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19th Congress of the International Council of Viruses of the Grapevine April 9-12, 2018 Santiago, Chile

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FINAL REPORT to
WINE AUSTRALIA

Project Number: **WAT 1701**

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Research Organisation: **THE UNIVERSITY OF ADELAIDE**

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Travel Report for Wine Australia - Dr Vinay Pagay

19th Congress of the International Council of Viruses of the Grapevine

April 9-12, 2018 Santiago, Chile

The 19th Congress of the ICVG was held at the Santa Carolina Winery, Santiago between April 9- 12, 2018. The conference is held every three years, the last meeting being in Ankara, Turkey in 2015. The meeting was attended by academics, primarily grapevine and horticulture virologists and viticulturists, members of the grape/wine industries in Chile, Argentina, and other countries (USA, Canada, France, Italy) including grapevine nurseries.

Jimena Balic, oenologist at Santa Carolina Winery, Chile, opened the session with an overview of viruses in Chile, virus effects on grape and wine quality, and how the winery deals with infected plant material. She mentioned that no certified planting material was available in Chile. Also, the high cost of virus testing prohibits growers from testing every vine (true for most countries) so new tools and techniques for virus detection and surveillance are required to manage viruses in vineyards. Anecdotally, she mentioned that older vineyards are healthier than younger vineyards, attributed perhaps to the lack of rigorous testing in nursery mother ("increase") blocks or even from material being imported from ENTAV (France) and FPS (USA). Although not virus related, she mentioned that grapevine trunk diseases and nematodes are a significant problem in Chilean vineyards.

The keynote talk was delivered by Prof Giovanni Martelli (Univ. Bari, Italy), who spoke broadly about the current situation of grapevine viruses worldwide, new/emerging viruses, and emerging methods of virus detection including the use of High Throughput Sequencing (HTS) or Next Generation Sequencing (NGS) techniques, which is becoming increasing used in virology research and detection in several countries around the world including USA (California), France, and Italy. HTS has been used to identify 16 new grapevine viruses since 2017 underscoring its value for detection of novel viruses. The price of this technique is also becoming more affordable (e.g. $US300 per sample at UC Davis). Some of the challenges and opportunities Prof Martelli mentioned include identifying the vectors of certain viruses of economic importance including Grapevine Fleck Virus, greater use of biotechnology (e.g. virus-induced gene silencing: plant host genomes engineered to silence viruses) and transgenic resistance (using genetically-modified vines that are resistant to viruses; these vines have been bred at INRA-Colmar, France).

Grapevine Red Blotch Virus (GRBaV) Update

Red blotch virus (RBV) is a leaf reddening type virus, similar to Grapevine Virus A (GVA) or Grapevine Leafroll-associated virus (GLRaV) that are found in Australia, found primarily in redberried grapevine cultivars and also some white cultivars, which remain asymptomatic. Red blotch results in uneven berry ripening, and relatively low sugar and anthocyanin accumulation. The vector was recently identified to be leafhoppers and two treehoppers (*S. festinus*, *Malanoiarus* sp.). In New York State, RBV has not been found in wild grapevines and tends to spread from cultivated grapevines to wild/uncultivated grapevines. The current strategy for management are to rogue and replant with certified planting material. One researcher from Switzerland reported that RBV did not exist in Swiss vineyards except in a germplasm collection for observation. RBV is also not currently known to exist in Australian or Chilean vineyards.

Grapevine Leafroll-associated Virus (GLRaV) Update

GLRaV is associated with Grapevine Leafroll Disease (GLD) and is widespread globally. Leafhoppers and mealybugs are known vectors of the virus. In New Zealand, alternative hosts are being sought such as white clover. In Ontario (Canada), a study was done to assess the best tissue and timing to sample; the best tissue to use was found to be berries early in the season and leaves or cambium late in season. Virus titre increases from early season to pre-harvest and then decreases. UC Davis has developed a new ELISA assay for all variants of LR that has a cocktail of monoclonal antibodies. In Canada, LR3 is spread extensively across interspecific hybrid grape cultivars (e.g. Marechal Foch, NY Muscat) and across several regions (Eastern Canada - Nova Scotia, Ontario - largest production area, British Columbia). No effects on yield were observed in LR3-infected vines in Canada but decreases in grape soluble solids and anthocyanins were noticeable. In New Zealand vineyards, one researcher reported that LR3 control involves visual identification of the symptoms, vector control, and rouging and replanting. A similar strategy is pursued in South Africa for leaf roll management. With LR2 in Argentina, decrease in yield were associated with lower berries per bunch; soluble solids were also lower in the fruit.

