

HLB tolerant rootstocks

Australian, Indonesia trials commence

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AUSTRALIAN

Citrus News

In this issue...

CEO REPORT

- 4** HLB tolerant rootstocks a new addition to biosecurity strategy

NEWS

- 5** Jackie on board to help growers with labour options
6 Export roadmap reveals extra competition ahead
9 Australian and international expansion
12 Further citrus exports to the US within reach

MANAGEMENT

- 13** The effect of seasonal conditions on granulation in Imperial mandarins
16 The changing face of solar
18 The days of being an island are over

BIOSECURITY

- 22** Biosecurity a passion for new team member Jessica
24 Identifying challenges of urban plant biosecurity

INNOVATION

- 29** HLB tolerant rootstocks arrive in Australia
30 Establishing HLB tolerant rootstock trials for the Australian citrus industry
32 Review your postharvest fungicides

Cover image: HLB tolerant rootstocks imported from the USA are being grown and will be tested in Australia.

OUR CORPORATE PARTNERS





HLB tolerant rootstocks a new addition to biosecurity strategy

It's always satisfying to share the news of industry research and other work being undertaken by the Citrus Australia team on behalf of its members and growers nationwide.

I'm particularly excited to share news in this edition of the HLB tolerant rootstock trials in Australia.

Australia has the advantage of preparing for an incursion of the Asian Citrus Psyllid/HLB; a luxury not available to the Florida citrus industry, which was decimated by the disease.

For example, we now have a world class industry propagation facility in Auscitrus, which has implemented the latest methods in disease and pest protection.

As discussed in the magazine, importing tolerant rootstock seeds gives the citrus industry a head start on local evaluation. It will enable industry to gain a good understanding on how they react to being in Australian soils and our climate, and growing Australian varieties.

I look forward to updating you on the results through this magazine and our other communication channels.

Biosecurity at all levels remains an important focus for Citrus Australia.

Areas of concern, potential solutions, and accessing additional government support are discussed and actioned by Citrus Australia's Citrus Pest

and Disease Prevention Committee throughout the year.

Citrus Australia will advocate for additional Federal Government funding to shore up plant-based biosecurity measures, including a nursery registration scheme, as well as additional biosecurity measures on the frontline.

The government this year allocated \$84m over four years in frontline measures, including detector dogs and enhanced screening technology.

However, our industry is worth almost \$900m annually in farmgate sales, including \$500m in exports, and funding for risk prevention should be allocated accordingly.

Citrus Australia will continue to work with government and other horticulture bodies to ensure our requirements, both long-term and short-term, are met.

There has been much publicity about the new Ag Visa and we believe it will become an important long-term tool in providing a sustainable workforce for all citrus businesses.

We are consulting with industry and advising government to ensure the visa fits businesses of all sizes, focussing on areas including accreditation, sponsorship and portability, whilst balancing the amount of red tape.

It is important that our citrus businesses understand that the Ag Visa will not likely deliver many staff for most next season simply because of the range of negotiations and regulations that need to be completed as part of this process. For example, officials will need to negotiate bilateral

agreements with partner nations, there will be processes that need to be bedded down in Australia and in partnering countries.

Although the visa will be in place by September 30, it is unrealistic to expect large numbers of workers will be available until mid-2022 at the earliest. This means most businesses will need other labour sources to fill the ongoing worker shortage, particularly those picking Valencias, lemons and limes this year, and mandarins early next year.

We are unlikely to see any volume of backpackers until 2024 and it is unclear whether working rights in holiday visas will be further eroded in that time. The Citrus Australia team will work to ensure government plays their part in improving quarantine pathways and providing access to workers, but we advise all citrus businesses to start planning their workforce for next year when this harvest concludes.

We understand how difficult the worker shortage has been for many this season. For help on navigating available options, I encourage you to call Jackie Heaysman at the Citrus Australia office on 03 5023 6333.

As a very difficult season heads toward the finishing point, I ask you to check in on your neighbours and friends. Some people prefer to chat, others prefer to sit quietly, maybe with a drink. Doing it together has a bigger impact than you may think. ●

NATHAN HANCOCK
Chief Executive Officer,
Citrus Australia



Thank you and welcome to our new members

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GSH International

Arkie Investments

River Road Citrus Packers

Jackie on board to help growers with labour options

Growers can contact new Citrus Australia team member Jackie Heaysman for help on available options for sourcing labour, both immediate and for next season.

Jackie has joined Citrus Australia as Seasonal Workforce Industry Support Officer and aims to help growers gain a better understanding of labour options and government assistance.

“I am available to talk to growers about any workforce challenges they are facing and to hopefully provide them with some ideas and point them in the right direction to finding some solutions,” Jackie said.

Jackie’s past roles have included working for the Sunraysia Institute of TAFE for 17 years and the Victorian Government, where she managed a range of economic development initiatives for businesses to facilitate growth opportunities.

“I’m excited with this opportunity to help growers and give them some tools to help source workers, and help them navigate the system.”

“I see myself as being able to listen to people’s concerns and questions, find out what they need and then find a solution or help them find a solution, pointing them in the right way.”



Jackie said the pandemic has clearly presented new challenges to industry with growers finding themselves in a completely new situation finding workers.

“Growers are capable of adapting to these changes, but they need the knowledge, and they need to plan,” she said.

“It’s all about planning and that’s where this year they were caught a bit by surprise.”

We encourage our growers to call Jackie on 0456 628 560 or at Jackie. heaysman@citrusaustralia.com.au. ●

Funding for this position was provided by **Agriculture Victoria**.

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Export roadmap reveals extra competition ahead

In March 2021, Citrus Australia finalised the Australian citrus industry export strategy (2021 – 2025) which aims to provide a roadmap for the industry to maintain and further develop its export success over the next five years.

The strategy was funded by Hort Innovation using the citrus research and development levy and funds from the Australian Government.

In developing the strategy, Citrus Australia consulted with its Australian and overseas network that spans the entire citrus value-chain.

As the citrus export trade continues to grow, so too do the risks and challenges. For the industry to maintain its growth trajectory, there is a large amount of work to be carried out – and leadership at the national level is needed.

Conditions of trade remain challenging and are seldom liberalised, with importing countries regularly raising their phytosanitary expectations.

On the other hand, Australia’s agrichemical toolbox for pest and diseases is under constant threat as products are withdrawn from use and residue limits are lowered to exceedingly low levels – levels that are difficult for exporters to achieve.

Government processes for export accreditation, inspection and certification are also becoming more complex and struggling to keep up with new technology.

As the Australian Government moves towards co-regulatory approaches to export certification and accreditation, industry contribution to process improvement (including technical and commercial advice) will very much be needed.

Food safety remains a looming issue with retailers, consumers and regulators in export markets demanding higher levels of protection and information on the products they receive.

While the industry is well-prepared to meet these challenges, it must continue to address risk, confront new issues as they arise, and maintain systems that demonstrate

Key points

- ❖ Export strategy 2021-2025
- ❖ Pandemic creates challenges
- ❖ Aggressive global expansion

a commitment to achieving all requirements in export markets.

Global pandemic

The impacts of the global pandemic on the export trade, both short and long term should not be underestimated.

Access to reliable shipping routes, freight and logistics will most certainly represent challenges for the foreseeable future.

This will impact on Australian citrus exporters but also Australia’s southern hemisphere competitors.

Changes to the retail landscape have also been accelerated as a result of the

pandemic as the sector capitalises on new technology and channels to reach and deliver product to consumers.

Global expansion

Aggressive expansion of Australian citrus plantings is reported but plantings in other southern hemisphere citrus producing nations are also expanding at extraordinary rates.

While the Australian citrus industry currently boasts a reputation for superior quality, colour and flavour, competitors are improving their product offerings with new varieties and more advanced cultivation practices.

South Africa, Chile, Peru and Argentina represent formidable threats in Australia’s major export markets.

