

Final Report

Citrus Technical Forums

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Citrus Technical Forums CT16700

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Content

| Content | 3 |
|--|----|
| Summary | 4 |
| Keywords | 5 |
| Introduction | 6 |
| Methodology | 7 |
| Outputs | 8 |
| Outcomes | 9 |
| Monitoring and evaluation | 10 |
| Recommendations | 11 |
| Refereed scientific publications | 12 |
| Intellectual property, commercialisation and confidentiality | 13 |
| Appendices | 14 |

Summary

The objective of the 2017 and 2019 Citrus Technical Forums is to bring growers, packers, exporters, researchers, regulators and suppliers of other goods and services together at a single point in time. The Forums included formal auditorium style presentations and break-out workshops and in-field demonstrations, providing an opportunity for participants to better understand how R&D levies are being invested and an opportunity to provide input into future investment. The ultimate goal is for Hort Innovation to showcase its R&D investment and for industry participants to apply the latest findings to improve productivity and competitiveness.

The 2017 Citrus Technical Forum and Field Day, held 1-2 March 2017 in Mildura, attracted 374 delegates. The maximum number of delegates was in fact limited by the size of the various venues and so many late registration inquiries disappointingly missed out. Sixty per cent of delegates were growers, and 68 per cent of the grower delegate survey participants received information that they will apply to their business this year.

Many respondents noted that the opportunity to network and meet peers in the industry was a major highlight of the forum. The field trips received considerable praise.

Preferences for different tech presentations varied considerably. Presentations sharing knowledge about biosecurity and pest management, post-harvest practices, variety evaluation and rootstock trials were particularly popular.

The 2019 Citrus Technical Forum, held 6-7 March 2019 in Adelaide, attracted 430 delegates. The Citrus Technical Forum and Field Day 2019 was held from March 4-7, 2019 inclusive.

The pre-Forum tour was held on March 4-5, beginning in Mildura and running through the Riverland, completing its journey in Adelaide the night before the Forum. There were 90 delegates on the tour, primarily growers from every State, as well as New Zealand.

The Forum was organized into different sessions that included post-harvest technology updates; biosecurity; increasing IPM and minimizing chemical resistance; orchard best management practice; farm tech; and nursery best practice. The Tech Forum was held at the Adelaide Convention Centre, as it had outgrown the previous location in Mildura. This provided a more comfortable experience for delegates and sponsors.

Keywords

Citrus; Technical Forum; biosecurity; markets; exports; post-harvest; pest management; variety evaluation; rootstock trials; post-harvest technology; IPM; chemical resistance; orchards; best management practice; farm tech; nurseries.

Introduction

The inaugural Citrus Technical Forum was held in Mildura in 2015. The two-day event was attended by approximately 350 participants from the citrus industry, the research community, and other supply-chain participants. The forum included formal auditorium-style presentations, workshop sessions, packing-house visits, and in-field demonstrations in nearby orchards. Speakers and presenters were selected from Citrus Australia's extensive network of experts within Australia and from overseas.

The objective of the 2017 and 2019 Citrus Technical Forums is to bring growers, packers, exporters, researchers, regulators and suppliers of other goods and services together at a single point in time. The Forums included formal auditorium style presentations and break-out workshops and in-field demonstrations, providing an opportunity for participants to better understand how R&D levies are being invested and an opportunity to provide input into future investment. The ultimate goal is for Hort Innovation to showcase its R&D investment and for industry participants to apply the latest findings to improve productivity and competitiveness.

The Technical Forums provide a low-cost opportunity for every levy payer to hear updates on the latest research and available technology in one location, and the opportunity for business to business networking. The Forum Planning Committee used its own network to ensure topics chosen would meet current needs of growers, and sessions catered for information that could be applied immediately, and updates of longer-term research. Powerpoints of presentations are available to all levy payers, whether they attend the Forum or not, and concise articles were distributed through social media, the eNewsletter and the Australian Citrus News, which is sent to all levy payers.

Methodology

Each Forum is initially designed by a Planning Committee, including Citrus Australia staff and other key citrus industry stakeholders. Those involved in planning the 2017 and 2019 Forums include: Judith Damiani, David Daniels, Nathan Hancock, Stephen Cooke, Shay Linder-Auricht, Susie Mills, Bill Robinson, John Golding, Justin Lane, Danny Thornton Steve Burdette, Andrew Harty, Shane Kay, Graeme Sanderson, Steven Falivene, Bronwyn Walsh and Brad Wells.

The expertise of the committee looks at key areas relevant to growers, the most relevant information required from these areas and the best potential speakers to address this.

A draft program is then designed and speakers are approached.

The Citrus Technical Forum and Field Day held 1-2 March 2017 in Mildura attracted 374 delegates. The maximum number of delegates was in fact limited by the size of the various venues and so many late registration inquiries disappointingly missed out.

In 2019, the Tech Forum was held at the Adelaide Convention Centre, providing a more comfortable experience for delegates and sponsors, and enabling more to attend.

Risk management, stakeholder engagement and monitoring and evaluation plans were completed.

Key note speakers included Nate Jameson, President-elect of the International Society of Citrus Nurserymen and owner of Brite Leaf Nursery in Florida, USA; Beatriz Stein, Director of Argentina's Citrus Sanitation Centre; and leading postharvest researcher, Prof Lluis Palou, Director of the Postharvest Technology Centre at the IVIA in Valencia, Spain.

Workshop sessions included post-harvest technology updates; biosecurity; increasing IPM and minimizing chemical resistance; orchard best management practice; farm tech; and nursery best practice.

An R&D poster session was also held. Researchers attended and presented their posters to industry delegates.

The pre-Forum tour was held on March 4-5, beginning in Mildura and running through the Riverland, completing its journey in Adelaide the night before the Forum. There were 90 delegates on the tour, primarily growers from every State, as well as New Zealand. The tour visited MFC, Mildura, to witness its packing lines; the NSW DPI Research Station at Dareton, NSW, to learn of latest research; Auscitrus, to look at new biosecurity measures implemented; Costa Farms, Kangara, with discussions on afourer management and correct spray techniques; Woolenook Fruits, Murtho, SA, to see new efficiencies made in their packing shed; Nippy's Juice, Moorook, to look at export potential; and, Pyap produce, Pyap, to witness netting.

Outputs

2017 Tech Forum

- Program
- Participant survey
- Presentations
- Citrus News Tech Forum edition

2019 Tech Forum

- Program
- Participant survey
- Tech Forum presentations (click here)
- Citrus News Tech Forum edition

Each of these outputs have been sent as attachments.

Outcomes

Outcomes outlined in our Project Logic Model (part of our Monitoring and Evaluation Plan submitted as part of Milestone 104) were:

Intermediate outcomes

Increased knowledge of Hort Innovation R&D funded by the citrus levy amongst participants

All speakers presenting research funded by Hort Innovation acknowledged this as part of their talk, and through logos on their presentations.

An increase in knowledge, attitudes, skills and aspirations relating to Australian and international R&D; and awareness of emerging issues for the Australian citrus industry

From our participant survey, in 2017 68% of respondents and in 2019 77% of respondents said they would apply information from the Forum to their business over the next 12 months. Sessions in the 2019 Forum included a sharp focus on biosecurity threats and an overview of domestic citrus plantings, and international export numbers. These are key emerging issues that will affect Australian exports and were given due prominence to raise grower awareness.

End-of-project outcomes

Adoption of new R&D knowledge, technology and skills by the Australian citrus industry

From our participant survey, in 2017 68% of respondents and in 2019 77% of respondents said they would apply information from the Forum to their business over the next 12 months. The Forum sessions were designed to ensure growers could apply information that would improve their skills immediately (eg. Better spray coverage, afourer management); new technology that is available that would fit their needs (eg. packing equipment for great efficiencies; iirigation technology; GPS guidance systems); and new R&D (many presenters unveiled latest researched, funded by Hort Innovation).

Establishment of new business to business relationships in the Australian citrus supply chain

The Forum emphasised networking (business to business relationships) by allocating sufficient time at lunch and in breaks to ensure delegates weren't rushed, and ensuring sessions ran to time. The MC regularly reminded growers that all speakers were available to meet in between breaks. 'Networking' was mentioned regularly in highlights section of feedback survey.

Relevant SIP outcome

Outcome 4: Industry participants have increased skills, capacity and knowledge

The survey and discussions with delegates after both Forums indicate all participants have increased their skills, capacity and knowledge as a result of the 2019 Tech Forum.

Monitoring and evaluation

Effectiveness

To what extent has the project improved knowledge and awareness of new research and industry trends?

Sessions in the Forums included a sharp focus on biosecurity threats and an overview of domestic citrus plantings, and international export numbers. These are key emerging issues that will affect Australian exports and were given due prominence to raise grower awareness. From our participant survey, in 2017 68% of respondents and in 2019 77% of respondents said they would apply information from the Forum to their business over the next 12 months.

Relevance

To what extent has the project met the needs of industry levy payers?

The Technical Forum provides a low-cost opportunity for every levy payer to hear updates on the latest research and available technology in one location, and the opportunity for business to business networking. The Forum Planning Committee used its own network to ensure topics chosen would meet current needs of growers, and sessions catered for information that could be applied immediately, and updates of longer-term research. Powerpoints of presentations are available to all levy payers, whether they attend the Forum or not, and concise articles were distributed through social media, the eNewsletter and the Australian Citrus News, which is sent to all levy payers.

Process appropriateness

Was the presentation of the material appropriate to maximize engagement and uptake of knowledge?

Material was presented in two forums – the pre-Forum Tour, which enabled presenters to show information in a practical environment; and the Forum, where presenters could provide an overview of their information utilising video and diagrams, and speak with interested parties at later breaks. The Forum tours included working presentations of spray coverage, netting, current research at the NSW DPI Dareton site, and net technology applied in packing sheds. The longer sessions enabled the delegates to question the host at the time.

Sessions in the Tech Forum were primarily 15 minutes, which allowed more topics to be covered. Presenters were advised beforehand on the areas the Planning Committee wanted them to focus on, to ensure the needs of growers would be met. Many presenters commented post-Forum of the positive level of interaction with growers during breaks.

Did the project engage with industry levy payers through their preferred learning style?

Many levy payers prefer to attend working demonstrations, and the pre-Forum Tour provided the opportunity for this. The Forum presentations were designed with growers in mind, so that information provided was relevant to them.

Efficiency

Was the Forum program the most effective and efficient way to distribute knowledge to growers?

There would not be a more efficient way to distribute knowledge and business to business networking as this 'onestop shop'. In the space of two days (for the main Forum), levy payers received a comprehensive overview of postharvest technology updates; biosecurity; increasing IPM and minimizing chemical resistance; orchard best management practice; farm tech; and nursery best practice. Commercial exhibitors were on hand with the latest equipment to improve efficiency and productivity; scientists were also available as part of the poster presentation to detail research into current problems. The future dissemination of knowledge and ideas through the Australian Citrus News further enhanced the reach effectively.

Recommendations

Feedback from the two delegate surveys provided information to be considered for the 2021 Tech Forum. Of all the feedback provide, the following could be prioritized:

- Continue to prioritize networking opportunities
- Continue to expand trade show
- Encourage presenters to use case studies where possible
- Add some researchers into the main program
- Expand farm workshop session, which proved very popular

When asked what information growers would implement in the next 12 months, priorities were:

- Applying biosecurity on-farm
- Post-harvest options
- Pest control/IPM

This information could be expanded on next Tech Forum.

Refereed scientific publications

N/A

Intellectual property, commercialisation and confidentiality

No project IP, project outputs, commercialisation or confidentiality issues to report.

