



21 NOV, 2020

SAVE OUR CITRUS

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SAWEEKEND

The Advertiser

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ORANGE CRUSH

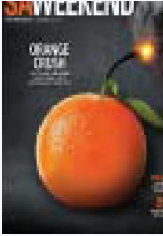
THE TICKING TIME BOMB
THREATENING EVERY
AUSTRALIAN CITRUS TREE

TOUGH GIG

THE POST-COVID,
POST-CASH WORLD
OF A CITY BUSKER

DOWN... NOT OUT

PARENTING A CHILD
WITH A DISABILITY



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COVERSTORY



Artist Alison Mitchell with a finger lime tree in the Adelaide Botanic Garden.

A tiny bug threatens Australia's citrus industry and every backyard orange and lemon tree – but a weird Aussie lime may be the saviour.

WORDS ROY ECCLESTON PHOTOGRAPH TOM HUNTLEY

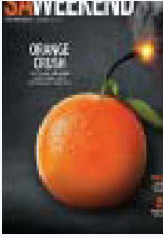
When artist Alison Mitchell chose citrus as the theme for a new exhibition at the Adelaide Botanic Garden, she felt sure she'd have no shortage of subject matter – not when just outside her rural Riverton studio were 10 citrus varieties including a beautiful espaliered Lisbon lemon, guaran-

teed to groan with yellow fruit.

"Painting lemons for this exhibition was going to be easy, I thought," Mitchell recalls. "I was wrong."

Just when she needed the tree most, a drove of hungry hares jumped the protective fence and almost ringbarked it, leaving her a pitiful bounty of just five lemons.

But, as Mitchell came to learn, a few hares



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are the least of the worries citrus trees are facing. Something much worse is on the horizon, and it could put at risk every citrus tree across Australia.

In many parts of the world, citrus orchards have been ravaged by a disease called huanglongbing or HLB, Chinese for yellow dragon disease. Also known as citrus greening, it's one of the most severe plant diseases – a kind of COVID-19 for citrus, except more lethal.

It is caused by a bacteria spread by the Asiatic citrus psyllid, a tiny sap-sucking insect, and the only things keeping it out of Australia are the narrow waters of Torres Strait and vigilant border security.

"It was a bit of a shock," says Mitchell of her reaction to learning of the disease at a workshop in Adelaide by Professor David Mabberley, an international botanical expert and author of the popular plant dictionary Mabberley's Plant-book. "I was surprised people weren't more alarmed about it. Very few people knew. I guess it hasn't come to Australia yet."

The good news is that just a few months ago, a US scientist announced that an extract from an Australian native lime from the rainforests of Queensland and northern NSW was showing promise as an effective antibacterial agent.

But no-one can be confident it will work in the field. And no-one can be confident that the psyllids, like those hares, won't jump the barrier into Australia. A cyclone could blow some of the infected material or bugs across from Papua New Guinea to northern Australia, or a gardener might smuggle in some illegal citrus budwood for propagation. And after this year, Mitchell points out, we all should know how serious an impact a foreign germ can have.

The evidence on HLB is that once it breaches a border it is almost impossible to stop. For Australia's \$1bn citrus industry, and SA's Riverland, that could be catastrophic. On the latest figures, SA was the biggest producer of the nation's citrus, worth about \$280m in 2019. The value of

national exports, booming thanks largely to China, hit a record \$540m last year.

Among fruit growers across Australia, everyone from big orange juice companies to niche Australian native citrus farmers are fearful of the potential economic ruin the disease could bring. Also at risk would be every backyard citrus tree in the country.

Loxton citrus grower Ryan Arnold, whose family produce oranges, mandarins, le-

mons and other citrus on its 120ha in the Riverland, says the industry has gone onto a war footing in the past 18 months, determined to prevent the insect from gaining a hold in Australia.

In the US, the economic impact has been massive. HLB led to a 72 per cent cut in production of oranges for juice in the 10 years to 2018 – a reduction of about 6 billion tonnes – and a 20 per cent cut in fresh orange production. Most of the damage was in Florida.

Arnold is on the citrus pest and prevention committee of the peak body Citrus Australia, and about 18 months ago he saw first-hand the ruin HLB brought to Florida. He also visited California, where the insect has also spread, but has yet to wreak havoc on the commercial industry, which is >

worth \$US1.7bn. Arnold says Florida shows how devastating the psyllid could be in tropical environments like Queensland, but California's Mediterranean climate is more like SA and the experience of that state may provide crucial lessons here.