Markets identified as having growth potential, albeit with various market maintenance and market development challenges are South Korea, Indonesia and India.



Access to reliable shipping routes, freight and logistics will most certainly represent challenges for the foreseeable future.



India is one market identified as having growth potential.

Vietnam has also been identified as a market of good potential given the trading history and strong forecasted economic growth.

Noting the difficulties of achieving changes to protocol and import administrative arrangements, the quickest gains could be expected to apply to South Korea and Indonesia exports respectively.

China



The success of the Australian citrus industry over the last decade has been fueled by growing demand and strong prices for Australian citrus in Asia.

The market in Greater China in particular has grown at a remarkable rate, importing 116 000 tonnes at its peak in 2019. This represented approximately 40 per cent of total Australian citrus exports in the 2019 season.

In response to the success in China, the Australian citrus industry has undergone structural adjustments with strong investment in new plantings and other capital equipment — with a specific focus on servicing the China market.

While the industry can boast impressive export volumes into China, it is also important to recognise that it is the highly profitable China export trade that has kept the industry afloat for nearly the last decade.

Without the export opportunities in China, the industry will most certainly require structural adjustment once again.

Current tensions between the Australian and Chinese governments represent a significant threat to the viability of the industry and it is likely that the industry is facing strong headwinds.

A number of Australian export industries have already been targeted by the Chinese authorities in an effort to influence Australian policy decisions.

It is unlikely that the differences between the two governments will be resolved in the short to medium term. On that basis, it is imperative that the industry look to further develop existing trade relationships in markets other than China.

While opportunities in new markets are limited, there are a number of opportunities that have not been fully

exploited in the past due to the strong focus on China.

Moreover, there may be opportunities to identify niches within existing markets that have typically been categorised as class-2 markets, that may provide higher returns for premium grade fruit.

Increased competition

Irrespective of the fractured trade relationship with China, the citrus industry was already at a stage where it needed to explore other export opportunities.

This was obvious even prior to the time that the dispute with China became apparent. Given the large amount of recent investment and the fact that the China market demands specific size and quality parameters, additional volumes of Australian citrus will become available over the next decade that do not necessarily meet market requirements in China.

This is even more so the case in the mandarin category. Critically,

Continued page 8

Challenges and threats to export success

A number of specific challenges and threats to maintaining the current export success were identified in the strategy including:

- geopolitical tensions with the Chinese government
- ongoing changes to importing country conditions on the use of agrichemical inputs including changes to maximum residue limits
- changes to importing country conditions on food safety assurance
- increased scrutiny of Australia's phytosanitary controls by importing authorities, particularly in relation to fruit flies including 'other lesser-known' species
- ongoing challenges to the integrity of South Australia's Riverland Fruit Fly Pest Free Area and suspensions by a number of trading partners
- restrictions on the citrus varieties that may be exported to Japan under in-transit cold disinfestation procedures
- restrictions on the production regions eligible to export to the United States
- ongoing importing country audits and inspection arrangements (e.g. pre-clearance inspection)
- absence of accurate real-time shipping data to inform export marketing decisions
- inequitable quota allocations for citrus imports into Indonesia
- food safety requirements for exports to Indonesia
- high tariffs applied to Australian citrus exports in a number of destinations including India and Sri Lanka
- transaction costs associated with applying in-transit cold disinfestation
- a number of quarantine pests are difficult to control (e.g. Fuller's rose weevil, California red scale)
- onerous orchard and packing-house accreditation requirements for some export markets.

From page 7

competition in China from other southern hemisphere citrus producing nations continues to grow.

South Africa has already established a strong presence with plantings and production volumes increasing at an astonishing rate.

The South American countries, namely Peru and Chile both have a presence and there is strong evidence that they are both increasing production volumes and improving their product offerings.

The citrus industry export strategy

focuses primarily on oranges, mandarins and lemons. An export strategy for Australian limes had already been developed under a tropical fruits project funded by Hort Innovation. On that basis, Australian limes were not a focus of this body of work. ●

Future steps required

In response to the challenges, the strategy identified a range of market development and market maintenance activities that should take place for the citrus industry to maintain its current trajectory. Activities include:

- monitor and respond to regulatory changes to phytosanitary, food safety and agrichemical residue regulations
- maintain technical resources within the sector to provide technical and commercial advice to government to improve market access conditions and resolve trade issues when they arise
- maintain effective communications to value chain participants
- continued investment in research and development to underpin and prosecute cases for improved market access arrangements as well as defending the current position
- maintain technical resources within the sector to work with government to develop efficiencies in assurance, verification, inspection and certification of citrus exports
- continued investment in technology to support the export accreditation process for growers and packers
- assist industry participants to understand and fulfil regulatory requirements in relation to phytosanitary, food safety, chemical residues and other technical specifications (e.g. grading, packaging and labeling)
- maintain resources within the sector to coordinate and accommodate inspections, audits and verification visits conducted by the overseas authorities
- provide commercial and technical advice to government on citrus industry expectations in relation to future free trade agreement negotiations
- continue to work with state and Commonwealth government departments to defend the Riverland Fruit Fly Pest Free Area and to reinstate recognition by certain countries
- explore options to further reduce the costs associated with in-transit cold disinfestation
- engage with other citrus producing nations to protect agrichemical options for citrus and prosecute cases for appropriate residue limits.



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Australian and international expansion

The Australian citrus industry continues to expand but it is not alone, as a competitor analysis reveals the production capacity of other southern hemisphere citrus producing nations.

The Australian citrus industry export strategy (2021-2025) examined the state of the current plantings in Australia in the most recent citrus tree census and determined that there are currently 27,963 hectares of land planted with citrus across Australia.

The average annual production volume is in the range of 700,000 – 750,000 tonnes, although in some ‘on’ years the total volume can be as high as 850,000 tonnes.

Based on modelling, it is predicted that annual production of navel oranges will increase from 320,000 tonnes to 375,000 tonnes over the next five years.

Similarly, over the next five years, the production of Murcott (and Murcott type) mandarins is expected to increase from 48,000 tonnes to 68,000 tonnes annually.

Production of Afourer (and Afourer type) mandarins is expected to more than double from 43,000 tonnes to 102,000 tonnes annually. The resurgence in lemon plantings over the last five years is predicted to have a dramatic impact on production which is forecast to increase from 61 000 tonnes to 95,000 tonnes annually.

While only a minor crop in Australia compared to other parts of the world, grapefruit production is expected to

increase from approximately 10,000 tonnes 14,000 tonnes over the next five years.

Southern hemisphere competition

South Africa is the leading southern hemisphere nation producing more than 3.2 million tonnes of citrus annually, of which more than two-thirds is destined for export.

Production in Argentina and Peru is also substantial (in excess of one million tonnes annually) although these two nations are still developing their export capacity.

Chile and Uruguay are small producers but certainly warrant the attention of Australian citrus exporters, in the case of Chile at least.

South Africa embarks on ‘aggressive expansion’

South Africa



South African exporters are active in all of the same markets that Australia is active in but unlike Australia, they also have a strong presence in Europe.

Oranges are South Africa’s strongest export category, exporting 1.25 million tonnes in 2020 with the predominant varieties being Midnight, Valencia Late, Delta, and Turkey (Juvalle).

It is increasingly obvious that it is the South African industry’s ambition is to “push east” due to ongoing quarantine and agrichemical residue challenges in Europe.

While South Africa can boast impressive trade volumes in the orange export trade, it also has substantial market share in other categories.

In 2020, South Africa exported a remarkable 458,000 tonnes of lemons, with the bulk of that volume exported to Europe and the Middle East.

Reasonable volumes were also shipped to Hong Kong and Singapore. South Africa also exports significant volume of soft citrus (mandarins) with 19 per cent average annual growth over the last five years.

In 2020, South Africa exported a total of 390,000 tonnes of mandarins with the main export markets being Europe, the Middle East and North America.