Appendices

2017 Tech Forum

- Program
- Tour Program
- Participant survey
- Presentations
- Citrus News Tech Forum edition

2019 Tech Forum

- Program
- Tour Program
- Participant survey
- Presentations
- Citrus News Tech Forum edition



FORUM & FIELD DAY PROGRAM: DAY 1 - Wednesday 1 March

MILDURA ARTS CENTRE

Buses will collect delegates from hotels 7.00 – 7.30 am

| REGISTRATION, WELCOME & INTRODUCTION | | | |
|--------------------------------------|---|---|--|
| 7.30 - 8.30 | Registration at Mildura Arts Centre, 199 Cureton Avenue, Mildura Trade exhibits open | | |
| 8.30 - 8.35 | Welcome and Housekeeping Tania Chapman Citrus Australia | | |
| 8.35 - 8.45 | Official opening, Ministers address | Senator Hon. Anne Ruston Assistant Minister for Agriculture and Water Resources | |
| 8.45 - 9.00 | Hort Innovation - Citrus Industry Strategic Plan | David Moore Horticulture Innovation Australia | |

| INSIGHTS INTO CITRUS TRENDS FROM KEY REGIONS OF THE GLOBE | | Chair: Shane Kay |
|---|---|-----------------------------------|
| 9.00 - 9.40 | From plate to tree: world citrus trends | John Chavarria, MFC / NOVA fruits |
| 9.40 - 10.00 | 2016 Citrus Tree Census and Production Forecast 2017 to 2032 | Nathan Hancock, Citrus Australia |

10.00 – 10.30 MORNING TEA & TRADE EXHIBITS

| AGRICHEMICAL | S: | Chair: Ben Cant |
|---------------|---|---|
| 10.30 - 10.50 | Exirel [®] by DuPont: new chemistry for pest control in citrus. | DuPont - Gold Sponsor Geoff Cornwell, DuPont |
| 10.50 - 11.30 | Major pests and their control in South Africa – evolving agrichemical practices in RSA | KEY NOTE SPEAKER: Tim Grout |
| 11.30 - 12.00 | Agrichemical use in the Australian citrus industry - implications for trade, practices, permits and reviews | David Daniels |

12.00 – 1.00 LUNCH & TRADE EXHIBITS

| CONCURRENT WORKSHOPS: SESSION 1 | | | | | |
|---------------------------------|--|--|---|---|---|
| Facilitator: | Shane Kay | Nathan Hancock | Steven Falivene | David Daniels | Bronwyn Walsh |
| 1.00 - 2.00 | Post-Harvest Technology Updates | Soil Health – Improving Your Asset | Growing to Market Requirements | Advances in Pest Management | Technology Improvements on Farm |
| | Keynote address: World overview | Grower experience in adapting to | Setting the bar - how pack-out impacts percentage profitability - Justin Lane | Keynote: Pest control experience in South Africa - Tim Grout | Managing deficit irrigation from your smart phone - Mark Skewes |
| | post-harvest treatments: Mohsen Sales | alternative farming practices - TBC | Keynote: Uses and timing of GA for fruit set, creasing and extended harvest – Ian Garden. | Red scale R&D update – Jianhua Mo Gall Wasp R&D Update – Jianhua Mo | Grower developed whole farm management tool Berto Srhoj |
| | National Post- Harvest R&D Project – John Golding | Beneficial bacteria's role in soil health – Hugh Armstrong | Nutrition's role in fruit quality – Bruce Scott | Best practice control of mealybug – life after chlorpyrifos Craig Swanbury | Advances in maturity testing equipment; hand held and inline technology – Kerry Walsh |

2.00 – 2.30 AFTERNOON TEA BREAK

| CONCURRENT WORKSHOP SESSION: SESSION 2 | | | | | |
|--|---|--|--|--|--|
| Facilitator: | Shane Kay | Tim Herrmann | Steven Falivene | Andrew Miles | |
| 2.30 - 3.30 | Post-Harvest: Technology Updates | New Technologies for Future Plantings | Growing to Market Requirements | Advances in Disease Management and Detection | |
| | Fungicide resistance in Australian packhouses – Craig Wooldridge | High density planting in various tree crops; learnings for citrus growers – Helen Hofman | Managing rough skins in citrus fruits – John Chavarria | Graft transmissible diseases, Auscitrus, diagnostics - Nerida Donovan | |

| Post-Harvest fungicides: new and future product update - Lee Duffy | Tissue culture propagation, world trends, a future in Australian citrus plantings? Alan Saunders | Managing citrus under netting, two growers experiences. Ryan Arnold & Dean Morris | Endemic disease management, exotic disease management - Andrew Miles | |
|--|---|---|--|--|
| Advances in food safety – SP Singh | Variety evaluation update - Graeme Sanderson National rootstock trial update - Tahir Khurshid | Improved rootstock for Imperial mandarin – Malcolm Smith | Update on the biosecurity project - Stuart Pettigrew | |

| 3.30 - 4.30 | Citrus Australia Annual General Meeting – all members |
|-------------|---|
| 3.30 - 4.30 | R&D Poster Session |

Buses will drop delegates at hotels from 4.00 pm Buses will collect delegates from hotels 5.00 pm

| 5.30 | PRE DINNER DRINKS AND BOAT CRUISE: MILDURA WHARF |
|--------------|--|
| 7.00 – 10.00 | OFFICIAL DINNER AT TRENTHAM ESTATE |

Buses will drop delegates at hotels 10.30 – 11.00 pm



FORUM & FIELD DAY PROGRAM: DAY 2 – Thursday 2 March

MILDURA ARTS CENTRE

Buses will collect delegates from hotels 8.00 - 8.30 am

| FIELD VISITS (select one). | | | |
|----------------------------|---|--|--|
| Post Harvest | Departs MAC at 9.00am Tour of Mildura Fruit Company packing facility | | |
| Orchard 1 | Departs MAC at 8.30am Minter Magic, Darren and Anne Maree Minter, Iraak | | |
| Orchard 2 | Departs MAC at 8.45am Belah Heights, John Hederics, Trentham Cliffs | | |

| FIELD VISIT - POST HARVEST – MILDURA FRUIT COMPANY | | | | |
|--|--|---|--|--|
| 9.15 – 10.30 | Packing shed tour, including receivals, traceability, quality assessment, drenching, fogging, de-greening, bagging equipment demonstration | Perry Hill, Craig Chappell. Mohsen Sales, Craig Wooldridge, Robert Marsters | | |
| 10.30 - 11.00 | Morning tea | | | |
| 11.00 - 11.45 | Post-harvest presentations: Strip out rate Water quality | Mohsen Sales SP Singh Craig Wooldridge | | |
| 11.45 | Return to Mildura for lunch | Exhibitors tent | | |

| FIELD VISIT – ORCHARD 1 – MINTER MAGIC DEPART MAC AT 8.30AM | | | | |
|---|---|-----------------|--|--|
| Arrive 9.15 | Minter Magic is a diversified horticulture business with Citrus, Almonds and Asparagus the main crops. Darren consistently yields 56t/ha in his navel patches with 1 st grade packouts above 85%. Darren will describe his pruning technique, fertiliser practice and reasons for replacing drip with under tree sprinklers. | | | |
| | Other topics: NAA application trial, 2,4-D and GA application demonstrations, Exirel demonstration (thrips), Tops demonstration. | | | |
| Morning tea provided | | | | |
| Depart 11.15 | Return to Mildura for lunch | Exhibitors tent | | |

| FIELD VISIT – ORCHARD 2 – BELAH HEIGHTS DEPART MAC AT 8.45AM | |
|--|---|
| Arrive 9.15 | Belah Heights is a citrus business in an expansion phase. John Hederics has planted new varieties of mandarin to compliment a large navel planting. John is trialling the use of plastic mulch under new plantings. John has a unique irrigation system which he will describe. He has used spotted gums successfully as a windbreak and uses grasses for windbreaks to protect new plantings. Fertigation and Biosecurity vehicle wash down bay will also feature. |
| | Other topics: NAA application trial, Exirel trial results, Tops demonstration in Daisy Mandarins. Afourer pruning – discussions with industry Managing citrus under netting. |
| Morning tea pr | ovided |

| Depart 11.15Return to Mildura for lunchExhibitors tent | |
|--|--|
|--|--|

12.00 – 1.00 LUNCH & TRADE EXHIBITS

| DAY TWO FORUM SESSIONS | | |
|------------------------|--|------------------|
| 1 00 - 1 15 | Welcome to day two & Citrus Australia Undate | Judith Damiani |
| 1.00 - 1.15 | welcome to day two & citrus Australia Opuate | Citrus Australia |

| MULTI-SCALE MONITORING TOOLS FOR MANAGING AUSTRALIAN TREE CROPS — INDUSTRY MEETS INNOVATION | | Chair: Ian Evans |
|--|---|---|
| 1.15 - 1.30 | Satellite based remote sensing | Andrew Robson, University of New England |
| 1.30 - 1.45 | Robotics in citrus - collecting and interpreting data | James Underwood, University of Sydney |
| 1.45 - 2.00 | Capturing images of all horticultural crops 2ha and above | Craig Shepherd, Department of Science Information Technology and Innovation |

| BIOSECURITY: PROTECTING THE INDUSTRIES FUTURE | | Chair: Greg Dhnaram |
|---|---|---|
| 2.15 - 2.30 | Biosecurity – What does the future hold and are we ready? | Lyn O'Connell - DAWR |
| 2.30 - 2.45 | What is being done to protect the Australian citrus industry? – a growers perspective | Steve Burdette |
| 2.45 - 3.00 | Post entry quarantine service – safely bringing new genetics to Australia | Joel Sterling and Lani Denovan, Department of Agriculture and Water Resources |

| FIGHTING FRUIT FLY – NATIONAL STRATEGY, ON FARM ACTIVITY | | Chair: Greg Dhnaram |
|--|---|--|
| 3.00 - 3.15 | Sterile insect technology and the national strategy for fruit fly control | Darryl Barbour, Dan Ryan, Penny Measham |
| 3.15 - 3.30 | Developing a Qld Fruit Fly Female Trap - the commercial realisation of years of Australian R&D | Dick Drew, Griffith University |

| CLOSE | | |
|-------|-----------------------------------|--|
| 3.30 | Closing remarks by Judith Damiani | |





Citrus Australia



Tech Forum and Field Day survey: Report Prepared by Currie Communications – April 2017



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14



1. Background

Citrus Australia held the second Citrus Technical Forum over two days on 1 – 2 March 2017. The event held in Mildura attracted over 360 delegates from across Australia and New Zealand.

The forum provided an opportunity for researchers to showcase their work to those in the citrus industry. Growers, packers and exporters were offered a glimpse of future industry technologies that were potentially applicable to their business. Sponsors were provided an exhibitor space to promote their profile, products or services. The event also featured two field visits to two different orchards and one packing house.

Citrus Australia conducted a short survey to gain feedback from attendees about the event. This report outlines insights derived from the feedback and provides a detailed summary of responses to each question.

2. Methodology

A survey was developed containing qualitative and quantitative questions designed to provide:

- Feedback about the Tech Forum and Field Day from attendees
- Feedback on Citrus Australia publications

Respondents were given one week to provide feedback from 24 March to 1 April.

The survey was distributed to 320 attendees of the forum by email, returning 50 responses. This sample size leaves a high 12.88% margin of error at a 95% confidence level. Survey results should be read in this context.

3. Insights

An analysis of responses to survey questions highlighted some key insights about attendees' reception towards the tech forum and Citrus Australia publications.

A further comparison between attendee segments – packers, growers, exporters, commercial providers, researchers, and sponsors – provided insight into each segment's experience at the Tech Forum and their preferred communication channels.

These insights aim to help Citrus Australia continue improving the Tech Forum and its communication channels moving forward, as well as tailor its event services and communications to fit the needs of different segments.



Key insights from responses

Responses from survey questions provided six key insights about attendees of the forum:

- Growers and packers were the most represented groups in attendance.
- The major highlights for attendees were networking, field trips, tech presentations and insights into citrus trends.
- Better cooling in the marquee was a common suggestion for improvement.
- Most attendees (74%) received information from the forum that they would apply to their businesses this year.
- The Citrus eNews was the preferred avenue for further tech forum information
- The vast majority of attendees (91%) found Citrus Australia publications relevant to their business.