Grapevine Pinot Gris Virus (GPGV)

The virus was first found in NE Italy in 2003 on Pinot gris but also Glera (Prosecco), Gewurtztraminer, Moscato, Traminer, Pinot noir and other cultivars. The virus is the causal agent of 'Grapevine Leaf Mottling and Deformation Disease' (GLMD), as suggested by Italian and French scientists. Symptoms include stunting, shoot deformation, chlorotic mottling, leaf mosaicing.

Elisa Angelini reported that in one Italian collection of grapevines, of 64 symptomatic plants, 62 tested positive for GPGV and the annual increase in the number of symptomatic plants were 3— 80% depending on the vineyard. The vector is reportedly *Colomerus vitis* (erineum mite), which has been shown to transmit GPGV under glasshouse conditions. Healthy vines planted in infected vineyards show symptoms within two years of planting.

In Hungarian vineyards, Eva Varallyay reported that a number of alternate hosts for GPGV exist including *Fraxinus* sp., rose bushes, and *Rubrus* sp., and that a two-way transfer between Vitis and these other hosts was possible. Older vineyards had more diverse variants of GPGV than younger vineyards.

GPGV exists in Chilean vineyards but vines show only minor symptoms. White cultivars often do not show symptoms so are difficult to detect in the field.

In France, Anne-Sophie Spillmont reported that GPGV was first found in Bordeaux in 2014 in Merlot grapevines as a co-infection with Tomato Black Ring Virus (TBRV). Since then, the virus has been found in several cultivars including Grenache, Tempranillo, Vermentino, Bianco Gentille, and Zinfandel. The French variants of the virus are similar to the Italian variants. A major survey across French vineyards in 2016 and 2017 revealed that GPGV was extensively distributed in vineyards two years old or greater. The known vector, *Colomerus vitis*, was highly efficient in spreading the virus. In vigorous vines such as Glera (Prosecco), symptoms have not resulted in lower yields or quality; however, in low vigour varieties such as Pinot noir or Pinot gris, the virus has negative effects. In all cases in France, symptoms reveal a positive virus status, and all vine ages are affected (< 10 year old vines, > 100 year old vines).

Christophe Debonneville reported that antibodies are currently being produced for GPGV that will allow detection via ELISA tests in the future.

High Throughput Sequencing (HTS)

Several researchers presented on the use of HTS technology for virus detection. The technique generally agrees with ELISA and PCR but reveals some new viroids. According to Maher Al Rwahnih (FPS-USA), 24 samples can be analysed by HTS within one week and the results can be used to permit imports of new plant material. HTS can be used to resolve virus aetiology, discover new viral agents, for routine detection of viruses. Hans Maree (South Africa) outlined a number of advantages of HTS including being unbiased, multiplexing ability, high sensitivity, rapid development of specific assays given the availability of sequence information. He went on to outline some of the disadvantages including the high skills in bioinformatics required, a level of interpretation that is involved, expertise that is required, high sensitivity is a double edged sword, possible detection of viruses that are inconsequential to production. Further limitations of HTS were highlighted by Al Rwahnih including inability of HTS to prove causality, inability to satisfy Koch's postulates, and prediction of symptoms and agronomic consequences. Using HTS technology, FPS has found some novel viruses including Grapevine geminivirus A (GGVA) and Grapevine Fabavirus (GFabV). A panel of speakers concluded that given the various methods/platforms of HTS that are present, standardisation across HTS testing facilities are critical to obtain consistent results. Johan Burger (South Africa) suggested that what is critically needed is high throughout phenomics to characterise the effects of virus infections in vineyards.

The conference concluded with some remarks:

- The ICVG currently has over 400 members from 45 countries
- Next ICVG meeting will be held in Thessaloniki, Greece in September 2021
- Prof Giovanni Martelli resigned as president of ICVG after 31 years in the position Marc Fuchs (Cornell University) is the new president of ICVG