Alarming for Australian exporters, the trade in South African mandarins to China and the United States is growing at impressive rates.

The main mandarin varieties currently cultivated in South Africa are the Afourer ‘type’, Nules (a Clementine ‘type’), Nova, TangoTM and Orri.

The Nova variety is believed to be robust and capable of withstanding the harsh conditions of cold disinfestation.

Grapefruit exports from South Africa are also substantial with a total of 244,000 tonnes exported in 2020.

The main markets for South African grapefruit are Europe, China, Japan, Russia, North America and South Korea. It would be very difficult to see Australia compete against South Africa in the grapefruit trade.

There is strong evidence that South African citrus plantings are in a state of aggressive expansion with

Continued page 10



The South African citrus industry poses a formidable threat to Australia’s major export markets.

From page 9

growth in both the mandarin and lemon categories.

In 2016, South Africa was granted rights to the Tango™ mandarin variety (a seedless Afourer “type”) which is expected to compete with the standard Afourer variety.

The area planted to mandarins is forecast to increase by 10 percent in 2021. Many growers are establishing new orchards under netting which has improved water efficiency, yields and the overall quality of soft citrus production in South Africa.

In addition, there is an increasing trend towards late varieties being planted, which has seen the peak harvest of soft citrus shift from week 20 (beginning of May) to between weeks 21 to 30 (mid-May to July).

While the authors of this report have not seen the evidence, there is a wealth of information in the media predicting that South African production volumes will increase by 500,000 tonnes over the next 3 – 5 years.

This would represent an increase of 15 per cent on existing production. Much of that volume is likely destined for the United States.

The Citrus Growers Association of South Africa has openly stated that China, India, Philippines, Japan,

Vietnam are markets that have also been identified for further growth.

Lemon plantings in South Africa are also experiencing strong growth. In 2010, reports were that South Africa had a total of 4,667 hectares planted to lemons. In 2020, this had increased to 18 000 hectares.

The most popular variety of lemons planted in South Africa is the Eureka accounting for 76 percent of the area planted, followed by Lisbon (8 percent) and the 2PH Seedless (5 per cent).

South Africa’s production of lemons is expected to continually increase due to the high number of new plantings in the past five years soon entering into full production.

While there will be substantial increases in lemon and mandarin production in South Africa, production of grapefruit and oranges is expected to only marginally increase in the next five years.

Reports indicate that orange plantings have increased from 42,000 hectares in 2016 to 46,000 hectares in 2020.

However, the new orange plantings will be partially offset by growers in other regions transitioning to mandarins. Relatively speaking, grapefruit is only a minor crop in South Africa with a reported 8,200 hectares planted in 2021 from a base of 7,200 hectares in 2016.

South American countries continue expansion

Chile



Chile has recently emerged as the second largest exporter of citrus in the southern hemisphere, exporting a total of 396 000 tonnes in 2020, distributed among oranges (30 per cent), mandarins (43 per cent), lemons (27 per cent).

As a competitor to Australia, the Chilean citrus industry competes primarily in the United States where it has built a substantial presence and captured much of the market share that once belonged to Australia.

Chile’s status as a fruit-fly-free country means that it has significant advantages over other southern hemisphere exporting nations.

Its technical market access negotiations with trading partners are less complicated (and can often be expedited) and its fresh produce items do not require cold disinfestation, leading to reduced transaction costs and a superior quality product.

This second point provides a substantial advantage insofar that some citrus products (e.g. lemons) suffer chilling injury as a result of cold disinfestation.

The Chilean citrus industry has undergone significant change in the past three decades. In 1990 production was split equally between oranges and lemons, with almost no mandarin plantings recorded.

In the next 30 years, orange production changed focus from Valencia oranges to late navels but growth in overall hectares was only marginal.

In that same time, Mandarin production increased rapidly and now accounts for more than one-third of citrus plantings in Chile.

The area planted to citrus has increased from 13 000 hectares in 1990 to a reported 20 606 ha in 2018 including 7 672 hectares of mandarins, 6 178 hectares of navel oranges and 6 489 hectares of lemons.

In 2020-21, the Chilean Fruit Exporters Association Citrus Committee



South Africa is expected to compete strongly in the mandarin export market.



provided an export capacity estimate of 349 000 tonnes although this was a “light” year due to range of unfavourable weather conditions.

Mandarin export capacity was forecast to be 173 00 tonnes, oranges are forecast to be 85 000 tonnes and the lemon forecast is 90 000 tonnes.

Argentina



Argentina is a large citrus producing nation with a forecast production for 2021 of more than 2.6 million tonnes.

Volumes have been as high as 3.3 million tonnes within the last five years. More than half of the volume produced is lemons, forecast to be 1.55 million tonnes in 2021.

Oranges make up the next largest share at 675,00 tonnes and mandarins make up 293,000 tonnes.

Grapefruit production is also substantial with a forecast of 96,000 tonnes. Based on figures over the last five years, Argentinian citrus exports are typically between 10 and 12 per cent of total production. Argentina has quite a strong domestic market and a large processing sector.

Lemon plantings in Argentina have expanded over the last few years both with new entrants to the industry and re-working existing orchards with higher density plantings.

However, the area planted to lemons is expected to remain unchanged at approximately 50,000 hectares.

Orange and mandarin plantings are following a similar trend with no significant investment in recent years, with the industry consolidating, not expanding.

Reports indicate that there are 39,000 hectares of orange plantings and 28,000 hectares of mandarin plantings.

Smaller producers are struggling to compete and when they exit the business, tend to sell their orchards to larger operators that are focused on improving land management practices and increasing productivity.

In 2020, Argentina exported 374,000 tonnes to nearly 50 different export destinations. The five top markets in descending order were Russia, Spain, the Netherlands, Paraguay and the United States.

As a competitor to Australia, Argentina competes primarily in the United States and Canada. In Asia, the two key markets where Argentina competes are the Philippines and Indonesia.

At this stage, Argentina is not considered a large threat to the Australian citrus export trade in Asia but is most certainly competitive in North America.

Peru



Peru is another large citrus producing nation that has produced more than one million tonnes annually for the last five years.

Data indicate that Peru’s production forecast for the 2020-21 season is a total of 1.26 million tonnes. Oranges make up the majority of the production volume at 509,000 tonnes, mandarins account for 482,000 tonnes, and lemons/limes account for 262,000 tonnes.

While Peru records impressive production volumes, its export performance over the last decade has been below average, with annual exports only representing between 10 and 15 per cent of the total production volume.

The industry has however demonstrated impressive export growth over the last five years with export volumes more than doubling in that time as the Peruvian industry has progressed an aggressive market access agenda.

Data from 2019 indicates that there are approximately 65,000 hectares of land planted to citrus in Peru.

Orange plantings made up 26,017 hectares, lemons accounted for 25 840 hectares, mandarins accounted for 12,429 hectares, with only minor plantings of grapefruit at 852 hectares.

When examining the FAO (Food and Agriculture Organisation) data for the previous five years, it appears that plantings of oranges and mandarins have seen a slight decline while lemon and grapefruit plantings of have remained stable. Media reports indicate that overall production this season (2020-21) will increase by 5 per cent.

The main mandarin varieties cultivated are the Satsuma, Afourer type, Clementine and the tangelo. The industry is investing in variety

development and looking towards some earlier and later maturing varieties. The Orri, Ortanique and Primsole have attracted some attention in Peru.

In 2016, Peru exported 129,000 tonnes and by 2020 this figure reached 265,000 tonnes. Mandarins make up the bulk of Peruvian citrus exports, with exports reaching more than 215,000 tonnes (81 per cent) in 2020.

The top five markets for Peruvian mandarins include the United States (105,000 tonnes), the United Kingdom (26,000 tonnes), the Netherlands (23,000 tonnes), Canada (16,000 tonnes) and Russia (13,000 tonnes).