Segment comparison – packers

- Packers wanted more information on packaging at the tech forum.
- Positively, 79% of packers received information that they will apply to their business this year – slightly above average.
- Packers wanted more updates around packing, and packing innovation in Citrus Australia publications.

Segment comparison – growers

- The field trip was a particular highlight for growers.
- 68% of growers received information that they will apply to their business this year.
- Citrus eNews was the preferred communication channel for further tech forum information by a considerable margin.



Q6 How would you like further information from the Forum and Field Day presented?



Segment comparison – exporters

- Exporters found information concerning citrus trends the most useful.
- Like growers, exporters preferred the Citrus eNews as the channel to provide further tech forum information.

Segment comparison – commercial provider

- Commercial providers suggested improvements around having more tech updates at the forum.
- Commercial providers, in particular, wanted sessions to overlap less.
- 57 per cent of commercial providers received information from the tech forum that they would apply this year.





Answered: 7 Skipped: 3



Segment comparison – researcher

- For researchers, networking was the major highlight by far.
- Researchers appeared to be the most satisfied group, with the fewest suggestions for improvement proportionally.
- 85 per cent of researchers received information they would apply to their business this year from the tech forum.

Q4 Did you receive information from any of the sessions or field trips that you will apply to your business over the next 12 months?





Segment comparison – sponsor

- Like researchers, sponsors' major highlight at the tech forum was the opportunity to network.
- Sponsors found the information provided at the tech forum very useful like researchers, with 85 per cent saying they it was applicable to their business.
- Unlike any other segment, researchers preferred the website as the best channel to communicate further tech forum information.

Q6 How would you like further information from the Forum and Field Day presented?





4. Responses

Q1: What is your role in the Australian citrus industry? (Tick multiple if applicable)

Growers (35%) and packers (35%) were the most represented at the Tech Forum. Exporters (16%), commercial providers (20%), researchers (16%) and sponsors (14%) were each only moderately represented. Processors (2%) were considerably underrepresented in responses.



Q1 What is your role in the Australian citrus industry? (Tick multiple if applicable)



Q2: What were, for you, the highlights of the 2017 Citrus Technical Forum and Field Day?

Respondents had a range of highlights during the Citrus Technical Forum and Field Day. The most common highlights, in order of prominence, were:

- Networking
- Field trips
- Tech presentations and content
- Insights into citrus
- Dinner
- Boat ride

Many respondents noted that the opportunity to network and meet peers in the industry was a major highlight of the forum. The two field trips received considerable praise.

"Networking with like-minded people."

"The packing shed tour was of good value and so were the informal sessions like the pre-dinner drinks and the boat ride to the dinner where everyone was happy to mingle and talk."

Preferences for different tech presentations varied considerably. Presentations sharing knowledge about biosecurity and pest management, post-harvest practices, variety evaluation and rootstock trials were particularly popular.

The Day 1 presentation providing insights into citrus trends was a highlight for a number of respondents. John Chavarria was specifically noted as valuable speaker.

Less common highlights included: The location, the trade show, and seeing sponsors.



Q3: Please provide suggestions on how we could improve the event.

Most responses demonstrated overall satisfaction with the forum, with no suggested improvements.

The most common improvement suggested was better cooling in the marquee. Alongside this, respondents also suggested having more water available.

"An internal venue such as an exhibition centre, rather than a Marquee. Unfortunately, it was uncomfortable and hot inside a marquee."

Respondents showed disappointment at not being able to attend every presentation they wanted to. Suggestions included running more concurrent sessions, or extending the event. Along this line, it was suggested that the sessions that ran concurrently not target the same group, i.e. two concurrent sessions for packers, but instead different groups to allow people to attend more sessions of their interest.

"Its [sic] hard to cram into 2 days and my only regret is that I can't attend everything. Would be good to get all the notes or be able to watch the presentations on the web at a later date."

"When running parallel talks these must be of different interest. It is not good planning to run 2 production talks at the same time, or 2 packing topics at the same time."

"The concurrent nature of technical sessions was unfortunate being unable to attend all. Would be prepared to go later in the day to cover all."

"Too many concurrent sessions together – means you miss too many great talks – need to reduce to maybe 3 a session or run an extra half day of the tech program?"

Other suggestions for improvement included:

- More attendees
- More technical updates
- More focus on packaging
- Having material (notes and presentations) uploaded online after the event
- A list of attendees provided before the event
- More information on control strategies
- For the event to be held annually
- For posters to be placed in a central area

"Place the posters in a central area where people are likely to visit and feel comfortable. Their location around the side of the marquee, quite hidden from view and physical separates from the stands inside... meant we had virtually no visitors other than other researchers."



Q4: Did you receive information from any of the sessions or field trips that you will apply to your business over the next 12 months?

Nearly three quarters of respondents received information applicable to their business this year.

Q4 Did you receive information from any of the sessions or field trips that you will apply to your business over the next 12 months?



Q5: If yes, what information was it?

The most useful information for attendees was:

- An industry outlook which helped with business decisions and clarity around what to plant
- New technology that could be applied to their business
- Pest control measures
- Newly formed networks

Overwhelmingly, responses pointed to insights into citrus and varietal trends, and overall industry outlook as useful knowledge gained through the event.

"Worldwide trends in citrus production will enable our business to gear up for the future."

Less common benefits included information around degreening, area wide management, pruning crop sizing, fertiliser, and post-harvest treatment.



Q6: How would you like further information from the Forum and Field Day presented?

Respondents preferred (45%) Citrus eNews as the avenue to provide further information from the Forum and Field Day.

Other responses noted that having a separate manual that contained all the presentations would be ideal.



Q6 How would you like further information from the Forum and Field Day presented?



Q7: Do you find the information contained in the following publications relevant to your business?

The vast majority of respondents found the Australian Citrus News (95%), the Citrus eNewsletter (95%) and the Season Update (85%) relevant to their business.

The Season Update received slightly fewer "relevant" responses. This stems from a higher number of "N/A" responses.





Q8: What additional information would you like to see in these publications that would benefit your business?

This question was skipped by 62% of survey participants, and responses varied widely. Responses were broadly divided into comments about the Season Update, the Tech Forum and the content of Citrus Australia publications.

Season update:

- "Perhaps the Season update could be abbreviated some of the contributors write a lot and it would be good just to get a one page summary and then read into the detail if you want to."
- "Need to review Season Updates and standardise across states."

Tech forum

• "I hope the CA Technical Forum will be a permanent event."

Citrus News:

- Regular update on what plantings are being removed
- Regular update on what is being planted by variety, by hectare, by region.
- Tree census data each year
- What other growers are doing in the way of orchard practices
- More in-depth practical and technical information for the grower
- More local updates on packing and seasonal progress
- Interviews of successful citrus growers
- Market trends and market access
- DAFF inputs
- IPM program updates
- More information on new variety's
- New innovations
- "I would like to hear about the challenges growers face to better supply research that is required".

One attendee responded: "As I'm based in NZ, unfortunately don't get any of the above publications. But would like to."



New tech fuels future growth





Inside this issue

Hand held Brix testing

8

Boost fruit set with GA Higher packouts under nets

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In this issue...

NEWS

| Citrus weathers floods, heat | 3 |
|--|--------|
| CITRUS TECH FORUM 2017 | |
| Growing export interest for pigmented oranges | 6 |
| Rough skins matter of nutrition | 6 |
| Regular pruning improves quality and prices | ′ 7 |
| Timing the perfect harvest | 8 |
| Research critical for South Africa to retain European markets | 9 |
| Right timing, right nutrients for better fruit | 12 |
| Cold plasma could minimise fungicide use | 14 |
| Improved rootstocks for Imperial mandarin | 15 |
| GA on young trees boosts fruit set by 30% | 16 |

Major expansion employs new technology for early production 20 Agrichemicals an evolving challenge 26 Growers can add new insecticide to their arsenal 27 Post-harvest R&D critical for population growth 28 Attention to detail critical to beat moulds 29 Farm biosecurity critical to protect markets 31 Higher densities could boost fruit yields 33 FARM MANAGEMENT Barkley rootstock available for mandarin growers 36 The essentials of degreening 37 INNOVATION

| New brown spot treatments | |
|---------------------------|----|
| under spotlight | 38 |





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New technology only way to progress



OUR citrus industry needs to continue to adopt new research and technology both on farm and post-harvest to ensure its future against current and emerging competitors.

Citrus isn't alone. Gina Rinehart highlighted the importance of investing in new technology when she spoke at The Australian's Global Food Forum in Melbourne.

Australia's richest woman, who purchased the iconic S.Kidman & Co cattle stations last year, said availability of technology in Australia enabled it to maintain its competitive advantage despite high costs.

Rinehart will roll out a digitalised UHF system, which enables communication from anywhere on a property to anywhere in the world, as well as walkover weighing systems, something the cattle industry has been talking about for quite some time.

The Citrus Technical Forum and Field Day dinner was a highlight.



Costa CEO Harry Debney told the Food Forum that Costa citrus is trialling improved vision sorting equipment which checks each piece of fruit 100 times up from its previous best of 7 times. Debney considers this a 'game-changer' as it eliminates sorting labour and has provided a 50% throughput improvement.

The recent Citrus Tech Forum and Field Day revealed new technology that will help Australian growers maintain their advantage over their international competitors.

Speakers showcased new technology – both for the farm and in the packing shed – which will lead to better quality fruit and greater profitability through more efficient use of resources and reduction of costs.



Shay Linder-Auricht, Judith Damiani, David Daniels, Nathan Hancock and Susie Mills.

With the growth in our exports, postharvest technology has arguably never been more important and the latest work in food safety, fungicide resistance, sanitation revealed how Australian packers will continue to meet exacting international protocols.

Then there is the latest advancements that will help growers meet the constant challenges of labour and water.

The level of detailed management information for growers is increasing and has never been more accessible through smart phones.

Australian citrus growers and packers have proven themselves innovative members of the Australian agriculture industry and continue to thrive against larger nations through adoption of research.

We trust stories from this year's Technical Forum will provide practical ideas and inspiration to help your business capitalise long into a very competitive but prosperous future.

JUDITH DAMIANI Chief Executive Officer, Citrus Australia





Season outlook Citrus weathers floods, heat

By Rosalea Ryan

Key points

Central Burnett escapes flood damage

Cool spring impacts flowering

Southern mandarin crop rebounds

WHILE much of Queensland and northern New South Wales was severely wind- and/or water-damaged by Cyclone Debbie and its tropical storm aftermath, the Central Burnett was spared major devastation.

Cris Bryant of Blue Cow Citrus at Gayndah said rain and associated flooding at the end of March would cause only slight delays to harvesting. "Blocks will need a week or so to dry the root zones and, in some cases, to become accessible again," Cris said on April 3.

Thankfully, he said, the fruit itself had not been damaged.

"Imperials are showing good internal quality," Cris said. "Clear skies since the cyclone, along with cooler nights, are aiding colour break and the fruit size is good.

"The signs are that there will be a larger percentage of fruit harvested in the first pick due to the delayed start and slightly lighter crop this season."

Cris said lemons had "tracked well so far this season".

Kevin Cock



"There's good pricing to date, with plenty of lemons to hit the market prior to Easter."

He said grapefruit were also selling well as supply failed to meet demand.

Cris said the season had been favourable overall.

"The hot and dry summer provided good growing conditions; fungal issues were reduced.

"Ample water was available from the Burnett system but the recent heavy rain event has been timely as some of the minor systems that feed the Burnett were running very low and the water was starting to become a bit salty."

Citrus Australia's Citrus Quality and Market Information Manager Nathan Hancock agreed.

"The water situation was becoming tricky for many on the smaller rivers in the Gayndah Mundubbera region, so the rain has been a welcome relief.

"The lead up rain prior to Debbie also helped with conditioning the fruit and probably helped add a little size"

"Overall the Imperial crop appears to be down slightly, but with the past few seasons producing increasingly larger crops I don't think the impact will be felt at all."

