# Xylella: the front line

As Xylella continues to plague horticultural sectors overseas, work is under way in Australia to prepare for what many fear could be its inevitable arrival. This article follows Vinehealth Australia's June 2017 article, '*Xylella fastidiosa*: What do we know and are we ready? Part One'.

The Australian Government has amplified its focus on preventing the plant bacteria Xylella (*Xylella fastidiosa*) from entering Australia, with an increased effort in recent years on inspecting and testing potential host plants arriving from overseas.

*Xylella fastidiosa* can infect more than 560 plant species worldwide[1] and is now found across southern Europe, from Italy to Portugal, as well as in North and South America, Taiwan and parts of the Middle East. It affects a broad range of plant species including grapes, citrus, almonds, apples and pears, as well as some ornamental and Australian native species. It infects the xylem vessels of host plants, reducing the uptake of water and nutrients, leading to reduced plant or fruit growth and plant death in many cases.

There are no treatments currently available to cure diseased plants in the field. With the infection known as Pierce's Disease in grapevines, the Xylella bacterium is transmitted by sap sucking insects and is known to cause vine death within a couple of years. Symptoms of infection include scorched leaves, browning and loss of leaves, stunted shoots, reduced fruit size over time, dieback and vine death.

Craig Elliott was appointed earlier this year under the Plant Biosecurity Research Initiative by Wine Australia and Hort Innovation to support their members and the Federal and State Governments to increase the country's preparedness for Xylella. Craig has worked for many years leading programs to prevent new incursions and responding to pest and disease outbreaks across animal, plant and environmental biosecurity.

[1]European Food Safety Authority (EFSA). (2018) Update of the Xylella spp. Host plant database 30 July 2018. EFSA Journal 16(9):5408.

Shrivelled berries growing in a Napa County vineyard due to Xylella infection. Photo Craig Elliott

"When starting this role, my first thought was how we would respond to a worst-case scenario; a Xylella outbreak occurring simultaneously in multiple areas that stretches our responders and shuts down domestic and overseas markets, as well as stopping the movement of produce and plants between properties. It's not what we want to see, but it is what we have to plan for," Craig said.

Since commencing, Craig has criss-crossed the country speaking with representatives of the sectors at risk from Xylella and government biosecurity managers to raise awareness of the issue and identify what concerns and gaps existed. He has also developed connections into the work being conducted overseas to manage existing Xylella outbreaks.

"There is a good reason why this is Australia's number one threat to our wine and horticulture sectors. For winemakers and grapegrowers alone, the potential impact has been estimated at between $2 billion to just under $8 billion dollars, under different scenarios, over a 50-year period," he said.

"Add in the costs to other sectors and you begin to understand the size of the problem and the significant stress Xylella would cause to individual growers and our horticulture sectors if it arrived. In

Grubbed Xylella-infected vines in Sonoma County. Photo Craig Elliott

looking at how to respond to this, I've thought about how we can maximise the chances of detecting this extremely early when it gets into Australia, what would happen in those first few days of an outbreak, and then how we would contain it while we assess whether it can be eradicated."

The national Xylella Preparedness Program is up and running and Craig has outlined the program's priorities over the next three years below, with a focus on prevention, early detection, rapid response and recovery activities.

## Prevention

Craig said the Australian Xylella Preparedness Program has a strong focus on encouraging improved property-level biosecurity to support the efforts at the Australian border. This is so that individual growers have the knowledge and practices in place to minimise the risk of any pest or disease entering their property and, if that does happen, are able to undertake early identification and containment to survive an outbreak.

"Everyone in agriculture needs to adopt the mindset of Xylella already being here," Craig said. "Growers need to manage what comes onto their property and ensure that visitors, contractors, equipment and any plants are appropriately 'clean'. Biosecurity needs to be a basic part of their everyday business. If they take this stance, they'll have a better chance at surviving a pest or disease outbreak, whether it is Xylella or another threat."

Prevention cannot be absolute though and Craig said the program would also be working with researchers to identify potential grape rootstocks that show genetic resistance to Xylella infection or the effects of infection.

## Early Detection

It's well known that the earlier you find a pest or disease, the greater chance you'll have to prevent its spread and then eradicate it.

"We're looking at a range of measures to improve the chance of early detection. There's been some exciting remote sensing work undertaken in Europe in olive trees revealing, with high accuracy, Xylella infection before some symptoms are visible to the naked eye," Craig explained.

"Researchers carried out intensive, multi-year, on-the-ground inspections of more than 7000 olive trees and associated hyperspectral and thermal imagery, finding that physiological alterations to olives caused by *X. fastidiosa* infection at the pre-visual stage were detectable in functional plant traits assessed remotely by hyperspectral and thermal sensors[2].

"If we can use a similar surveillance technique here in Australia, we have the advantages of both covering vast areas far more rapidly than people inspecting individual plants and being able to confirm the presence of Xylella in recently infected plants where typical symptoms are not yet evident."

Work has also commenced to assess and introduce new laboratory diagnostic tests and to have the ability to undertake some of these tests in the field.

"There are a number of subspecies of Xylella and each has a different host range," Craig said. "If we can quickly identify the subspecies, we will know which plants are at risk and hopefully minimise the number of horticultural sectors affected."

## Rapid Response

Once Xylella is suspected to be present, Craig said a rapid response to contain the infection and prevent further spread was critical.