Exports to China have been progressively building over the last five years and broke the 10,000 tonne mark in 2018. In 2020, China imported 12,500 tonnes of mandarins from Peru, only marginally lower than the volume of Australian mandarin exports to China that year.

In 2019, Peru gained official market access to Japan and exported 46 tonnes of mandarins.

In 2020, this figure had increased to 824 tonnes. Anecdotally, author of this report (David Daniels) understands that the Peruvian product has been well-received and Japanese buyers are looking to import substantial volumes of Satsuma mandarins from Peru this coming season.

Peru competes with Australia primarily in North America.

Where once considered “noise” in China, Peruvian mandarins are now earning their place.

The Japan market is certainly one to watch. Media reports indicate that the Peruvian citrus grower’s association (ProCitrus) has strong ambitions to open up market access in Thailand, Vietnam and India. Negotiations with Thailand are reported to be in the final stages. ●

This special report was written by **Citrus Australia General Manager, Market Development, David Daniels**, who developed the Australian citrus industry export strategy (2021 - 2025).



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***** BREAKING NEWS *****

Further citrus exports to the US within reach

Citrus growers from Queensland, inland New South Wales and Western Australia are a step closer to exporting Australian citrus to the USA.

The United States Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) has announced it will revise the requirements for the importation of fresh citrus from Australia.

The announcement was made following successful negotiations from the Australian Government Department of Agriculture, Water and the Environment.

Until now, citrus could only be exported to the US from NSW's Riverina, SA's Riverland and the Sunraysia region of Victoria/NSW.

Citrus Australia CEO Nathan Hancock said the decision was welcome news for citrus growers.

"Growers are looking to diversify their export markets as new plantings enter full production so this is welcome news," Nathan said.

"The USA has historically been a very strong market for exports from our south east regions and we feel that there are some good opportunities for fruit from other regions."

Nathan cautioned that while the decision was announced on the Federal Register on August 18, commencement of trade is contingent upon agreement between governments on an operational work plan.

At this time, the work plan is still a live conversation.

"Our technical market access request with APHIS has had a long history, well over a decade, and there has been a lot of work going on behind the scenes to make this happen," Nathan said.

"This has been an issue for Australia for two decades, and Citrus Australia has been working on it for the last 12 years. In the last few years we've used every resource available to us to achieve our goal.

"I would like to commend Citrus Australia General Manager, Market Development, David Daniels, as well as the technical officers and trade negotiators from the Department of Agriculture, Water and the Environment who have worked tirelessly through the negotiations for more than a decade."



Citrus Australia CEO Nathan Hancock said the decision was welcome news for citrus growers.

The effect of seasonal conditions on granulation in Imperial mandarins

Seasonal conditions play an important role in the granulation of Imperial mandarins, according to Queensland Department of Agriculture and Fisheries Senior Horticulturist, Helen Hofman.

Current research began in the 2017/18 season, and in that year and the following year there were high levels of granulation.

This season, however, Helen found there was ‘very little granulation’ in her trials thanks in part to a dry start to the growing season.

“In the months September to November in Bundaberg, for example, there was 42 mm of rain this year, compared to 656 mm in 2017/18 and 203 mm in 2018/19,” Helen said.

“Which is a good thing for the growers but it’s a bit annoying when you’re a researcher.”

Helen has several trials in Queensland focusing on three farming management practices that may help to reduce granulation: irrigation, fertilisation and flush manipulation through the use of plant growth regulators.

Trials recorded the lowest granulation of all four years of study to date,

Key points

- ❖ Over availability of water at early fruit development
- ❖ Low levels of plant nutrition
- ❖ Vigorous rootstocks contribute

reflecting a strong flowering, limited flush in Spring, a heavy crop load on trees and dry conditions in early fruit development.

“Where you’ve got a good flowering and a heavy initial fruit set, plus dry conditions in Spring, you tend to get less granulation and that seems to be what’s happened this year,” Helen said.

Helen is testing the hypothesis that too much moisture availability in the early stages of fruit development tends to lead to granulation in Imperial mandarins.

“It may seem counterintuitive: the fruit is dry so growers may believe the trees need more water, but our trials to date are suggesting that actually too much water in the early stages of fruit development leads to granulated fruit.”

The underlying hypothesis is that granulation is linked to high water potential in juice cells in early fruit development.

She has identified two main factors that appear to cause granulation: one, over-availability of water in the early stages of fruit development, and two, low levels of solutes in the juice cells. These are directly affected, respectively, by over-irrigation and low levels of plant nutrition, particularly low levels of nitrogen applications.

Continued page 15



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Citrus mealybug
(*Planococcus citri*)
Suppression only

From page 13

“I am also looking at the effect of flush because the vegetative growth seems in some cases to compete with fruit quality,” Helen said.

Other types of citrus can granulate but Imperial mandarins tend to be particularly prone to granulation because they are an early variety, Helen said.

“You’ve got a lot of very rapid fruit development early in the season which seems to exacerbate the problem where the flush and fruit growth are competing, whereas the fruit of other citrus varieties will take several more months to mature so they’re growing more slowly, and they’ve got time to develop properly.

“Another aspect is that growers tend to grow Imperials on vigorous rootstocks to get fruit to market as early as possible and that exacerbates the problem as well,” Helen said.

Helen’s research was initially funded by the Department of Agriculture and Fisheries (Queensland government) with contributions in cash and in-kind from Spencer Ranch Pty Ltd,



Helen Hoffman conducting granulation research in the field.

Seven Fields Citrus (Nutrano) and the Mundubbera Fruit Growers Association Inc.

Since March 2020, funding has been provided by Hort Innovation, using the Hort Innovation citrus research and development levy, co-investment from the Department of Agriculture and Fisheries (Queensland

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Alongside this comes a reduction in the price of solar panels, especially when coupled with the government

incentives, thanks to advancements in technology and manufacturing.

As a result, businesses across Australia are turning to solar as a more feasible investment that can prove to be cash flow positive from day one.

Government support is at hand

Recent circumstances have made solar even more affordable thanks to two key government inputs.

At present, the Australian government's Renewable Energy Target (RET) offers two types of Technology Certificates, which act as a rebate on a solar system, offering an immediate discount.

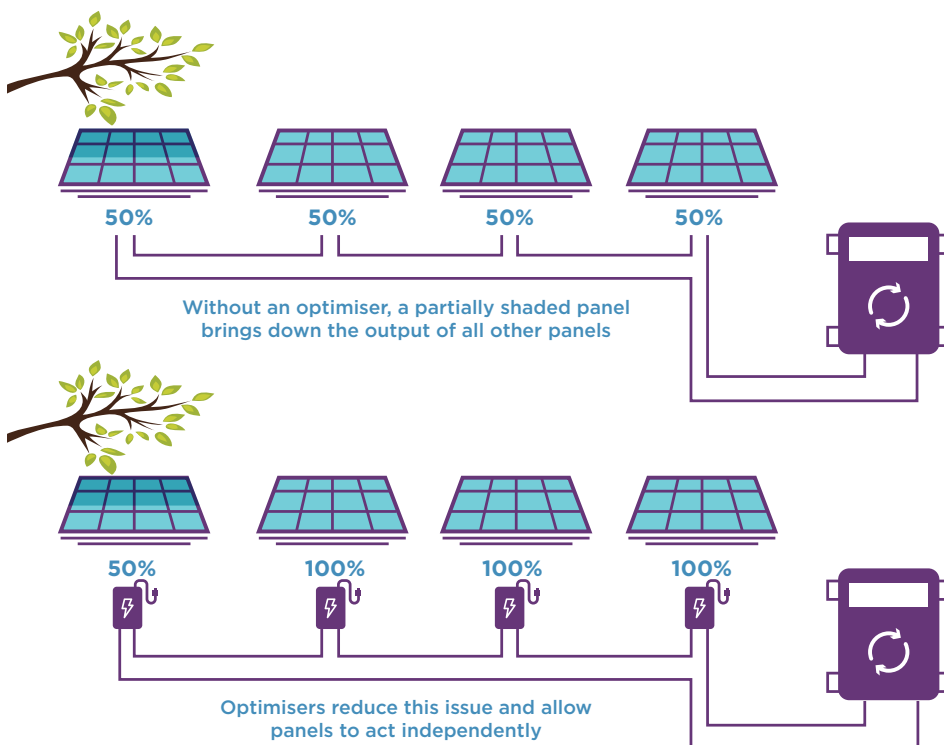
With this is the Instant Asset Tax Write Off (IATWO) scheme, an opportunity that furthers the affordability of solar not seen five years before.