Tri state area

Many growers took the opportunity to employ various crop manipulation techniques after the long heavy flowering that Spring produced.



"It was one of the coolest Spring periods for some time, many growers were looking at records to see just how unusual it was," said Nathan

"I think a combination of hedging, thinning and natural shed due to the brief heat wave probably helped reduce the crop load."

"What that will mean for marketers is a mixture of sizes, centring around the medium size orange rather than the large to extra-large that they have had to work with in the past two to three seasons."

"Mandarin volumes in the south are looking to bounce back in volume after a very light year in 2016 and I think sizing will be smaller where growers haven't employed any thinning practices."

New South Wales

In southern New South Wales, an extended heatwave through January and February did not compromise fruit quality in general but did slow down development, resulting in a drop of one size on average across oranges, Gary Pandolfo, Griffith, said.

"Because the crop's heavy and we didn't get that growth through summertime

we're not going to achieve the size we'd really like," he said.

However, "prices for Valencias have been good and juice contracts for next year are increasing because of a shortage of imported concentrate," Gary said.

Navel oranges set well, producing a heavier-than-normal crop. As result, the overall size would be down slightly, he said.

"Export prospects are strong for medium-sized Navels to the US, Japan and China, all of which like bigger oranges — there's not going to be enough of that larger fruit.

"Our other export markets are all looking very good; they all want Australian fruit. The returns for Australian growers will be as good as if not better than last year's.

"We don't know yet what the crops in South Africa and Chile are doing but our signs here are all positive at the moment."

Victoria

On the NSW-Victoria border, Kevin Cock, Buronga, said weather had favoured his property twice in the past two years. "We had a hailstorm through our Valencias 18 months ago so this year – when record prices were being paid because most growers had lighter harvests – ours bounced back with a very heavy crop.

"The Navels are also looking quite good."

Kevin said mandarin volumes were likely to be down slightly after a lot of young fruit was shed during early January's heatwave. "That was actually good for us," he said. "We didn't want to end up with a lot of very small fruit so that helped us out."

He said some rain would be welcome, provided falls in the Riverina did not mirror those that were occurring further north.

"In 1955, when floods were at record levels in Queensland we also had record flooding here so we definitely don't want to see that again," he said.

South Australia

According to Ben Cant of Impi Citrus in Renmark, the South Australian region had some cases of extended periods of flowering and fruit-set had resulted in a three- or four-week variation across trees.



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"As far as oranges are concerned, Navels are highly variable across both size and crop load as a result. We'll be slightly up on volume but one size down on last year on our farm."

Ben said he did not believe the drop in fruit size would affect Australian export returns. "From the packing and marketing end there's been no significant change to market conditions or exchange rates from last year. We're anticipating that China and Japan will be strong again. The US has had a lot of rain and won't be extending its export program until very late in the season so we won't have market pressure from the US."

He said that many of Australia's customers in Asia were happy to accept smaller fruit at "reasonable prices" - particularly those which sold citrus by the individual piece. "It's better in those cases for them to have a high count (number of fruit) rather than a very low count; having very

Herbicide

large fruit really restricts what the seller can sell a box of oranges for.

"Fortunately, as we've moved now to more of an Asia focus rather than a US focus there is a market for 113s and 138s, whereas the US weren't ever interested in taking those sizes," he said.

Ben said harvest was likely to be delayed by about a fortnight across the Riverland. "We're two weeks back on maturity across both Imperials and Navels here," he said on April 4.

At Pyap Produce, Loxton, SA, the Arnold family is also gearing up for a later start to harvest this autumn, starting with a trial plot of satsuma mandarins immediately after Easter.

"For us the size is looking quite good. From what I hear it's a little bit variable across the district, but on our property we had a reasonable flowering - it wasn't heavy - and then through set



we had plenty of fruit so we still thinned everything. Our crop loads are fairly average now.

"Our fruit size is average to good, and it depends how long it does take to ripen. If it is a couple of weeks late I think our size will be good but if it ripens up quickly then maybe some varieties might be a bit back on size," Ryan Arnold said.

Western Australia

West Australian mandarin and lemon grower Richard Eckersley, Yambellup Estate, Harvey, 140km south of Perth, said it appeared size and volume would both be up WA.

"A few people are reporting a little bit of variability in mandarins but for us the size is coming along nicely," he said.

"We're looking at harvest being delayed probably by a couple of weeks, at this stage. That will push us back into early June."

He said the only challenge had been above-average summer rainfall which meant growers "had to be more mindful of keeping up our copper sprays".

Richard said lemon size and crop volume were also likely to be up on 2016 levels.

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John Chavarria

Asia wants pigmented oranges

By Stephen Cooke

NEW trends in citrus varieties are emerging in different export markets, but Spain-based consultant John Chavarria has encouraged growers to do due diligence before chasing trends.

John complimented the Australian citrus industry on the resources invested in the evaluation project conducted by Graeme Sanderson at Dareton Research Station and said that the information available to growers through this project is world leading.

John said growers should take the time to investigate the new varieties and discuss options with their packer before planting.

Markets for the fruit are a significant factor that must be considered.

"Markets drive varieties and ultimately the profitability in the orchard" John said.

John gave the example of Clementine Nules and Nadorcott (Afourer), two varieties that grow very well in Spain.

"One is returning less than the cost of production whilst the other, the Nadorcott

is very profitable, the difference is a mature and over supplied market"

"Investigate new varieties, spread your risk across different markets and varieties," John said.

John said growers should be prepared that some varieties may not adapt to certain growing conditions, and factor this into their calculations.

"Varieties don't come with detailed instructions on how to grow them, we must take time to develop cultural practices and methods to produce these new varieties and it takes time" he said.

John advised that the Australian industry must continue to build on its reputation and its strengths.

"It's becoming increasingly important for Australian citrus to be good quality, have a high Brix, good colour and low residue.

"In Asia, perception is we have sweeter fruit than competitors. We must be market driven rather than production driven."

"As a high cost of production country, we need to deliver fruit that excels.

Clean fruit with low residues is becoming increasingly relevant, particularly in the European market."

John said there remains strong interest in Navels in Asia, with growth opportunities in China, although there is declining consumption in western markets.

Pigmented oranges (Cara Cara and blood types) are attracting increasing interest in Asia, the US and Canada.

"The market is looking for a Cara Cara with a blush and a later season."

There is also a need for bloods with more consistent colour and better size, and potential opportunities for pigmented Valencias, he said.

John said seed counts for Afourer mandarins in the future will be crucial for most markets and will impact grower returns.

To maintain demand in Asian markets, John said mandarins require high Brix (generally 13+) with smooth skins, good colour and medium size, although seedlessness was not a priority yet in China.

Rough skins matter of nutrition

WITH certain Asian markets, particularly China and Malaysia, demanding smooth rind texture, growers must ensure they have a balanced nutrition program to minimise rough skins.

John Chavarria said coarse texture is normally more evident on lighter crops and larger fruit, and is normally associated with thicker skins, high shoulders and more rag internally.

"Under certain conditions, fruit may develop coarse skin texture and will detract from appearance and affect pack-outs," John said.

Seasonal conditions can cause rough texture, particularly spring frost and a late set of flowers, while Navelinas, Washington and Lanes are more prone to rough skins than Lengs.

"In general stop fertilising Navelinas in February ahead of other varieties," John said.

TABLE 1 Rind texture – foliar sprays

| Timing | Chemicals and rates |
|---------|---|
| -eb-Mar | Mono-ammonium phosphate (MAP) or mono-potassium phosphate (MKP) @ 1kg/100L |
| | Zinc sulphate @ 100g/100L or chelates |
| | Manganese sulphate @ 100g/100L or chelates |

| Apr-May | • | Phosphonates (phosphorus acid – 400g/L) @ 750mL/100L and applying |
|---------|---|---|
| | | 3,000L/ha (20L/ha) |

Source: John Chavarria

"Nitrogen applications should be avoided in late summer when the rind starts showing early signs of roughness."

The use of auxins – growth regulators (2,4-DP and 3,5,6 TPA) will improve fruit size but can affect rind texture.

John said correct phosphorus application will benefit skin improvement, fruit texture and colour (see Table 1). "A standard nutrition program would include 30 to 40kg/ha of P.

"In late January, when early signs of roughness and high shoulders become evident, additional applications of 10 to 20kg/ha of P as MAP or phosphoric acid may be beneficial."

MORE INFORMATION

Contact John Chavarria on j.chavarria01@ gmail.com



Regular pruning improves quality and prices



By Stephen Cooke

Key points

Wind blemish main reason for fruit downgrade

KCT market now prefer medium sizes

Prune every tree annually

IGH quality fruit and good tonnes per hectare are as important as each other when seeking to improve profitability, according to Mildura Fruit Company (MFC) Grower Services Rep, Justin Lane.

Justin provided advice to delegates on improving pack-outs and pricing at the Citrus Technical Forum & Field Day held in Mildura.

Justin said aiming to set a Navel crop of 45-50t/ha with fruit that fall in the right size range for the KCT program is the recipe for success. Similarly consistently achieving an Afourer crop of 55-60t/ha Several growers, including Michael McMahon, shared their experiences in pruning methods during the Technical Forum and Field Day field visits.

is more profitable than getting in to a biannual cropping cycle by over-cropping the orchards.

"Wind blemish is generally the main reason fruit is downgraded to second or third grade," he said.

"When developing an orchard, growers should consider wind-breaks, spacing and patch layout because it certainly pays dividends."

Justin said pruning was important and that aiming to prune every tree every year had its rewards. Once an orchard is in a routine of pruning the amount of pruning required per tree actually falls, becoming a maintenance prune he said.

MFC run and pack about 180,000 bins (or the equivalent of 75,000 tonnes) of fruit per year and have capacity to grow their packed volume. They receive fruit from 120 growers with orchards of varying size, supplying anywhere from 10-15 bins, up to 15,000 bins each.

Justin said it was important to note that the KCT (Korea, China, Thailand) market now prefer medium sizes, paying premium prices for counts 56s to 80s (72-87mm), C31 equivalent cartons (16kg).

Non-KCT pricing premiums are generally for 48s to 72s (74-90mm), C31 equivalent cartons (16kg).

Justin gave an example of a grower that achieved close to \$1000/t gross return, his average first grade pack out was 16.8 cartons per bin (of a possible 23.3 cartons per bin) which included 14.4 cartons per bin that were KCT fruit.

That equates to 72% first grade pack out and 62% KCT destined fruit. In comparison better growers with late Navels not eligible for KCT achieved 44% less per tonne.

"In our experience higher pricing orchards had high first grade pack outs due to regular pruning and the use of wind breaks.

"Those with lower prices had excessive scale and wind blemish on their fruit."

Justin also noted that factory prices for Navels in their area at the moment are lower than picking and freight costs.

"Small fruit does not pay the bills.

"Higher pricing orchards all had high pack outs due to wind breaks or netting and some type of pruning, either mechanical or manual. Lower pack-out was due to a lot of green and blemished fruit."







Kerry Walsh

Timing the perfect harvest

By Sophie Clayton

Key points

Devices test Brix without destroying fruit

Mango producers using technology

Citrus model in development

WO handheld devices are being tested to determine if they can help citrus growers assess the maturity of fruit and Brix levels before harvest to ensure high quality fruit and to meet industry standards.

Professor Kerry Walsh from the Central Queensland University presented his work on testing two handheld devices, the F-750 Produce Quality Meter and the Sunforest H-100C, to measure Brix and dry matter in mango and their potential for the citrus industry.

This project is supported by Horticulture Innovation Australia, through funding from the Australian Government Department of Agriculture and Water Resources as part of its Rural R&D for Profit program.

Both devices can be used in the orchard and are non-destructive in the case of mango. The devices are placed in contact with the fruit, shining infrared light into the fruit to obtain a Brix estimate in a few seconds.

Once calibrated the devices can be used across an orchard measuring many pieces of fruit to get a full picture of the maturity level of fruit within any block.

