AWRI Australian Wine Research Institute

Fact Sheet
VITICULTURE

Grapevine red blotch virus

Photo credit: Dr Keith Perry, Cornell University

Introduction

Grapevine red blotch disease, was first discovered in 2008 on Cabernet Sauvignon located in the Napa Valley, California. The causative agent of this disease, grapevine red-blotch virus (GRBV, genus *Grablovirus*, family *Geminiviridae*) was then described in two separate studies in 2012 (Al Rwahnih et al. 2012 and Krenz et al. 2012). GRBV has since been found in a range of table and wine grape varieties, as well as rootstocks, hybrids and wild vines. It has been found broadly across commercial vineyards in the USA and also in Canada, Argentina, India, Mexico and South Korea. GRBV has only been detected in non-commercial collections in Switzerland, France and Italy.

In the USA where it is established, GRBV, has been reported to cause significant economic losses in some vineyards including lower yields and vine vigour, premature leaf senescence, and reduced quality in both wine-grapes and table grapes. Research shows that in some cases the virus can cause delayed fruit maturity, lower sugar levels (by 1 to 5°Brix) and negative impacts on secondary metabolites associated with wine colour, flavour and aroma (Wallis and Sudarshana 2016, Blanco-Ulate et al. 2017, Martínez-Lüscher 2019). In some cases, rootstock infection has been shown to be asymptomatic (Yepes et al. 2018), and other symptomless varieties have been reported (Marwal et al, 2019).

In the USA, economic damage as a result of GRBV has been reported to range from 2,213 USD per hectare in eastern Washington up to 68,548 USD per hectare in Napa county over a 25-year production period (Ricketts et al. 2017).

The potential impact of GRBV in Australia is unknown and would be influenced by a number of factors and their interactions including viral strains, host plants (i.e. grapevine variety), environmental conditions, and the presence of vectors and their transmission efficiency. Testing for GRBV at Australian national borders has been conducted since 2013 to prevent infected material from entering the country. Some post entry testing has also been conducted at testing laboratories since 2014, with the first Australian detections only being reported in 2022.

The symptoms

Both red and white grapevine varieties are susceptible to GRBV, but the symptoms are more pronounced in red varieties. GRBV symptoms are similar to those associated with leafroll diseases (e.g. reddening of the leaves) and are difficult to differentiate (Figure 1). In white varieties, leaves show irregular chlorotic areas that become necrotic at the end of the season. Leaf symptoms are usually visible from summer, first in the older leaves at the bottom of the canopy then progressively extending upwards towards the shoot tips during autumn. Abiotic stresses such as girdling and various nutrient deficiencies (phosphorus, potassium or various micronutrients) can also cause symptoms similar to GRBV. Due to the similarity between symptoms of red blotch disease and those associated with other biotic and abiotic stressors, diagnostic testing is required to confirm the presence or absence of GRBV.

Figure 1. Symptoms of grapevine red blotch virus on *Vitis vinifera* cv Cabernet Franc grafted on 101-14. (Pictures from: Dr Mysore Sudarshana, Department of Plant Pathology, University of California, Davis)

Virus spread

The long-distance spread of GRBV from its considered origin in the USA is thought to have occurred through infected propagation material (including grafting). GRBV has not been found to be spread by vineyard machinery or pruning tools. Short-distance spread of the virus has been linked to vector movement (Cieniewicz et al. 2019).

To date, the only confirmed vector is the three-cornered alfalfa hopper (*Spissistilus festinus)* (Figure 2). In 2016 this insect was shown to both acquire and transmit GRBV to grapevines in the glasshouse (Bahder et al. 2016). Since then, multiple studies have confirmed this vector's GRBV transmission capability. Further studies now suggest there may be additional insect vectors capable of vectoring GRBV. In a recent study the leafhopper *Scaphytopius graneticus* was identified as a potential vector that merits further investigation (Wilson et al. 2022). Currently there are no records of either of these vectors being present in Australia. There is likely to be regional specificity in regards to insect vectors capable of GRBV transmission to grapevines and so far no data on this within Australian vineyards has been collected.

The random distribution of vines infected with GRBV reported within North American vineyards indicates that winged adult hoppers spread the virus by piercing vines arbitrarily. This contrasts with the clustered pattern of viral spread caused by mealybug or scale insects, as seen with leafroll viruses and GVA-associated Shiraz Disease. Little work has been undertaken overseas to review the potential of scale or mealybug to vector GRBV.