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The main advantage of optimisers



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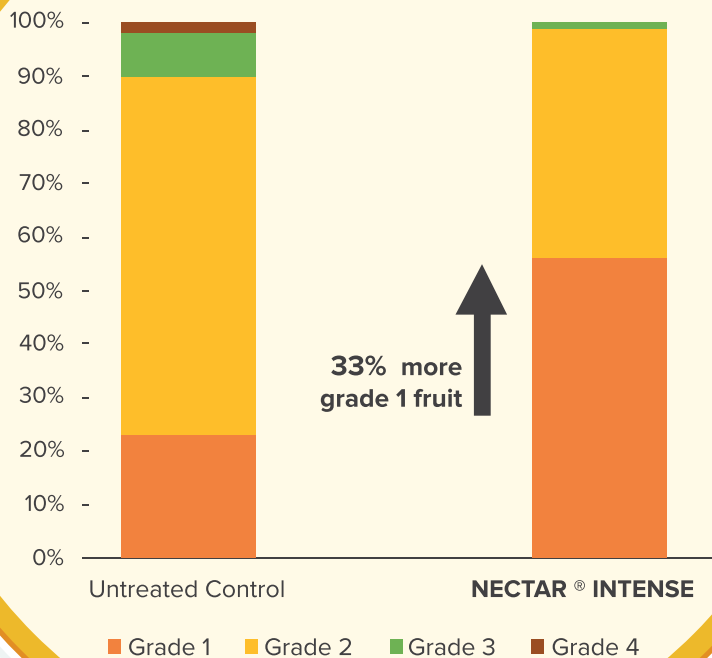
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The days of being an island are over

Carl Robinson is a fourth-generation citrus grower in Gayndah, Queensland, working with the family business since he left school.

His role as Operations Manager oversees the orchard production from growing, pruning, packing and marketing the fruit grown on the property.

Glenellen, located in the North Burnett Region of Queensland, has approximately 120 hectares of citrus. The orchard, approaching its centenary year, currently grows Eureka lemons, Imperial mandarins, Low Seeded Murcotts, Honey Murcotts and their own variety, the Empress-A mandarin.

When Citrus Australia visited his farm earlier this year, Carl said “the days of being an island” were coming to a close, as it becomes more challenging to grow and market citrus.

“We have begun to work together with our neighbouring farms and help each other, instead of competing against each other in the same marketplace,” Carl said.

Carl’s father, the late Frank Robinson, spent 20 years developing the Empress - a mandarin variety - and Carl said it has been extremely popular on the export market.

“Dad was quite passionate about the citrus industry and was very well respected,” Carl said.

Frank Robinson became known as one of the first growers to successfully plant mandarin trees on granite country.

“The hilly country on the property provided a new area for development,” Carl said.

“At the time, the citrus trees were predominately grown on the river flats of the Burnett River. In the early years, dynamite was used to break up the rock shelves. This was a new concept and proved to be successful.

“To this day, granite promotes good tree growth on the property.”

Tree health is paramount and Glenellen uses agronomic nutritional advice from local consultants.

Key points

- ❖ Developed Empress variety
- ❖ New shed built in 2010

“Soil and leaf tests are another helpful tool we use to monitor and implement the nutritional needs of the orchard,” Carl said.

“The nutrition of the trees is forever changing due to climatic conditions and weather patterns. Trace elements, foliar and dry fertilisers, together with compost help produce a healthy tree and top-quality fruit.

“This approach has proven to be successful over many years, however you always have to be willing to work with and adapt with mother nature.”

Packing Shed

The current packing shed has been in operation since 2010. The new shed predominately exports to international markets and domestically to independent retailers.

The Robinsons have always packed their own fruit on the property. The original packing shed still stands as a reminder of days past.

Carl’s mother, Allison, managed the packing shed for over 50 years. Local folklore considered it to be one of the oldest working citrus packing sheds in Australia.

Carl said when it came to the management of a large working packing shed, communication and building relationships are two important elements.

“The main benefit to growing and packing your own fruit, is knowing your product and being able to build good relationships with marketers.”



Steve Bryant, Carl Robinson and Shane Rothe on Glenellen in Queensland.

Loyalty has been a large part of the marketing program and relationships have been built with both domestic and export buyers over decades.

“Transparency in production and sales of our fruit is important to us. It gives pleasure as a grower to know your fruit is well received in the marketplace by the consumer.”

Carl said he had noticed a shift in the consumer trends in the marketplace.

“There are now fewer independent retailers who we sell to with a greater supply of fruit going to the supermarket chains. The consumers are shopping in one place for all their needs and essentials, and this includes where they purchase their fruit.

“We embrace the many challenges ahead of us and look forward to providing top quality mandarins to Australia and the rest of the world for many years to come.” ●



Picking at Glenellen earlier this year.

In dispute? Contact the Ombudsman

The Australian Small Business and Family Enterprise Ombudsman Bruce Billson is encouraging apple and pear growers and traders involved in a dispute to contact her office.

The Ombudsman can provide growers and traders with information and dispute resolution options, including access to mediation services and produce assessors.

Assessors can address issues such as whether a trader was entitled to reject produce or whether a grower has received the correct payment from the trader.

The Ombudsman's approach is to focus on fair outcomes for growers and traders whilst maintaining good working relationships.

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Biosecurity a passion for new team member Jess

Dr Jess Lye takes over the reins of Jeff Milne's position at Citrus Australia as National Citrus Surveillance Coordinator, launching a new 5-year-long biosecurity program as part of her role.

Jess will be taking over coordination of the citrus surveillance network, setting up traps for early detections of pests such as Asian Citrus Psyllid and other high priority exotic pests.

There are a number of objectives to Jess's role, one is to continue trapping and diagnostics in the production areas nationally.

"Another big part of the role is to start building that surveillance capability in urban areas, engaging with home gardeners to try to increase our surveillance in places like Melbourne, Sydney and Adelaide, because statistically large populations are high risk," Jess said.

This new biosecurity program is run in partnership with the NT Department of Industry, Tourism and Trade, and is led by Plant Health Australia.

As a part of the program Jess will also be looking at where the industry requires training and education on exotic pests. Pest identification is a focus but improving knowledge of how to manage these pests is another aspect.

"We'll support growers and other industry members to become more aware of how to effectively manage these pests so that if we do have an incursion, and if eradication isn't an option, which would be unfortunate, we can move into management as seamlessly as possible," Jess said.

When it comes to biosecurity, Jess said the most important thing you can do is be prepared.

"Preparing industry and growers for the worst-case scenario is crucial, so if we have an incursion of a pest we have the tools and knowledge to survey the spread, how to contain and eradicate it, or if it can't be eradicated, understanding how businesses can move forward if that pest is in your region," Jess said.

Before coming to Citrus Australia Jess worked at entomology research group Cesar Australia leading agricultural



extension activities, and before that at AusVeg leading biosecurity and pest management projects for the vegetable and potato industries.

"When I started my degree, I actually started as a geology major and then I decided to throw myself into the biology side of things," she said.

Jess worked in several science communication roles after completing her studies, when she felt that researchers were doing a lot of great work but weren't getting information about that work to the people who needed to be hear about it.

"I saw myself working more in a field where I could be involved in the science but as someone who was helping build relationships between the users of science and the scientists themselves.

"Which makes this biosecurity program a really great fit," she said.