Success in mango

Professor Walsh's work has shown that the F-750 meter is accurate at measuring dry matter in mango - a useful guide to fruit maturity and an index of ripened fruit eating quality. Combined with an industry initiative to implement specifications for harvest that stipulate minimum levels of dry matter before harvest, the technology has been adopted across the industry.

"About two years ago the mango industry supported taste testing in an effort to increase the consistency of mango quality for consumers and set quality specifications," explained Prof Walsh.

"Their testing identified the amount of Brix required in ripened fruit for consumer eating acceptance, which translated to 15% dry matter at harvest, depending on variety."

The industry has since set dry matter specifications for the major varieties.

The F-750 has allowed growers to measure dry matter of fruit in their orchards periodically throughout the season, assisting to determine the optimal time to harvest.

A web app displays where samples have been taken across farm blocks and provides information on block average and time to reach the specification target.

The technology is also in use in markets, with dry matter levels on incoming consignments being reported on in the mango industry's regular newsletter, and retailers also utilising it within their own quality assurance specifications. According to Prof Walsh, the mango industry's 'pull' for the technology has led to adoption of the F-750 meter despite its rather high price tag of slightly under \$10,000. He explained that a number of the larger producers have invested in the device themselves.

Potential for citrus

Both devices have potential for application in citrus, but citrus's thicker skin means further testing is required

to determine the devices' usefulness in the industry because both rely on penetrating the fruit's skin with light.

The new Sunforest model has been designed for application in citrus but it hasn't been tested locally yet, while preliminary testing on the F-750 is looking promising.

"Our testing is ongoing in citrus," said Prof Walsh. "The older model F-750 didn't perform as well as we had hoped, but a newly released model has performed better. A preliminary trial of the Sunforest was also promising, although results were poorer when fruit were in full sun."

Sunlight can interfere with a measurement as it has the same wavelengths used by the devices. To accommodate this the device must do a background correction. This year Prof Walsh will directly compare both devices in citrus – probably in Imperial Mandarin and Navel oranges - using fruit from orchards in the Mildura region.

Prof Walsh hopes that if the devices are accurate in citrus they can be used before harvest to ensure ideal Brix is achieved, helping growers to meet retailers' specifications and access export markets with Brix specifications such as Japan and Korea.

MORE INFORMATION

Contact Kerry Walsh, Central Queensland University, on (07) 4390 9707 or k.walsh@ cqu.edu.au











Research critical for South Africa to retain European markets

By Stephen Cooke

Key points

South Africa largest shipper of citrus

Post-harvest research prioritised

R&D targets phytosanitary pests

SOUTH Africa does not rank in the top 10 of citrus production by volume, but it is the largest shipper of citrus in the world.

It exports 1.7m tonnes of citrus. By comparison, Australia exported 220,000t last year.

South Africa's citrus production area of about 72,000ha comprises predominantly Valencias/midseason (almost 40%) and Navels (23%) whilst soft fruit (mandarins) is a growing category at the expense of grapefruit area (see Table 1). Exports have grown steadily as the South African rand has weakened against the US dollar – falling from 7 rand to the dollar at its peak to 13 rand to the dollar now. The major change in markets has been a swing from local fresh consumption (6%) to processing (27%) in the past 20 years.

Spain remains the largest exporter of citrus, but sells next door to its European neighbours. South Africa is the largest shipper with 40% of its fruit bound for Europe, and 21% to the Middle East.

Hence, research focuses on the postharvest challenges.

Dr Tim Grout — with 35 years' experience in citrus entomology — spoke of his country's research priorities at the Citrus Tech Forum. He has been the Research and technical Manager of the Citrus Research International since it was formed in 2001 and is responsible for the coordination of all citrus research in southern Africa.

As a percentage of GDP, South Africa spends 0.73% on R&D with only 0.06% going to agricultural research funding. It is one of the poorest research allocations in the world, and lags behind Australia. For that reason business funds 90% of citrus research in South Africa through a legislated 5 US cent per box levy. Around 60% of the levy goes to a trust for CRI and other research institutes to bid for, whilst 20% goes directly to the Citrus Growers Association and another 20% to developing growers.

The Citrus Growers Association created a number of not for profit companies which have different roles. For example the Cultivar Company aims to develop local varieties to give growers an opportunity to access lower cost cultivars, the Citrus Academy provides training material and funds bursaries and the Citrus Grower Development Company which assists new growers. River Bioscience was created to commercialise IP developed by researchers in CRI.

Most of their products are biorational, (pest control materials that are relatively non-toxic to people with few environmental side-effects)such as viruses for lepidoptera, fruit fly bait stations and male annihilation blocks for oriental fruit fly.

XSIT is a recently formed company under River Bioscience which has developed a control of False Codling Moth by releasing irradiated moths — a form of sterile insect technology. A portion of

TABLE 1 Australia vs South Africa's citrus production

| Variety | Australia (ha) | South Africa (ha) |
|------------|----------------|-------------------|
| Valencia | 8,638 | 26,262 |
| Navel | 11,713 | 16,684 |
| Grapefruit | 879 | 7,269 |
| Mandarin | 5,207 | 11,521 |
| Lemon/Lime | 1,153 | 9,551 |
| Total | 27,590 | 71,287 |

Source: Ian Garden

profits from these companies goes back in to the research fund.

Tim heads up the research program at CRI which has three main portfolios; Integrated Pest Management; Disease Management and Horticulture.

Their horticulture programs focus on cultivar evaluation; fruit production and quality; rind condition; and cold chain and packaging.

Whilst CRI does not have their own breeding program they do evaluate cultivars at a number of locations across the country, similar to the evaluation program in Australia. The fruit production and quality program delivers R&D on improved cultural practices for yield and internal quality.

Due to the export nature of the industry and the types of biosecurity pests and their treatments the greater focus of R&D is on rind condition and the cold chain.

"Rind condition is an important situation with long shipping conditions," Dr Grout said. "You can pack perfect lemons then when they are unpacked they can have marks called Peteca spot. The cold chain and packaging research links with rind condition projects."

The Disease Management program focuses on graft transmissible diseases such as Citrus Greening and Citrus Tristeza Virus; fruit and foliar diseases such as Citrus Black Spot and Alternaria which is increasingly important with increased plantings of mandarin; soil borne diseases and nematodes and; postharvest pathology.

In the Integrated Pest Management program Dr Grout said the phytosanitary pests are the most important and receive most of the research focus; particularly the internal pests such as fruit flies and false codling moth that are problematic for both existing and new markets.

"Cold treatment to kill false codling moth is twice as long as cold treatment for fruit fly. That means for some markets, we can't export lemons because the required cold treatment is too severe.



USA demands changes South African priorities

By Stephen Cooke

Key points

Zero tolerance for false codling moth

Red scale key pest in South Africa

Spray volumes up to 15,000L/ha

PHYTOSANITARY pests determine the approach to pest management in South Africa, with false codling moth the current priority.

False codling moth (FCM) for many years was not considered an economic pest and removal and destruction of dropped fruit once a week was adequate for control.

However, the USA demanded a 22 day cold treatment at -0.6°C for FCM and other new markets copied their lead.

"We had economic thresholds for FCM, but when the USA declared codling moth a phytosanitary pest, our thresholds went out the window. Several markets now demand cold treatment," Dr Tim Grout said.

"We now must have zero tolerance for FCM. No single treatment gives more than 80% mortality so a sequential combination of different approaches is used where Sterile insect Technology (SIT) is not available."

"A biological control product called Cryptogran (*Cryptophlebia leucotreta granulovirus*) was commercialised by River Bioscience, it is a naturally occurring virus which is ingested by the larvae.

"Mating disruption is best used in the summer months when the pheromone is more volatile.

"Egg parasitoids are commercially available for release and late in the season methoxyfenozide or chlorantraniliprole can be applied," Dr Grout said.

"Area-wide control with SIT is now happening in two regions and is very effective. Numbers of wild moths in those areas drop every year where sterile insects have been released."

Citrus black spot

Citrus black spot was historically considered a minor cosmetic pest in South Africa and fruit was often exported with one or two spots. However, EU requirements now force growers to have a zero tolerance and apply at least four sprays per season.

Unless the fruit is going to Canada, two sprays usually contain mancozeb which is detrimental to predatory mites. The result has been that areas like the Eastern Cape, where predatory mites were suppressing thrips populations soon after petal fall, have now had to resort to harsh thripicides as used in the subtropical region.

"Once again, phytosanitary requirements have been detrimental to IPM."

Red scale

Red scale remains a key pest in South Africa because of its ability to kill trees.

New methods to combat red scale have been necessary because of resistance to organophosphates (OP) and neonicotinoids.

Now, spirotetramat (Movento) is registered with 0.3% oil and is a good IPM option but is detrimental to predatory mites.

"Sulfoxaflor was recently registered for mealybug and gives some red scale suppression.

"Research shows that mating disruption can maintain low populations of red scale, but not high populations."

Citrus thrips

Dr Grout said citrus thrips are primarily a cosmetic pest and one that determines the effectiveness of a growers' IPM program.

Thrips in South Africa are different to those in Australia as they are linked to growth flush. "They build up when there is a growth flush then move onto fruit and damage the fruit."

With thrips, abamectin plus oil is relied on heavily as an IPM-compatible option and has been used for 20 years. "Spinosad gave similar control to an OP, with few repercussions but Dow replaced this with spinetoram which can cause mealybug flare-ups if used too late after petal fall.

"We are still waiting for new options like cyantraniliprole (Exirel) to be registered but its IPM profile looks good."

Fruit fly

The South African citrus industry was very progressive with the development and use of protein baits for fruit fly control from 1958 while more disruptive cover sprays were used for many years in other crops.

Spinosad in GF120 bait is now being used.

Biorational control options are also used such as bait stations with a pyrethroid toxicant (400/ha), male annihilation and SIT in regions where Medfly comprises more than 95% of the flies.

The arrival of oriental fruit fly in the northern parts has led to the use of MAT blocks (12/ha) impregnated with methyl eugenol and malathion, or Static spinosad being used in addition to the protein baits for females.

Spraying

Most sprays of citrus in South Africa are applied as 1X and Dr Grout said high volumes are used in order to control phytosanitary pests on fruit inside the canopy.

"We don't spray 4X or 6X, our sprays are very dilute at high volumes. To control sessile FCM eggs and CBS lesions on the back of fruit, or indigenous mealybug species on the tree trunk, penetration of the canopy must be very good.

"Therefore, spray volumes may be as high as 10,000 to 15,000L/ha. Growers here are shocked at volumes we are using although it is similar to what you use for oscillating boom sprays.

"Hand pruning of trees allows for better penetration of canopies and lower spray volumes."

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Doug Spanos and Scott Dix of Costa Group inspecting fruit at a Field Visit at Belah Heights.

Right timing, right nutrients for better fruit

By Sophie Clayton

Key points

Potassium, nitrogen and calcium most important nutrients

Potassium should comprise 2% of dry matter at harvest

Young trees require different nutrient management

MPLEMENTING a good nutrition plan in citrus orchards by timing fertiliser applications and choosing the right elements to apply is key to maintaining healthy trees and producing a consistently high quality crop year after year.

Growers must consider nutrients removed by the previous year's crop, assess the coming season's crop and adjust nutrient programs accordingly.

Plant nutrition and fertiliser specialist Bruce Scott of E.E.Muir & Sons Pty Ltd shared his insights to help growers manage their citrus orchard's nutrition requirements.

"The most important nutrients for citrus fruit development are potassium, nitrogen and calcium — in that order," explained Bruce.

"Potassium enhances sweetness, size and colour so is important for fruit quality and should comprise about 2% of dry matter at harvest.

"Nitrogen should comprise around 1.5% of dry matter in the fruit and this usually ends up as proteins and amino acids. Nitrogen is essential for tree development and is the nutrient most often applied in the largest amount because of the tree's overall requirements.

"Calcium is important for shelf life and structural integrity — much like calcium is important for people in developing our bones and 'structure' — calcium does the same in fruit in building up the structure of the fruit's cells so that they can enlarge without breaking down."