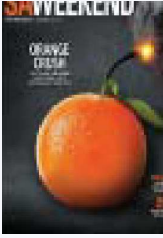
California, desperate to keep the bug out of its massive orchards, has been using sniffer dogs trained to find the bacteria in trees – where the infection can take a long time to become apparent – as well as drones, and door-to-door inspections of backyards where there are many thousands of citrus trees.

Arnold says the psyllid is now just a "hop, skip and a jump" from Australia in PNG and Timor Leste in Indonesia. In response, he says, the industry has set up an early-warning system of about 300 traps around the country. They range from Queensland to Western Australia across the north, down the east coast, in the Riverland (he has five at his property) and in urban areas including Melbourne and Adelaide.

The traps use a chemical on a sticky disc to attract and trap any psyllids that have infiltrated. They are checked four to six times a year, and so far no bugs have been found.

"It could wipe out the northern Australian industry and could possibly do the same to us down south as well," he says, of SA, Victoria and the southern NSW growing areas in the Riverina. "We're not quite sure how it would work in the south but it would definitely have an effect."

While northern Queensland is thousands of kilometres away, the psyllid could spread quickly south on popular plants favoured by home gardeners – and not just the oranges and lemon trees across the suburbs, but



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the *Murraya* varieties readily available in Bunnings. These are part of the citrus family and commonly used as hedging with names like mock orange, Chinese box, cosmetic bark tree and jasmine orange.

All citrus is affected, but scientists say the most susceptible are grapefruit, sweet oranges, tangelos and mandarins while limes, lemons and sour oranges are less at risk.

It's unclear where HLB originated but it has been blamed for dieback in India in the 18th century, was reported in China in 1919, South Africa in 1937, the Philippines in the 1960s and is now found in more than 50 countries across most regions including Oceania. In the EU, Spain and Portugal are on high alert, having the psyllid but not yet the bacteria.

Once established, the disease is devastating with the fruit smaller, misshapen, and seeds small and dark. They may taste "off", and drop from the tree prematurely. The tree could die within months or a few years.

Once Mitchell overcame her surprise at the scale of the threat, she began to form an idea of a theme for an exhibition of paintings, now on display at the Botanic Garden's Museum of Economic Botany. She wanted to let people know about the threat to citrus and titled it "Unlemon", after asking herself what would it be like in a world without lemons.

"If we're going to lose this thing, then what is it we're going to lose, and where does it come from?" she thought.

Some things were clear to her about the fruit, like how best to paint them, how to mix the right proportion of colours like cadmium yellow and the lighter arylide lemon.

"I find yellow the trickiest colour to paint," she says, "because it muddies so easily." As an artist who doesn't usually work from photos, it's also tricky to paint without fresh lemons. After the hares she was fortunate to find another local supply.

"When they're picked fresh there's shininess and tautness to them," Mitchell says. "They're bursting with oil glands and you can feel it. It's really nice painting that, to try to get that shine and that feeling of bursting freshness."

But even though she had been painting the fruit for decades, she soon realised that there was a lot she didn't know and she worked that personal journey of discovery into her paintings, which explore the origins of citrus, their use by people – and the threat to their future.

Her research revealed a fascinating, and

ancient, history. Citrus seeds were found near ancient Babylon and dated back to 4000BC, while Alexander the Great in the fourth century BC was the first European to see citrus – a citron – in Persia and India, where they were not eaten but used to deter moths from clothes.

The citron also featured in religious ceremonies by Jews and Buddhists, while other citrus varieties have since gone into all kinds of products from perfume, household cleaners, insecticides and alcoholic drinks to Earl Grey tea.

Their typically thick skin have made citrus well-suited to long travels. Famously, thanks to high doses of vitamin C, they helped prevent scurvy on British naval ships, keeping British sailors healthy and earning them a nickname among Americans – limeys.

But, where do the citrus fruit we're familiar with actually come from? Like most of us, she had no idea. Few were fully-formed unique fruit. The lemon, for example, has four parents: it is a hybrid of the citron and sour orange, while the latter was itself a hybrid of the pomelo, the largest of the citrus, and the mandarin.