Jess likes to get outside as much as possible either with her horses, hiking or maintaining her garden. Her favourite citrus hands down is a lemon, which she enjoys most in lemon tarts and her next grab would be a gin and tonic with a bit of lime.

Jess will be delivering new findings and organising training on digital platforms for growers and industry in the upcoming years. Keep an eye out for future stories on projects by Jess. ●

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Identifying challenges of urban plant biosecurity

Citrus greening, Asian citrus psyllid, citrus canker, Citrus variegated chlorosis, *Xylella fastidiosa*, Glassy winged sharpshooter... You have likely heard about these exotic diseases and the vectors of the pathogens that cause them.

The Australian citrus industry has been active in surveillance, preparedness and, where needed, response to these exotic threats.

Based on the overseas experience, urban landscapes can act as refugia for these pests, masking their presence until populations increase in density and providing a diversity of hosts to support populations throughout the year.

For example, after initially being detected in 2008, the current distribution of Asian citrus psyllid in California is still largely confined to urban-residential areas in that state.

Spatial modelling by Bayles et al. (2017) has indicated that spread of the psyllid into California has in part been driven by human-assisted dispersal, with psyllid hotspots being identified in urban areas.

The risk posed by high density urban areas as an entry and establishment zone for exotic pests has long been recognised.

Exotic plant pest transmission pathways are often closely associated with the movement of people or products, with major Ports of Entry, in turn, being associated with high density residential urban areas and arterials, which can lead directly to production zones.

It is becoming increasingly evident that a greater surveillance focus should be placed on these landscapes. However, plant biosecurity activities in urban environments throw up a variety of challenges that can complicate awareness, surveillance and response efforts.

Why do urban areas represent a challenging environment for plant biosecurity engagement, surveillance and response?

In comparison to rural areas, land is extremely fragmented, there are more

Key points

- ❖ Urban areas a biosecurity risk
- ❖ Surge in urban agriculture
- ❖ Focus on engaging urban residents

boundary lines, a greater number of land managers per set area, a greater variety of skills, knowledge, attitudes and values, diversity of culture and language, and importantly (at a broad scale) there is less social capital and cohesion.

Social capital is characterised by the strength of informal networks, opportunities to improve skills and knowledge, and regularity of organisational collaborations.

The strength of social capital is directly related to the resilience of a community and its ability to recover after upheavals such as a climate event, an epidemic, or a pest incursion. Therefore, it is a

good indicator of the ease with which a biosecurity response could be enacted.

A changing urban context may support a movement towards improving urban plant health (and biosecurity)

In looking at major cities in Australia (particularly Sydney and Melbourne) we can predict some significant challenges on the plant health front.

Using Melbourne as an example, the population is forecast to grow significantly over the next three decades, but the Melbourne food bowl will drop in production capacity by more than 20%.

This will largely be due to climate change, changes in lifestyle expectations ('tree-changers') and further predicted expansion of the city's Urban Growth Boundary.

As a result, supply chains will become longer as more city businesses source fresh produce. In addition, future reductions in urban forest canopy cover will lead to more temperature extremes at the level of the

Continued page 26



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From page 24

streetscape, and residents will become more isolated from green, open areas that can provide mental relief.

From a plant biosecurity perspective, we can find the opportunity in this changing context. As they become more apparent, those key challenges may support a movement towards improved plant knowledge and stewardship in cities.

This is a movement in motivation and knowledge that is currently underway and may be used as a vehicle to strengthen biosecurity arrangements, if the context is understood.

Capturing the changing context for better biosecurity

The concepts of 'urban greening', 'urban agriculture' and 'urban rewilding' are becoming increasingly normalised in high-density urban areas, such as Australia's capital cities.

As an example, in most major cities in Australia, until more recently, urban agriculture has been a fairly novel activity.

However, the past five years has seen an upsurge of urban agriculture activities in major cities, with the SUSTAIN Gardening in the Pandemic

survey (9000 respondents) identifying that during 2020 over 60% of respondents had spent more time than previously gardening, and in particular, growing food.

In a recent urban biosecurity study, we identified 231 urban (176) and peri-urban (55) gardens across 28 metropolitan council areas of Greater Melbourne.

We mapped these gardens against key peri-urban production areas, including tree fruit growing regions. We identified significant scope for collaboration between community gardeners and primary producers for the purpose of exotic pest surveillance and the setting up of sentinel sites.

In addition, we identified key risk areas near Ports of Entry and distribution centres that host a high number of community garden groups with strong, informal communication networks.

Such networks could be tapped into as an additional mechanism for upskilling local special interest groups and coordinating pest surveillance.

Would people who live in high density urban areas spare a thought for plant biosecurity? Yes, they would.

A growing disconnection between urban residents and primary production industries would certainly increase the challenge of maintaining good plant biosecurity in cities.

However, does a 'disconnection' exist between city residents and biosecurity awareness? This is an important question, as exotic pest detection in high density urban environments is a crucial risk mitigator of subsequent pest establishment in adjacent, high value peri-urban production zones.

In a survey dataset of 456 urban and rural residents across Victoria we actually found that the likelihood of reporting a suspect exotic pest did not significantly differ based on current residential location (rural or urban) and setting of upbringing (rural or urban), with over 2/3 of survey respondents indicating they were likely or highly likely to report a suspect exotic pest.

We also found that there is high alignment between rural and urban residents in relation to motivations that would drive reporting. For example, across all 'high likelihood' exotic pest reporters, key motivators were moral duty, environmental protection, agricultural protection, and general awareness of risk.



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In 2021, continuing Citrus Australia biosecurity activities will include a focus on engaging urban residents and collecting surveillance data from major cities for pests such as Asian citrus psyllid, with the aim of making a detection as early as possible before there is spread to commercial production areas. ●

However, a lack of knowledge and confidence among potential reporters is a major limiting factor in improving plant health outcomes in urban and rural environments.

This barrier is unlikely to be appropriately addressed through traditional biosecurity outreach approaches that place an emphasis on providing direct 'top-down' information about priority pests.

Rather, a more holistic process of building community social capital (strengthening informal networks) and empowering individuals and groups to become more familiar with their seasonal garden ecology will likely support longer-term positive outcomes.

Understanding the opportunity, and taking a long-term engagement outlook

Major cities, such as Melbourne, are surrounded by high-value peri-urban agricultural food bowls that stand to significantly benefit from plant health protection activities undertaken in adjacent urban environments.

Urban and peri-urban regions cannot be understated as critical zones for maintaining plant biosecurity engagement and plant health stewardship activities. Fortunately, this study demonstrated that significant good-will exists among city residents to report exotic pest species.

Dr Jessica Lye is the National Citrus Surveillance Coordinator with Citrus Australia.

This study was funded by the Australian Plant Biosecurity Science Foundation. The full report can be found at <https://www.apbsf.org.au/apbsf-projects/>

This article draws on findings from Lye J & McGregor H. (2020), APBSF Project Final Report, Urban plant biosecurity: Using a foundational approach to understand emerging risks, support resilient cities and safeguard rural industry.

Bayles BR, Thomas SM, Simmons GS, Grafton-Cardwell EE, Daugherty MP (2017) Spatiotemporal dynamics of the Southern California Asian citrus psyllid (*Diaphorina citri*) invasion. PLOS ONE 12(3): e0173226



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HLB tolerant rootstocks arrive in Australia

Huanglongbing (HLB) tolerant rootstock seeds from the University of Florida have arrived in Dareton and Bundaberg to be evaluated under Australian conditions.

Citrus Australia's Variety and Rootstocks Committee have been working on specific strategies in preparing the industry if Australia has an outbreak of HLB.

Citrus Australia CEO, Nathan Hancock, said the committee was driven by the fact the industry needs to be as far advanced as it can be in biosecurity preparedness.

HLB tolerant rootstocks play an important part of that strategy.