Recipe for quality

One example of a citrus fertiliser program to meet quality requirements (noting that there are many variations of how this can be achieved.)

Base fertiliser

 Platinum Plus or Rustica Plus spread about 4–6 weeks prior to flowering @ 300–400 kg/ha

Topdressing or fertigation

- Calcium nitrate can be spread or banded along the tree lines @ about 150kg/ha soon after fruitset and repeated about 4-6 weeks later. Alternatively, fertigate the calcium nitrate @ 50-70 kg/ha at 7-10 day intervals 5 or 6 times to achieve the same overall total application of 300kg/ha.
- After completing the calcium nitrate applications, follow-up with potassium nitrate spread or banded along the tree lines
 about 150kg/ha. Alternatively, fertigate the potassium nitrate
 50-70kg/ha at 7-10 day intervals 2 or 3 times to achieve similar overall total application of 150kg/ha.
- Fertigate with Solu-K (potassium sulphate) @ 50kg/ha or Thio K @ 50L/ha during later fruit sizing.
- Micronutrients can be supplied via foliar spray applications of Brexil Combi and fertigation of Trace-It Total and Ferrilene (specifically for iron).

Bruce emphasised the importance of different nutrient management plans for young trees — which should be focused on tree development that requires more nitrogen for root development, phosphorus for vegetative growth and calcium for structural development.

"Give the tree time to grow before you hang too much fruit on it," said Bruce.

"When the tree is of a suitable size and you want to bring it into production, then potassium becomes much more important. Elements that are important for tree development may be less important for fruit development and vice versa – getting that balance right is important."

Bruce recommended growers look for ways to build their knowledge on citrus nutrition such as by participating in independent courses like the citrus nutrition masterclasses run by Steve Falivene at the NSW Department of Primary Industries.

Growers can also extend their testing programs beyond leaf and soil analyses to fruit nutrient analyses to fully understand how much of each element is removed with harvest.

"If you have the results of a fruit nutrient analysis and you know how much you are harvesting per hectare you can work out how much of each nutrient is removed, which may be as high as 200kg of potassium per hectare," said Bruce.

"There is an amount of crop removal of nutrients and then there are the nutrients used by the tree for its growth and annual wellbeing, both must be considered to ensure a good crop year after year and to level out biennial bearing."

According to Bruce, the nutrient requirements of the common varieties and rootstocks are well understood and information is available to growers to ensure they can develop a nutrition plan to optimise fruit quality, packouts and returns. However, less is known about the nutrition requirements and responses of the newer varieties and growers may need to do some of their own testing.

"The aim of a good fertiliser program is to get the exact type and amount of nutrients delivered at the right time to the tree when it needs it," added Bruce.

MORE INFORMATION

Contact Bruce Scott, E.E.Muir & Sons, on 0408 537 857 or bscott@eem.com.au



Taking stress out of deficit irrigation

By Ryan Ong

Key points

Thermal camera on phone monitors water levels

Determines whether crop is water stressed

Useful for deficit irrigation management

HANKS to a smartphone app, manipulating crop irrigation in the future may become easier for farmers and could be a tool for improving Brix levels.

The Vine Water Stress App, being developed by the South Australian Research and Development Institute (SARDI) and UNSW with funding from Wine Australia, uses a thermal camera that can be attached to a smart phone to monitor water levels in vines.

"The app automatically identifies and measures the temperatures within the image, excluding things outside a certain temperature range. What remains is the canopy," said Mark Skewes, project leader of the research team heading the tool's development.

"It measures the average temperature of the canopy and compares this temperature to our benchmarks to give a crop water stress index number."

This number will indicate how wet or dry the canopy is, and provide information to farmers about whether the crop is in water stress.

The data and thermal imagery taken by the smartphone can be uploaded to the internet from the phone. Farmers will be able to access the information through their computer and use it to help improve irrigation management.

"The app could be very useful in regulated deficit irrigation management," Mark said. "This is when growers intentionally stress the vines to improve fruit quality."

"The problem is you have very little feedback during the process," Mark said.

"This app provides an immediate measure of what the plant is experiencing".

In the past, researchers have used thermal imagery to monitor crop water stress. This was mainly done with very expensive equipment. The app in development is a cost-effective way to make the technology available to anyone.

This research is currently being undertaken within Australia's winery industry, but may be applied in other crop industries such as citrus.

"The current app works with vines, but there is no reason why this approach can't be transferred to citrus. It would be very easy to rework the app to work for different crops", said Mark.

The VineWater Stress App is still in development and not yet generally available. It is currently being used by beta testers including growers, wineries and researchers.

The project is finishing at the end of June and aims to deliver the fully developed app then.

MORE INFORMATION

Contact Mark Skewes, SARDI, on mobile 0408 800 681 or Mark.Skewes@sa.gov.au



Cold plasma could minimise fungicide use

By Ryan Ong

Key points

5-year project to test cold plasma

Displays broad anti-microbial activity

Potential food safety tool for packers, growers

NEW technology in development could improve food safety across the supply chain. Whilst contamination in citrus is less frequent the technology could eventually do away with postharvest fungicides reducing costs and adding to our 'clean green' image in export markets.

Cold plasma technology is a new tool being developed by Dr Sukhvinder Pal Singh's research team, who work on the application of innovative technologies to improve food safety.

The cold plasma investigations are happening under Horticulture Innovation Australia's Health, Nutrition and Food Safety Fund, part of its new strategic co-investment initiative. The project is funded by Hort Innovation with coinvestment from the NSW Department of Primary Industries and funds from the Australian Government. Cold plasma technology has been used effectively in other industries, such as sterilising medical equipment and treating polymers and textiles. The five-year project is looking to see how the technology can be applied in the food industry, testing its application on vegetables, nuts, and fruit including citrus.

Though in early development, research is showing some promise in using cold plasma to treat microbial contamination of horticultural produce.

Cold plasma is a gas-like substance that displays broad anti-microbial activity. It is effective near room temperature.

"The benefit of cold plasma technology is that it kills bacterial, fungal and viral pathogens and is non-chemical, leaves no residues and has a short treatment time," said SP, "using this treatment can minimise use of fungicide."

This makes the technology a potentially effective food safety tool for packers and growers.

Advances in food safety technology have also arisen in attempts to minimise food fraud and improve traceability. These attempts follow fruit in China being falsely branded as Australian citrus. "At the moment, market surveillance and QR codes are two possible solutions to tackle food fraud," SP said.

"Market surveillance is too expensive. The size of the market means this is not a practical solution."

"QR codes are a good option. You can put QR codes on fruit and consumers can scan the code and know the authenticity of the product".

But this solution has its limitations. "There is a risk that people develop fake QR codes, and continue food fraud."

Safetraces is new US technology that presents another solution to improve fruit traceability. It is a liquid barcode sprayed on fruit at post-harvest.

"The barcode is invisible, edible, tasteless and odourless."

Safetraces is a cheap and effective way to guarantee traceability, and make sure consumers and those within the supply chain can authenticate horticultural produce.

At present, this technology is only approved in the US. SP predicts regulatory hurdles for implementation.

MORE INFORMATION

Contact Dr Sukhvinder Pal Singh (SP), NSW DPI, on sp.singh@dpi.nsw.gov.au





Improved rootstocks for Imperial mandarin

By Malcolm Smith

Key points

New rootstocks tested on farms

3000 trees, 500 rootstocks tested

Hybrids screened for virus resistance

QUEENSLAND growers, nurserymen and the Department of Agriculture & Fisheries Queensland (DAFQ) are working collaboratively through a project to find better rootstocks for commercial orchards.

The work is funded by Horticulture Innovation Australia with co-investment from Horticulture & Forestry Science DAFQ royalty funds, the Queensland Citrus Improvement Scheme and funds from the Australian Government. It's designed to deliver both short- and long-term benefits for Australia's citrus growers.

It has already identified a new rootstock for commercial testing and incorporated virus resistance into unique native germplasm.

Field trials have been established in Gayndah, Mundubbera, Emerald, Mareeba and Wallaville with the generous cooperation of local growers.

This ensures new rootstocks are tested under realistic commercial conditions. With more than 3000 trees and close to 500 different rootstocks the focus is, by necessity, on efficient ways to quickly identify those with most potential.

Similarly, the breeding and nursery phase of the project, which is conducted at Bundaberg Research Station, has efficiently screened more than 2500 hybrids for virus resistance, and greater than 1500 hybrids for phytophthora tolerance.

Rootstock requirements for Australian conditions were clearly defined way back in 1985, and have remained largely unchanged since then.

The project has addressed all 'essential' requirements (CTV, phytophthora, horticultural performance) and is now moving to address 'desirable' requirements such as salt and nematode tolerance, and tree size control.

Newly emerging rootstock requirements such as HLB tolerance, warm climate productivity, and gall wasp tolerance are receiving increased attention.

There remain many challenges and progress will be hard-won on complex issues such as granulation and incompatibility.

Fortunately, the scion variety being used in most of the field experiments is Imperial mandarin which serves as an excellent 'canary' for finding rootstocks that help to solve such problems.



New rootstock hybrids produced at Bundaberg Research Station being screened for resistance to phytophthora and Citrus Tristeza Virus, with the survivors destined for field evaluation in commercial orchards.

The strategy with these complex issues is to use results from existing field trials to identify which rootstock are best able to solve the problem, and to then use these as parents to produce the next generation of rootstock hybrids.

DAFQ are independently sponsoring a short-term study of molecular markers that may speed-up the process.

Germplasm from the breeding program is being tested against a range of molecular techniques to see if these can accurately predict virus resistance (CTV) and polyembryony (uniform seed propagation).

Through close collaboration between industry and researchers, field sites located on grower properties, efficient evaluation techniques, and a strong track record of delivering new rootstocks into commercial production, this small project is well place to provide long-term benefits for the Australian industry.

MORE INFORMATION

Contact Malcolm Smith, citrus breeder, DAF Queensland, on (07) 4326 1100 or Malcolm.smith@daf.qld.gov.au



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GA on young trees boosts fruit set by 30%

By Stephen Cooke

Key points

GA used to stimulate young tree growth

GA prevents creasing

Pruning essential for good coverage

UTILISING the plant growth regulator gibberellic acid (GA) for fruit set has become a multimillion dollar business in South Africa.

Ian Garden is the technical manager for Sumitomo Chemicals in South Africa, the manufacturer of GA ProGibb, and a specialist in the use of plant growth regulators (PGRs).

ProGibb is used routinely by growers on newly planted trees in the first two years, together with monthly or sixweekly foliar feeds.

"Every grower sprays on every cultivar to increase production," he said.

Ian said 10ppm solution of ProGibb is used to provide extra stimulation in growth and additional canopy development to get trees producing more quickly.

lan said applying ProGibb sees growers obtain on average a 25-30% increase in crop on fruit set.

Fruit

"You will obviously get smaller fruit with that so we follow up with Corasil to get rid of small fruit, then have an even distribution of ideal fruit counts. You can also use a product in South Africa we call Maxum, in Australia it's called Stop Drop."

"We spray GA on all seedless cultivars as the seed is your source of gibberellic acid. There's a shortage of GA during flowering time, so we spray GA to top up hormone levels and maximise fruit set.

"We only spray GA on healthy trees, any tree under stress is not sprayed, because you're going to put a bigger crop on that tree, put it under more stress and produce fruit that will not colour up."

Timing of spraying

"Go in between 80 and 100% fruit drop because the GA must be sprayed onto the fruit. If you spray too early on flowers, all GA falls to ground with the petals. It is not translocated from the petals to the fruit. You have to wait until flowers open and you spray on the fruit.

"In split applications, especially with long protracted flowering seasons, we'll go in not just with a single spray, but two or three sprays. We'll also generally spray the warm side of the tree first, which flowers first, then close off nozzles of spray rig and just do one direction. Spray the warm side of the tree then come back a week or ten days



lan Garden.

later and spray the cool side when those flowers opened."