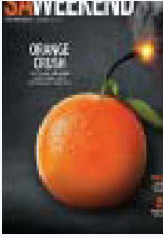
Nor did Mitchell know much about where citrus first grew. Like many people, she associated them with Europe, thanks to names like Valencia and Seville oranges and her own Lisbon lemon. "I hadn't really thought about it," she says. "I thought they might have originated from Asia, perhaps northern India, but I didn't have much of an idea where they came from. I was very naive in that sense."

Surprisingly, there were some who believed that Australia may have been one of

the original sources of citrus. Professor Mabberley tells SAWeekend that some of his colleagues "did put forward the idea that citrus may have arisen in the western Pacific, but evidence gathered since counters that – (it is) likely South-East Asia".

Still, Mabberley says, Australia does have numerous native varieties that range from tropical rainforests to deserts. "As a result of my own research in the 1990s, we now classify these plants such that Australia has more native species than does any other country," he says.

There are six natives, and examples include bush-tucker foods like finger limes, predominantly rainforest plants in Queensland and northern NSW. There's also one Mitchell painted that grows in South Australia, commonly known as desert lime, a hardy thing that proved the most challeng-



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ing to paint because it's small fruit was hard to discern against leaves of similar colour.

The desert lime is tough, she says, with dangerously spiny thorns that grow high enough to block a tall kangaroo. Unusually, for a citrus, it drops its leaves in a drought and manages in a temperature range be-

tween 12 below and 45C. Nutrition levels are high with plenty of vitamin C and 10 times the calcium of blueberries.

But it is the Australian finger lime, also grown commercially in California, that is very much the hero at the moment, given its claimed potential to fight HLB.

It is certainly not your typical lime. The fruit is about the size of a gherkin but in colours from green to red, brown and black. Inside, the juicy segments are nothing like what you'd find in an orange or lemon – they are balls of juice that range from pink to yellow, green and red.

“They look like caviar, little bursts of zing – lemony, but perhaps more like Tahitian lime, not so bitter,” says Mitchell.

But there is more than tang in the fruit – there is also a peptide, or natural antibiotic. A decade ago, University of California Riverside molecular geneticist Hailing Jin started investigating the tree because she said it had “some tolerance or partial resistance” to HLB.

After five years she found the gene she
Clockwise from above: Loxton citrus growers Ryan, Tim and Michael Arnold; Alison Mitchell with her paintings at the Museum of Economic Botany; Asiatic citrus psyllid; a trap for the bug in Loxton, and; the Australian finger lime.
Photographs: Supplied; Tom Huntley; Andrew Beattie, University of Western Sydney; Supplied; iStock

thinks gives it that resistance. Quoted in the university's newspaper in July this year, Jin said the new product was found “in the fruit of greening-tolerant Australian finger limes”.

One of these genes produces a peptide, she said, which she tested over two years and showed strong results against the bug. “You can see the bacteria drastically reduced, and the leaves appear healthy again only a few months after treatment,” Jin said.

The peptide only needed to be reapplied a few times per year, and could be developed into a vaccine-like solution to protect young healthy plants from infection. And, unlike the pesticides being used to try to control the bug spreading the dis-

ease, it's safe for people and stable at high temperature.

It's now being developed further by US technology firm Invaio Sciences. But, with the coronavirus still rampant in the US, further work has been delayed, and Jin insisted it is not yet a “cure”.

One uncertainty is how resistant to the disease the Australian finger lime could be. Mabblerley is definite. “Huanglongbing is incurable and the native Australian species are not immune – so they are not the answer,” he says.

But in Loxton, Arnold is hopeful about the finger lime development.

He says pesticides alone are unlikely to be the answer. And while California is trialling wasps that lay eggs that once hatched feed on the baby psyllids, Australia has introduced new species to solve problems before with mixed results, and would need to be cautious.

At least, he says, SA's experience in border protection with both COVID-19 and fruit fly has given us practice for what will be needed if HLB does work its way south. One problem, he suspects, will be backyard gardeners. “It's going to be really hard to get someone to remove their backyard orange trees if it's got greening,” he says. But without public support in the event of an incursion, it's possible that nobody will have orange trees, he warns.

But Arnold hopes it won't get to that. “We're hell bent on keeping it out”.

“
It could wipe out the northern Australian industry.



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