HLB is native to Asia but was detected in Florida in 2005, and by 2009 had reached across America and into 33 different countries.

The 20 different HLB tolerant rootstocks from Florida have already been sown at research centres to be propagated under Australian varieties and planted into commercial orchards.

"I'm really pleased that they are finally here, and they're in Bundaberg and Dareton being grown out from seeds into seedlings.

"Hopefully we will get some good understanding how they react to being in Australian soils, growing in

Key points

- ❖ Tested in Australian conditions
- ❖ Planted in commercial orchards
- ❖ Commercial viability a factor

Australian climates with varieties that are important to Australia in terms of domestic and export production.

"In Florida there's such a prevalence of the psyllid and such a high level of HLB infection that simply staying alive is enough for them to continue trying to breed that tree and do more with it whereas here, we're not under that pressure so it will be good to understand more of the characteristics the rootstocks can deliver in our conditions," Nathan said.

"Breeders in Florida have been facing this major problem with HLB that we don't have in Australia yet so they've had an opportunity to breed varieties that they think might have some tolerance to that disease.

"The guys in Florida, not just the university but the USDA [United States Department of Agriculture], they've put a lot of work into this material over many decades.

"For us to be able to access that material and potentially benefit from the work that they've put in is a really good thing."

It will take just five to ten years to evaluate the rootstock to get some idea how the material will react to Australia's climate and whether the material will be worth pursuing on a big scale.

Nathan said it's important that the rootstocks have arrived in Australia well before Asian Citrus Psyllid (ACP) and HLB.

"We need to know if these rootstocks from Florida are going to be good rootstocks for Australian conditions and it's also important to get access to the material ahead of when you actually need it.

"The important thing to know is whether they're useful commercially in Australia," Nathan said. ●

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Go to page 32 for an article on '**Establishing HLB tolerant rootstock trials for the Australian citrus industry**'

An orange infected with HLB.

Establishing HLB tolerant rootstock trials for the Australian citrus industry

Rootstock selection is one of the most important factors to consider when planning a citrus development.

Rootstocks affect yield, fruit size and quality. They also vary in their adaptability to different soil types, tolerance of adverse soil conditions, pests and diseases as well as their suitability for use on replant sites.

Different rootstocks are appropriate for different varieties and planting systems. The most appropriate rootstock will depend on site characteristics, intended planting system, the likelihood of specific pest, disease or salinity problems, the variety to be grown, planned market outlets and marketing strategies for the fruit.

Certain rootstocks have resistance or tolerance to phytophthora, citrus tristeza virus (CTV), nematodes and other diseases.

It is now well established that Huanglongbing (HLB) (*Candidatus liberibacter asiaticus*) or citrus

Key points

- ❖ HLB tolerant rootstocks
- ❖ Imported from Florida
- ❖ Trials in Indonesia, Australia

greening disease is devastating, having damaged citrus crops around the world.

HLB is a bacterial disease that is transmitted by a vector, the Asian citrus psyllid (ACP), which spreads through the tree canopy, causing tree decline and then death. Similar to the citrus leaf miner, the ACP requires a new flush of leaves for reproduction.

However, unlike the citrus leaf miner, adult ACP can survive on hardened

leaves and if not controlled, will move to new flush as it becomes available. Therefore, suppressing adult ACP during winter (i.e. before the new spring flush) will be helpful.

HLB is not present in Australia, however, if infected plants, budwood, cuttings or rootstock were imported, this could change. Therefore, there is an urgent need for the Australian citrus industry to safeguard itself against HLB.

HLB is present in neighbouring countries to our north and the Torres Strait Islands; both could provide a potential pathway for its spread into Australia.

I am leading a Horticulture Innovation-funded project 'Evaluation of new rootstocks for the Australian Citrus Industry' at the NSW DPI Dareton Agricultural Research and Advisory Station.

One of the key components of this project is to import HLB tolerant rootstocks and to test them with different scion varieties in different citrus growing regions of Australia.

Currently there are no rootstocks available in Australia that are HLB tolerant, meaning we rely on rootstocks bred overseas for this trait.

I have established relations with scientists overseas who are working on HLB tolerant rootstocks and have been working closely with them to negotiate the import of HLB tolerant rootstocks.

The first set of seven rootstocks arrived from the US Department of Agriculture (USDA), Fort Pierce, Florida, in December 2020 as a result of long-term negotiations.



Dr Tahir Khurshi, NSW DPI, with Dr Kim Bowman, USDA, Florida, inspecting the performance of navel oranges of different rootstocks at Dareton.

These rootstocks are US-802, US-812, US897, US-942, US-1283, US-1284 and US-1516. They are hybrids of Trifoliata and other citrus types such as grapefruit, mandarin and oranges. The new rootstocks have germinated to develop seedlings to be budded with different scion varieties.

These imported rootstocks were bred by Dr Kim Bowman from USDA, Florida and he has published several articles on the efficiency of these rootstocks against HLB.

These rootstocks will be tested in replicated trials in Australian citrus growing areas for yield, tree growth and fruit quality with different scion varieties.

These rootstocks will also be tested for HLB in Indonesia under a new project titled 'Preparedness and management of huanglongbing (citrus greening disease) to safeguard the future of the citrus industry in Australia, China and Indonesia' funded by the Australian Centre for International Agriculture Research (ACIAR) and Horticulture Innovation in Indonesia and Australia.

In this project, the efficiency of new rootstocks will be quantified for their tolerance to HLB with different scion varieties. The project is led by Citrus Australia and the NSW DPI citrus team.

The information obtained from this research will be useful for citrus



HLB tolerant rootstocks from the USDA growing as seedlings in Australia.

growers in Australia as it will help identify the most effective rootstock for HLB tolerance and for yield and quality. Importantly it exposes the new rootstocks to HLB strains in countries closest to Australia.

NSW DPI has recently signed a collaborative agreement with the University of Florida, Lake Alfred to obtain the new rootstocks.

However, Citrus Australia CEO Nathan Hancock played an important role and made it possible to obtain these rootstocks for the Australian citrus industry.

Twenty new rootstocks provided by Dr Fred Gmitter, University of Florida, arrived in Australia in April 2021.

There were 7 rootstocks from the UFR series, 6 rootstocks from the B11R series, 4 rootstocks from the N40R series and 3 from AMB+CZO, Orange14 and Orange 16 series respectively. These rootstocks are all hybrids of different citrus species and have recently germinated to develop rootstock seedlings.

The trial sites will be established in the citrus production regions of Australia in sandy loam and clay soils. ●



Dr Tahir Khurshid, NSW DPI with Dr Fred Gmitter, University of Florida, inspecting the rootstock fruit from the mother trees of Chinese Poncirus trifoliata at NSW DPI, Dareton.

Tahir Khurshid is a research physiologist with the NSW DPI based at Dareton. You can contact him by email at tahir.khurshid@dpi.nsw.gov.au

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Review your postharvest fungicides

The use of postharvest fungicides is important to control decay during storage. However, fungicides are just one tool that are needed for effective postharvest decay management.

There are a range of other management factors, including correct harvest and handling, required to successfully control decay (see **Figure 1**).

However, the use of postharvest fungicides are essential to control postharvest decay such as green mould, blue mould and sour rot which occur during storage.

While routinely using the same postharvest fungicide program throughout the season may seem simple, it poses a risk and it is, important to rotate fungicides with different modes of action to ensure that potential fungicide resistance does not develop.

The continued use of the same fungicide, particularly with poor packinghouse practices and sanitation can lead to the development of fungicide resistance.

Resistance to postharvest fungicides occurs where the decay fungi grow in the presence of the fungicide, therefore making the fungicide ineffective.



Something you don't want to see when you open a carton of your fruit

For example, rotating away from commonly commonly used fungicides such as TBZ, which are routinely used, to other fungicides with different modes of action is strongly recommended to prevent the build up of fungicide resistance.

With the season in full swing, there is no better time to re-examine your postharvest fungicide program.

