles and support VI programs, especially through maintenance and provision of high health materials, for the long-term benefit of the industry.
- The recent detection of GPGV in rootstocks highlights the need for risk management strategies in the supply chain to protect limited resources and provide an alternative source of material to ensure continued supply of propagation and planting materials in the event of an incursion.
- A rise in private nurseries and germplasm collections that may not be managed under a national vine improvement standard need to be considered to minimise biosecurity risks.
- There is currently a vacuum in national co-ordination of vine improvement broadly. Some work, however, is currently being undertaken by SAVIA, at its own cost, to review the common industry standard for maintenance and provision of pathogen tested rootstock and *Vitis vinifera* planting material at all levels of production, including germplasm, multiplication rows and source blocks.
- The current absence of a driver or overarching grapevine propagation industry body that effectively represents the whole industry (table, dried and wine grapes) reduces the ability of the three industries to mitigate and respond to biosecurity risks in a co-ordinated approach for the benefit of all.

4.0 Conclusion

The GPGV information extension program was a valuable exercise, as both a mechanism to increase knowledge of GPGV by the grapevine propagation sector and to consolidate feedback to improve the effective performance of the sector, particularly in a time of heightened biosecurity risk. A positive outcome was a willingness by VIs and the attending nurseries to continue their support and collaboration in future research, development and extension activities for GPGV.

The GPGV incursion has highlighted the importance of the complex interactions between the table, dried and wine grape sectors, as well as the grower, propagation sectors and industry groups in contributing to the sustainability of the industry as a whole. Currently there are a number of structural and functional gaps that need addressing as part of these interactions to ensure distribution of high health planting material and thus establishment of sustainable vineyards.

It is recommended:

1. In cooperation with industry, that future research and development activities for GPGV, focus on all three of the following;
    a. Ensuring that field sampling and laboratory detection procedures for GPGV can be undertaken with a high degree of confidence, and at the same time as for other viruses.
    b. Identification of incidence and rate of spread of GPGV in Australia
    c. Verification of impact of GPGV in Australia

2. The vine improvement and nursery sector together with the relevant industry bodies, focus on:
    a. Addressing identified structural and functional gaps to ensure responsibility for distribution of high health planting material, and effective coordination and communication when required
    b. Building resilience in light of future pest/disease issues.
    c. Improved promotion of the value of planting with high health propagation material and promotion of the systems in place to produce such quality planting material.

5.0 References

Giampetruzzi, A., Roumi, V., Roberto, R., Malossini, U., Yoshikawa, N., La Notte, P., Terlizzi, F., Credi, R. and Saldarelli, P. 2012. A new grapevine virus discovered by deep sequencing of virus- and viroid-derived small RNAs in cv. Pinot Gris. Virus Research 163, 262–268. https://doi.org/10.1016/j.virusres.2011.10.010.