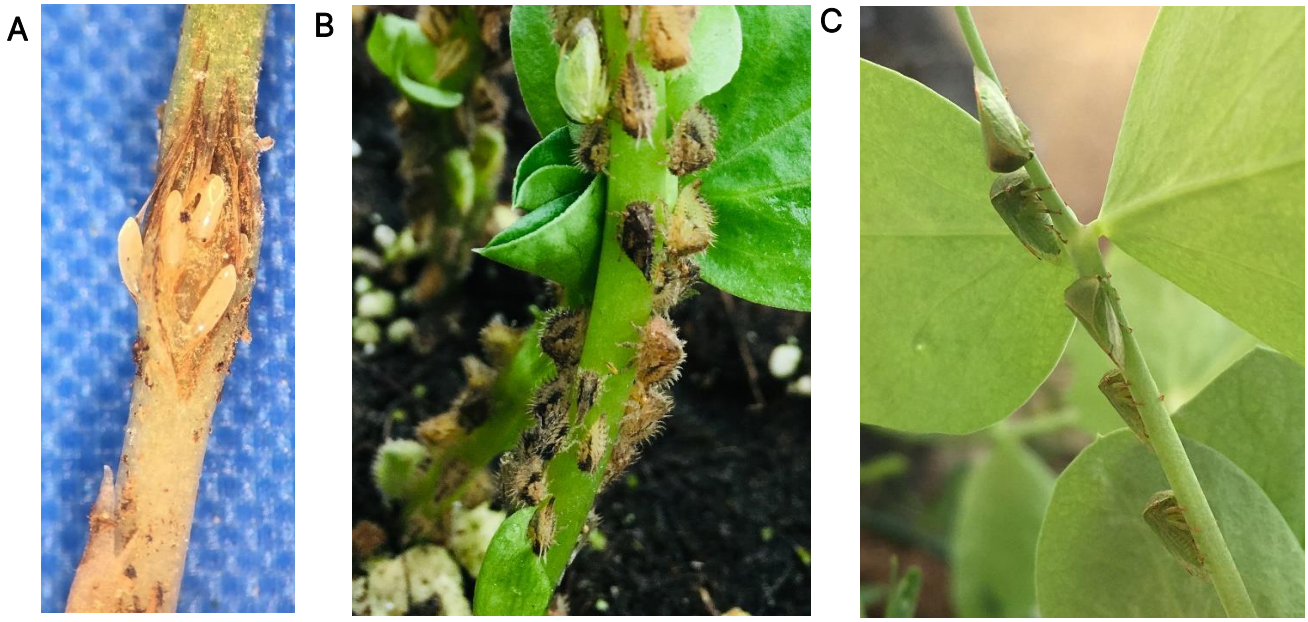

Figure 2. Three-cornered alfalfa hopper (*Spissistilus festinus)*; A: eggs, B: nymphs and C: adults. (Pictures from Dr Cindy Kron, University of California, Santa Rosa)

Management

There is no cure for GRBV once a vine is infected so preventative measures need to be adopted. GRBV is known to be graft-transmissible, so the use of virus-tested planting material (negative for GRBV) in propagation is the first line of defence against this pathogen. Rogueing of positive vines is the only treatment for infected vines and will help to stop spread to further vines if insect vectors are present within the vineyard. The extent to which rogueing will keep virus progression at bay will depend on the efficacy with which the vector(s) present spread the virus.

Good preventative management programs will include regular vineyard monitoring for virus-like symptoms and potential vectors. Virus testing of material with suspicious symptoms can be carried out to confirm presence if required (see 'Diagnostics' below).

Diagnostics

Molecular testing can be used to confirm the presence of GRBV in grapevine samples and is available from the diagnostic laboratories listed below. Contact the relevant facility for further information. While GRBV remains classified as an exotic virus to Australia, any positive detections are required to be reported by laboratories to state government biosecurity departments.

Affinity Labs (South Australia)
Telephone: (08) 8313 0444
Email: customerservice@affinitylabs.com.au
Website: https://affinitylabs.com.au/

Agriculture Victoria - Crop Health Services
Telephone: (03) 9032 7515
Email: CHS.Reception@ecodev.vic.gov.au
Website: https://agriculture.vic.gov.au/support-and-resources/services/diagnostic-services

Biosecurity Tasmania – Plant Diagnostic Services
Telephone: (03) 6165 3777
Email: plantdiagnosticservices@nre.tas.gov.au
Website: https://nre.tas.gov.au/biosecurity-tasmania/plant-biosecurity/plant-diagnostic-services

DPIRD Diagnostic Laboratory Services (Western Australia)
Telephone: (08) 9368 3351
Email: DDLS@dpird.wa.gov.au
Website: https://www.agric.wa.gov.au/bacteria/ddls-plant-pathology-services

NSW DPI Plant Health Diagnostic Service
Telephone: 1800 675 623
Email: laboratory.services@dpi.nsw.gov.au
Website: https://www.dpi.nsw.gov.au/about-us/services/laboratory-services/customer-service

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Contact

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