Table 1 is currently available on the postharvest page of the Citrus Australia website and the NSW DPI citrus website.

For updates on changes to these postharvest fungicides, please check the APVMA Public Chemical Registration Information System Search (PubCRIS) database - <https://portal.apvma.gov.au/pubcris>.

This APVMA website is an excellent resource to find the most up to date details including product name, registering company, active constituents and product category for not only registered postharvest chemicals, but all agricultural chemicals.

It is important that the selection of the postharvest fungicide is not only based on efficacy and practical use within the packing line, but it also considers on where the fruit is going to be sold.

It is essential that the selection of fungicide meets the in-market maximum residue limit (MRL) requirements.

For fruit to be sold on the domestic market, all postharvest fungicides listed are allowed and should meet MRL requirements when used according to the label.

For export markets, some postharvest fungicides are not allowed. An example of this is guazatine in some export markets.

For an up to date summary of the export MRLs, please consult with the Citrus Australia MRL listings on the Citrus Australia website. These are regularly updated to ensure industry has the most up to date information to make informed decisions. ●

Figure 1. Postharvest fungicides are just one component of decay control.

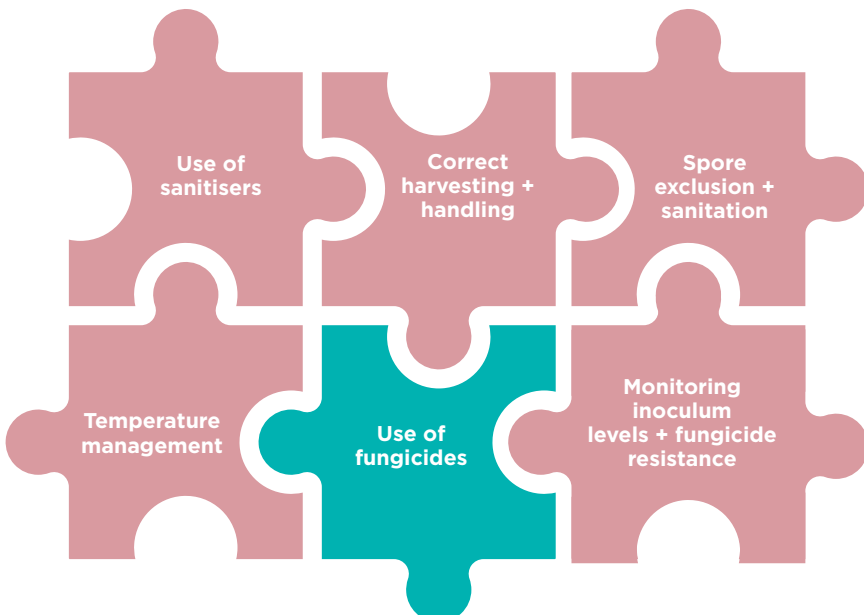


Table 1. Summary of current postharvest fungicides

Active ingredient(s)	Trade names ¹	What does it control	Fungicide group	FRAC Group number
thiabendazole (TBZ)	Vorlon®, Tecto®	blue mould, green mould with activity on Stem End Rot, <i>Phomopsis citri</i>	Benzimidazole Group	Group 1
imazalil	Magnate®, Fungaflor®	blue mould, green mould	DMI (Demethylation Inhibitors) (Imidazole)	Group 3
pyrimethanil	Penbotec®	blue mould, green mould	Anilinopyrimidine Group	Group 9
imazalil and pyrimethanil	Philabuster®	blue mould, green mould	DMI and Anilinopyrimidine Group	Group 3 and Group 9
fludioxonil	Scholar®, Fludy®	blue mould, green mould, activity also Diplodia Stem End Rot	Phenylpyrrole Group	Group 12
propiconazole and fludioxonil	Chairman®	blue mould, green mould, sour rot	DMI and Phenylpyrrole Group	Group 3 and Group 12
sodium ortho-phenylphenate	Preventol® ON Fungicide	blue mould		
guazatine ²	Zanocline®, Panocline®	sour rot with activity also on blue and green mould	Multi-site activity (Guanidine)	Group M7

¹ other Trade names exist. Please see APVMA website for all registered chemicals.

² Check that this is registered in your state / territory

Acknowledgements

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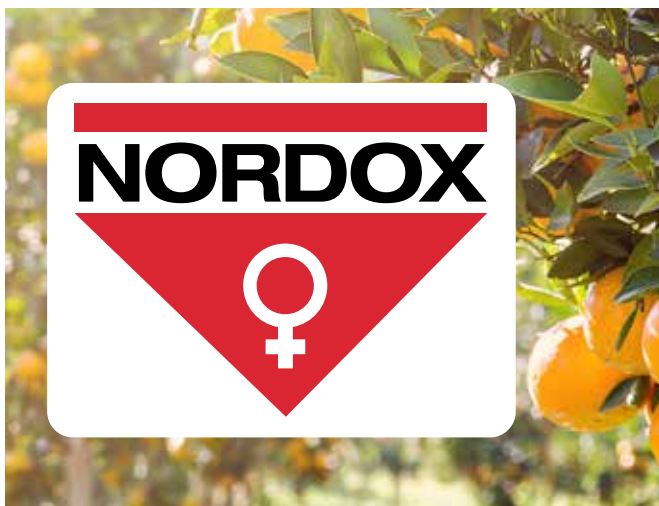
Dr John Golding is a research horticulturist with NSW DPI.

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Examples of green mould and blue mould.



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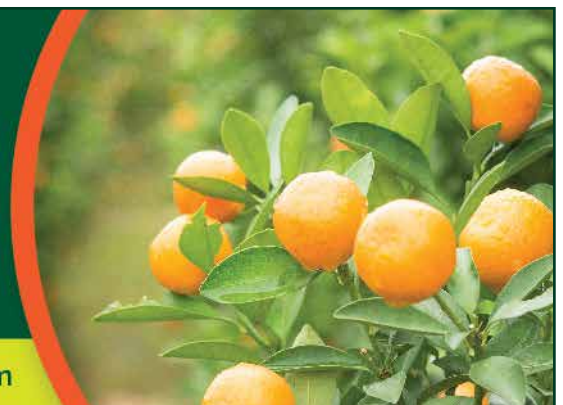


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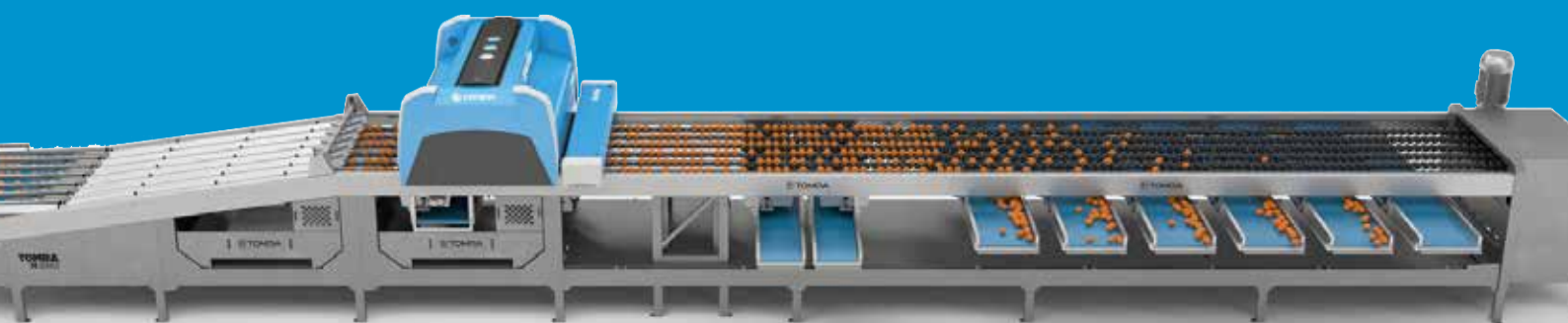
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