Coverage

"Coverage is most important. We come in with a pre-blossom 1% low-biuret urea or potassium nitrate to get a good spring flush around the inflorescence, because it's gibberellic acid, we need to lower the pH of the water to between 5-7 pH. Most guys here do 4-4.5pH which is also fine."

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Gibberellic acid is compatible with most insecticides sprayed during flowering time, and other nutrient sprays, but lan said never spray with copper.

At flowering time, South Africa has cool temperatures in September and beginning of October, so they don't like to spray in cool conditions under 12-13°C, because product stays on new leaves too long and can result in scorching. Spraying is not done above 28°C, especially when accompanied by wind, as it dries too quickly.

He advised pruning to get good spray penetration, especially varieties with a lot of internal fruit or dense foliage. "You need to get it into the middle of the tree to get decent fruit set."

Before timing of Stop Drop spray, crop size is assessed to prevent it being too big.

Creasing and rind quality

To overcome creasing (albedo breakdown), South African growers apply GA on seedless Valencias in January and Navels in January-February.

"It's very important to cover the entire fruit, using a high-volume high-pressure spray. Creasing is normally on the backside of fruit facing the stem, so the spray needs to penetrate the tree to hit the back of the fruit.

"We add a wetter or sticker otherwise product runs off fruit as it has an oily rind. We can bring the incidence of creasing down to 1-2%, where we often have high creasing levels of between 25-50%."

GA is used to increase rind quality and is applied at the same time as that to prevent creasing – the first two weeks of January but no later because Pro Gibb has a negative effect on colouring of fruit.

"In very hot areas, equivalent to that here on the Murray River, you'd spray Navel oranges in mid-December, when average fruit size is 35-40mm. By coming in two weeks earlier, we still control creasing but won't have a negative effect on colour.

"When we spray Corasil, it improves rind quality and colours up fruit quicker, so the combination of GA and Corasil complement each other and Corasil overcomes the colour problems you experience with GA."



Achieving better balance in the root zone

By Rosalea Ryan

Key points

Healthy soil promotes active root growth

Beneficial bacteria live in rhizosphere

AINTAINING healthy soil was becoming a priority among growers of perennial crops such as citrus as Australian farmers looked to maximise productivity, according to Bayer Crop Science business development manager Hugh Armstrong.

"A healthy soil could be defined as one which is friendly towards active root growth, with a balance between adequate chemistry — nutrients — and physical characteristics such as porosity and softness and active biological components such as organic matter and a balance of bacteria, fungi, protozoa and nematodes," Hugh said.

He said growers often asked how they could improve their crop via the soil by adding something which may benefit the system in both the short and the long term. Hugh said he recommended a specific Bayer product, Serenade Prime.

"Prime is a product based on the beneficial bacteria *Bacillus subtilis* strain QST713, specifically selected for its superior performance in cropping systems.

"In each container there is a guaranteed quantity of viable spores of QST713 as well as a complex mixture of the plant-supportive biochemical which the bacteria produces.

"These types of beneficial bacteria live on plant root surfaces and in the soil around the plant root system in a zone called the rhizosphere. In the rhizosphere, plants and bacteria can develop a mutually beneficial relationship under suitable conditions. When the interactions between the bacteria, the plants and the soil are balanced, both the plants and the bacterial populations in this zone function at a higher level as a result."

Hugh said having plants and beneficial bacteria functioning in harmony in the rhizosphere enabled resources required for growth — such as nutrients and water — to become more available through the mutually beneficial plantbacteria relationship.

"It is important to understand that it is only as a result of these interactions within the rhizosphere that the benefit to plants becomes available; the *Bacillus subtilis* organism does not directly provide improved plant growth, " he said.

Hugh said that in perennial crops such as citrus, Serenade Prime was designed to reinvigorate the soil-root-microbe interrelationships in the rhizosphere at critical times of plant and/or root growth.

"Initial trials in both lemons and mandarins in Queensland have shown positive improvements in packout and returns per hectare," he said.

"Bayer is in the early phases of assessing the best-use pattern in Australian citrus and looks forward to sharing further results."

MORE INFORMATION

Contact Hugh Armstrong, Bayer, on 0419 822 594 or hugh.armstrong@bayer. com







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Major expansion employs new technology for early production

By Stephen Cooke

Key points

Tress planted into black mulch

Spotted gums for windbreaks

Farm biosecurity a priority

BELAH Heights is trialling black plastic mulch for its citrus expansion, which involves planting all trees into plastic mulch covered mounds.

Belah Heights is a 500 hectare horticultural property with current plantings of 130ha in citrus, comprising new and established plantings grown for both the domestic and export markets, 50ha in wine grapes and about 30ha planted to watermelons during the summer months.

Current citrus plantings include the Navel varieties of Cara Cara, Navelina, Lane, Leng. and Washington; Afourer and Daisy mandarins, Arnold Blood and Seville oranges; Eureka and Lisbon lemons; and, Star Ruby Red grapefruit. New plantings in 2015 and 2016 included Afourer, Tango and Gold Nugget mandarin varieties and Arnold Blood oranges.

Belah Heights is now involved in a major citrus expansion, planting 30,000 trees (40ha) per year for five years, starting last year.

They want young trees to bear fruit as quickly as possible so are trialling black plastic mulch, which they have used successfully for their melon crops.

"The aim of the plastic mulch is to increases soil temperatures early and late in the season, which we believe will extend the growing period. It also helps retain moisture and stops weeds," John said.

A thicker plastic was used for their citrus trees, and a dripper is laid underneath the plastic.

"We haven't signed off on the black plastic, we're trialling it, but we're hopeful. It worked well for the watermelons." All trees on the farm are planted into mounds 600mm high and two metres wide. John said the farm comprises a mix of good and poor soil.

"We mound so we can ensure trees are planted into good soils and are well drained. The mounds also play a role in increasing soil temperature."

Early results show increased soil temperature, attributed to the mounds and black plastic, and more moisture held close to the soil surface.

Trees shown to delegates at the Citrus Tech Forum were planted two and half months earlier. Compared to one year old trees, more moisture had been held closer to the top, and feeder roots were found 30cm from the top. In a one year old tree, feeder roots were found at 60cm.

The trees are currently using less water than others without black mulch. The mulch was covered with kaolin clay to prevent the soil getting too hot. This will wear off over time and with rainfall.

The mulch layer lays mulch and drip line in one pass. Oats were grown on the mound during winter and were worked in



underneath the black plastic. Row space is 6 by 2.5 metres.

Sudex sorghum has been planted as a wind break and Belah Height recommends this as a key factor in growing young citrus, saying the windbreaks help reduce wind damage as well as producing a microclimate that aids in tree development. Sorghum is the best option for their operation.

"It helped these trees through those 47°C days and we'll leave it there as long as we can."

Wind breaks currently have one drip line but that will eventually be pulled across in a few years when the black plastic disintegrates, providing two drip lines for trees.

Fertigation

Belah Heights utilises proportional dosing through an advanced fertigation system, under the guidance of their Agronomist Shane Singh, AgriHort Solutions.

"Fertigation systems can be overly complicated, we have worked with Shane to try and make it as simple as possible," John said.

Their continuous fertigation system is used for their citrus, watermelon and grape crops.

"To do that, we had to get more inventive on how we set it up."

They have installed a five-tank system – one tank for each of nitrogen, phosphorus, potassium, calcium and magnesium. The two latter tanks also contain micronutrients – each one different to meet the nutritional requirements of the different crops.

There is a fertiliser mixing tank where the five mixes are prepared. This then goes to holding tanks where it is injected through the volumetric Venturi system, controlled by two NMC controllers.

It is fed into two main lines, one for older citrus and vines, the other for young citrus and watermelons.

Pruning

Field day delegates learned of the pruning technique applied on farm that John first saw in Spain.

"A lot of people have fruit set on tops of trees. We do something to help even the spread of fruit. After harvest, we hedge the tops of trees at a height of 2.5-3m.



of nitrogen, potassium, calcium, phosphorus and magnesium.



John Hederics discusses planting into black mulch with delegates.

"We then cut the centre out to increase light, which encouraged lower fruit set and lower shoot development.

"We haven't had to hedge the sides since, because the trees are growing in, not out."

Spotted gum windbreaks

Belah Heights are firm advocates of the benefits of windbreaks.

They have used spotted gums successfully as a windbreak with no intrusion into the citrus root zone. They have used casuarina trees in the past but found they pull too much water from the citrus trees.

"The rule of thumb, if trees are 25m high, they should be 50m apart. We're looking at 100m apart in our plantings and that seems to be effective." They also use grasses and sorghum to protect new plantings. They water the sorghum using T Tape for the life of the windbreak.

Lucerne has also been planted in rows and has grown well because of the wet season. It has proven effective in reducing heat.

Residual herbicides have not been used for the last couple of years.

Biosecurity

Biosecurity is a priority at Belah Heights. Belah Heights had a farm in the NT quarantined after their melon crop was infected with cucumber green mottle mosaic virus, so John knows first-hand the importance of on farm biosecurity.

As part of their biosecurity procedures, all vehicles that enter Belah Heights have their underbelly washed.

"It also gives everyone the message that we're serious about what happens on farm."



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Dean Morris on his Leeton farm



Higher packouts under nets

By Sophie Clayton

Key points

Nets for high value Afourers

Extra management required under nets

Varieties behave differently

N 2009, NSW citrus grower Dean Morris put up his first nets to cover a block of young Afourer mandarin, eight years later he has learnt a lot about managing trees under nets and is producing more high quality fruit as a result.

While not the first grower to net his citrus orchards, Dean was one of the forerunners. He grows Navel oranges and Afourer mandarins near Leeton, and it is the higher value Afourer that he has netted to reduce wind-rub and reduce seeds through bee exclusion.

The upside

There are many reported benefits for installing nets. Dean says the most important are wind, hail, bees and increased fruit size.

"One of the most important benefits of the nets is that they can decrease wind speed significantly and, in our case, reduce blemishes caused by branches rubbing against the fruit by up to 25%," Dean said.

"This also reduces our thinning costs because we don't have to thin out as much blemished fruit later in the season."

Hail is rare on Dean's block in Leeton but the nets do provide insurance against the one in ten year serious hail event that can wipe out a crop.

The nets are also effective at keeping the bees out to avoid cross pollination – critical for production of his premium seedless Afourer.

"In a good year our Class 1 packout was pushing 90% seedless under the nets versus 65% seedless outside of the nets," Dean said.

"Last year was 80% under versus 65% outside.

"The increased humidity also helps to increase fruit size and has increased our water-use efficiency – we're saving about 1.5 megalitres per hectare under the nets – meaning we can produce more fruit with less water.

"We are saving up to \$4000/ha on thinning blemish costs and are able to hold that 10 to 15 tonnes extra on the tree that would normally have to be removed."

Adjusting management under net

On the downside the increased humidity under the nets also creates a favourable microclimate for insect pests and for tree growth, which means pest damage and tree vigour can be a problem.

"Our Integrated Pest Management (IPM) had to be ramped up under the nets because the higher humidity and lack of wind creates a favourable environment for insect pests," Dean said.

"You have to be very vigilant at critical times because pest numbers can get out of control quickly if you don't act fast to control them. We had a disaster one year where we lost control of the insects and our packouts were terrible as a result."

As part of his IPM program, Dean also releases beneficial insects up to three times a year in his netted blocks, whereas outside of the nets he may do it once a year or not at all.

"Extra management is required in the netted blocks from flower through to fruit set, but if you are on top of that you are generally right," Dean said.

Part of that management includes pruning twice per year to open up the canopy to improve colour development and to reduce vigour.





Bird's eye view of Dean's trees under netting.

"It's harder to get colour under the nets if you don't prune properly," Dean said.

"The percentage of net shading varies from 12% to 22% under the nets. So it just means you have to keep control of vigour in the tree by pruning, and irrigation and nutrition management.

"When we keep the trees compact so they get lots of sunlight we don't have a problem with colour."