"We need to understand both the size of the area infected, the plants affected and what insects may vector the bacteria and infect additional plants, to then work how we can combat it," he said.

Australia's biosecurity system will see government agencies working together under existing intergovernmental agreements to share resources and data and ensure a consistent approach to a response. Craig is working with state, territory and the Federal Governments to establish an agreement on how a response would be planned and delivered. Further work will also be done through various simulation exercises to assess the potential effectiveness of a response across the system.

[2]Zarco-Tejada, P.; Camino, C.; Beck, P.S.A.; Calderon, R.; Hornero, A.; Hernandez Clemente, R.; Kattenborn, T.; Montes-Borrego, M.; Susca, L.; Morelli, M.; Gonzalez-Dugo, V.; North, P.R.J.; Landa, B.B.; Boscia, D.; Saponari, M. and Navas Cortes, J.A. (2018) Previsual symptoms of Xylella fastidiosa infection revealed in spectral plant-trait alterations. Nature Plants 4:432-439.

"It's important that grape and wine industry bodies are also engaged both in the development of these response plans as well as part of the simulation exercises in time. I'm encouraging every sector to be proactive in asking to host discussions on what happens in the situation of a pest incursion such as Xylella that comes under the Emergency Plant Pest Response Deed (EPPRD), to both improve understanding of how a Xylella response would actually roll out and how industry bodies can best support the response and their members. This threat isn't something anyone should be passive about," he said.

## Recovery

Years ago, recovery didn't feature prominently in response arrangements and affected industries would often be caught unprepared and support could be ad hoc and slow getting through to those affected.

"But in recent times there have been important steps forward in addressing that gap and ensuring that the needs of the industries and communities that are being impacted are recognised so that work starts almost straight away to minimise the impacts and get them back on their feet," Craig said.

The EPPRD, which governs how high priority plant biosecurity threats are managed, contains information on how industries are involved in response decision-making. Craig said growers should be aware of the information they need to have ready in the event of cost reimbursements being made under the EPPRD and the criteria for applying for reimbursement.

"It's vital that growers understand the EPPRD, including the requirement for early reporting of an outbreak. Delays in reporting not only affect the likely success of a response but also the eligibility for cost reimbursement," he said.

## The US experience

In a recent visit to California, Craig had discussions with University of California researchers on their work to breed grape varieties with genetic resistance to Xylella and the associated Pierce's Disease in grapevines. He said that once field trials are completed in the US in coming years and commercialisation issues are solved, this area would be an important dimension for the Australian grape and wine industries to keep abreast of as part of future potential recovery arrangements.

"In some ways, seeing the situation in California was encouraging. They've been dealing with Xylella for about 140 years and while it has caused widespread devastation in some counties, the vector management program is quite mature and has protected the northern growing areas from significant disease impacts," Craig said.

He said the arrival of the glassy-winged sharpshooter in southern California in the mid-1990s escalated the risk for the wine sector from Xylella, but the state government program, costing more than USD20 million a year with coordinated delivery through County Agricultural

Vine replants in Napa County following the removal of Xylella-infected plants (above) and dead vines in Napa County due to Xylella infection (below). Photos Craig Elliott.

Commissioners and the strong support of an industry advisory committee, has proven effective in minimising the spread of this vector. Vector management has been a focus of that program and reinforces the importance of understanding the relationships between a pathogen, its hosts and its vectors. Northern areas are still affected by Pierce's Disease and endemic insects still transmit the disease, but most vineyards are able to manage the impacts.

A study of sapsucking insects in Australia is being proposed to understand their potential to carry and transmit Xylella. Craig said this will provide critical information to understand how Xylella may be detected and then managed. Wine Australia and Hort Innovation have already committed to fund the project and it is hoped that the Federal Government will confirm their contribution in the near future." This project aims to build on the findings of similar work completed in 2001[3] which documented native xylem feeding insects already occurring in Australian vineyards and adjacent habitats.

## Five things Wine Australia and Vinehealth Australia recommend you can do now

1. Ensure you and your staff are aware of the signs and symptoms of a Xylella infection (see typical leaf symptoms below) and include monitoring for Xylella as part of your standard monitoring program.
2. Talk to your neighbours and community about biosecurity, share information, keep a watching brief for anything unusual in your region and contact Vinehealth Australia for support on (08) 8273 0550.
3. Use the Emergency Plant Pest Hotline (1800 084 881) to report any visual symptoms you think could potentially be due to Xylella.
4. Review what farm-gate hygiene activities you are undertaking on your property to reduce the risk of entry and spread of an exotic or high priority endemic pest and disease. Refer to www.vinehealth.com.au for further information and remember the 'arrive clean, leave clean' sentiment.
5. Undertake a biosecurity risk assessment for your business to help identify what practices you need to improve on to secure your property and business from the entry of pests and diseases and ensure long term sustainability of your business.

Vinehealth Australia has a strong focus on improving biosecurity prevention at the farm-gate and continues to work closely with Craig Elliott and Wine Australia, to ensure synergies in our biosecurity activities and messaging.

[3]Merriman, P.; Luck, J.; Traicevski, V.; Mann, R. and Moran, J. (2001) The potential for the establishment of Pierce's Disease in Australian grapevines. Final Report GWRDC DNR00/1.

Xylella leaf symptoms. University of California.