Cost benefits

The nets are part of Dean's plan to focus on producing more high quality premium Afourer seedless mandarins for the domestic and export markets, that are sold locally under the brand name Delite[®].

"We are positioning ourselves to be able to produce the highest percentage of Class 1 product that we can," Dean said.

In 2016, Dean explains that he had a similar packout in a netted and unnetted block of Afourer. However, in the unnetted block it cost \$3500/ha to thin 20% of the crop and he suffered a yield penalty of 5 to 10 tonnes. He adds that the increased pruning in the netted block is an additional cost of \$2.50 per tree, but by doing the extra pruning he has helped to avoid biennial bearing and cropped more fruit closer to the ground.

"Overall the gross margin difference between netted and unnetted can be between \$7500 and \$15,000/ha depending on the block," Dean said.

"Different varieties behave differently under the netting and to justify netting a crop it has to be a high value crop.

"If your packouts are already high and your block's not in a high wind area then you've got to really do the numbers to determine if it's better to net. If your block is next to a high pollination variety and you see a benefit for a seedless product then you should factor that into your cost benefit analysis."

MORE INFORMATION

Contact Dean Morris on deanmorris700@ bigpond.com





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Agrichemicals an evolving challenge

By David Daniels

Key points

Vigilance needed on MRLs

Hard to encourage R&D investment

Permit renewals a priority

GRICHEMICALS are a major area of work for the Australian citrus industry. As exports have grown, so too has the risk of MRL violations. MRLs are constantly changing and so are the pests we have and the products we use to control them.

Moving away from broad spectrum products, pests that haven't previously been a problem can start to re-emerge as issues.

Pests like citrus gall wasp have expanded their distribution and present serious threats in new areas.

As agrichemicals are placed under scrutiny and even removed from sale, it is imperative that we keep looking for new options. But gaining access to some new chemistry can be difficult.

Australia is a small market and it is difficult to convince the chemical companies to invest in R&D and seek approvals here in Australia. The other challenge is that while we may obtain approvals in Australia, importing counties may be years behind in setting MRLs.

To gain access to new chemistry, we need to demonstrate responsible agrichemical

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usage. The industry has invested in a program to monitor importing country MRLs, communicate advice to industry and testing residues on exported fruit.

The program is funded by Horticulture Innovation Australia (Hort Innovation) using the citrus R&D levy and funds from the Australian Government. In 2011, the Australian Citrus Pesticide Residue Monitoring Program was established, too. Also funded by Hort Innovation using the citrus R&D levy and contributions from the Australian Government. With Citrus Australia as the delivery partner, the program screens for around 200 different agrichemicals and approximately 450 samples are submitted each season.

Having Australian government involvement adds weight to negotiations if issues arise in overseas markets.

The program also allows Citrus Australia to better understand use patterns across the industry and which particular products are critical. By looking at the data from the last five seasons we have been able to determine where our priorities lie.

The Queensland sector is heavily dependent upon dithiocarbomates for disease control. We had a major success this season in having the MRL changed from 0.2-7mg/kg. While this is welcome news, we need to continue to look for alternatives as all the dithiocarbamates come under increased scrutiny.

The emergency use permit for Rovril (iprodione) expires in September 2017 and we certainly have a bit of work to do to renew that permit. The industry



was also granted a permit for Captan in October 2016 which is valid until 2022.

We also reached full product registration for Amistar (azoxystrobin) in late 2014. We are currently collecting data to register another two fungicides, fluopyram and fluxapyroxad.

We see some major threats on the horizon. The industry is heavily reliant upon chlorpyriphos, a product that is under a high level of regulatory scrutiny, particularly in the USA.

While it appears that the decision in the USA has now been stalled, the Australian regulator (APVMA) also has chlorpyriphos in its sights. Methomyl is another product in the spotlight. Citrus Australia has commenced work on defending these important products and exploring alternatives.

We achieved two emergency use permits for clothianidin (Samurai[®]) late last year and are working with Sumitomo to achieve a label claim in 2017-18.

The industry is also working with the chemical companies to obtain funding through the Australian government to expedite a number of new product registrations through the AgVet collaboratives forum.

MORE INFORMATION

Contact David Daniels, Citrus Australia, on 0402 270 554 or david.daniels@ citrusaustralia.com.au

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Growers can add new insecticide to their arsenal



Key points

Exirel insecticide launched

Targets thrips, apple moth

Trials against current sprays

CITRUS growers will have a new mode of action chemistry targeting a range of chewing and rasping pests to consider when DuPont[™] releases Exirel[®] insecticide next season.

Exirel[®] was announced by the Gold sponsors of the Citrus Technical Forum and Field Days, DuPont and is a brand new insecticide for the industry.

DuPont Crop Protection Product Development Manager, Geoff Cornwell, said the insecticide was able to be used at different times of the season to control a range of pests.

"The active ingredient is Cyantraniliprole," Mr Cornwell said.

"It targets Kelly citrus thrips and Lightbrown apple moth. The idea with the spray is to control the thrips before they cause damage to the calyx of the fruit. If there is any scarring there, that damage gets accentuated as the fruit grows and has an impact on quality and pack out rates."

He said trials were conducted last season comparing one and two spray regimes with Exirel[®] to a two spray regime of Delegates received test results at the Belah Heights field day.

current commercial standards with the results released at the Forum.

"In those trials we've quite clearly demonstrated control of the thrips insects and improved fruit protection by using the Exirel[®] treatment," Mr Cornwell said.

"The Exirel[®] has performed, equal to or better than the commercial standards in the trials."

He said work conducted by DuPont global scientist showed that thrips rapidly stopped feeding when exposed to the Cyantraniliprole active ingredient.

"Their normal bodily functions are affected within hours. They eventually starve to death because they can't feed properly. Exirel[®] stops pests feeding very quickly providing almost immediate crop protection."

Exirel[®] may also be an option in a control program to assist in the management of Fuller's Rose Weevil. Exirel[®] is effective against Fullers Rose Weevil however a use pattern is still being developed to ensure treated produce will meet import country residue and phytosanitary requirements.

"We see it as another tool in the toolbox for growers," Mr Cornwell said.

"The growers will still have to be skirting their trees, controlling weeds under the trees and doing all those cultural practices to help manage Fuller's Rose Weevil but if we can demonstrate that Exirel® is a good substitute for either one or two trunk band sprays, I think that would be guite attractive."

He said some of the chemistry used to trunk band spray was disruptive to Integrated Pest Management (IPM) programs and there were possible issues associated with occupational health and safety.

"A citrus orchard is actually an ideal environment to practise IPM and that has been demonstrated by researchers in the industry over many years. Unfortunately when that system is disrupted by broad spectrum chemistry then IPM can fall apart.

He said Exirel[®] was a good fit in IPM programs because of its selectivity on key beneficial insects and also has favourable mammalian toxicity.

Translaminar activity and local translocation in plant material aids spray coverage and control of pests in hidden feeding sites and also improves rainfastness for more effective control.

"I think the key thing about Exirel[®] is to have the correct spray timing on the pest, at the specific developmental stage of the crop to maximise that crop protection effect," Mr Cornwell said.

Exirel[®] is currently under evaluation by the APVMA with full registration expected prior to the 2017-18 citrus season.

A demonstration at the Citrus Technical Forum & Field Day of undamaged fruit (left) versus damaged fruit (right) after the Exirel insecticide application.







Mohsen Sales.

Post-harvest R&D critical for population growth

By Stephen Cooke

Key points

Post-harvest losses could rise 18%

Sour rot trials conducted

Sanitation method critical

EEDING an expected world population of 10.5 billion people in 2050 will be difficult to achieve without improvements in postharvest technology, according to Decco Technical Service Manager, Mohsen Sales.

Mohsen, who helped commercialise new post-harvest chemicals in the USA, said food supply would need to increase by 60% to feed the additional population.

Mohsen noted that only 5% of money spent on R&D in the last 30 years has focussed on cures for post-harvest losses, despite WTO figures showing 45% of fruit is lost to post-harvest and processing and distribution.

"If there are no advances in postharvest, losses could increase by 18%. Good post-harvest control would cost you \$9 a tonne, so there are significant savings."

Sour rot is a significant problem for lemons and easy peelers in the US. There are limited chemical control options in Australia with many packers using a combination of fungicide and sanitisers and/or generally regarded as safe compounds (GRAS).

Testing was performed with Syngenta's 'Mentor' that has the active propiconazole which is not yet approved in Australia.

They found the best treatment for sour rot was a mix of 4000ppm Mentor and 1000ppm of Graduate A+ (actives azoxystrobin, fludioxonil) mixed in storage wax (not pack out wax) or 1000ppm of Mentor and 1000ppm of Graduate A+ applied with a drench.

Testing also showed Graduate A+ has excellent control of green mould.

Mohsen said the most effective way to combat fungicide resistance was to alternate fungicides with different classes of fungicides, but each class should be limited to one application per fruit lot.

"Although the use of fungicide pre-mixtures can be a step in the right direction, unless both mixture components have activity against a particular pathogen, they will act like single-fungicides in the selection process.

"Each class of fungicide should only be used once on fruit — if you drench fruit in the orchard, then bring it to the packing house, don't use the same class of fungicide again."

Mohsen strongly emphasised the importance of sanitation in managing resistance.

"It is very important to sanitise the packing house at the end of every day. Combining fungicide with sodium bicarbonate enhances performance.

Testing was performed on several room sanitisers available in the US, and although some performed better than others, Mohsen said the most important factor was ensuring thorough application throughout the shed.

He recommended a thorough wipe out treatment, a fast acting chemistry with high levels of chlorine dioxide (CIO_2), followed by slow release maintenance program, with low doses of CIO_2 over 90 days.

Potassium phosphite and natamycin are bio-fungicides now being used in post-harvest management.

Potassium phosphite is used for brown rot (phytophthora) control while natamycin works well against green mould and sour rot when mixed with registered products, according to Mohsen.

"None of the soft fungicides can stop rot occurring like conventional fungicides."

"Success of product depends on maturity of fruit. Start of season, strong fruit, very effective. But at end of season, it lacks performance," he said.

MORE INFORMATION

Contact Mohsen Sales, Decco, on Mohsen. sales@uniphos.com





Attention to detail critical to beat moulds

By Rosalea Ryan

Key points

Mould spore loads rise through season

Not enough fungicide leads to resistance

Two new products available

STRIKING the delicate balance between using too little and too much is imperative where postharvest fungicides are concerned.

That message was emphasised by E.E. Muir & Sons' post-harvest consultant Craig Wooldridge, based at Renmark, South Australia.

Craig shared results from a series of industry-led surveys, conducted by South Australian Research and Development Institute's (SARDI) Peter Taverner and supported by E.E. Muir & Sons, that tracked fungicide resistance in five large packing sheds and coolrooms in the Riverland and Sunraysia regions. The project found that mould spore loads and resistance generally rose throughout the season.

Craig said excessive use of fungicides could breach maximum residue limits in export destinations such as Japan (where not only the government but also individual retailers set specific requirements).

Applying too little, on the other hand, resulted in poor control and contributed to allowing fungicide-resistant pathogens



to evolve, he said. Populations were not killed outright so surviving organisms were able to develop increasing levels of tolerance in each generation.

Speaking after the forum, E.E. Muir & Sons' national post-harvest product manager, Lee Duffy, said inadequate fungicide application and substandard hygiene and sanitation could be caused by many factors.

"It might be that packers are not seeing evidence of a mould problem, or they're looking to reduce costs by minimising their inputs so they're actually not using enough of the product. Perhaps they don't need an extended period of control, or they just don't implement the correct practices, procedures and rates, or the temperature of the fruit or the drench isn't where it needs to be, or there's an error in the pH of the drench solution — possibly caused by other treatments — or in the contact time. Phil Rogers, Craig Wooldridge, Danny Thornton and Lee Duffy from E.E. Muir & Sons.

The different types of product all have different formulations."

He recommended two relatively new products, Scholar and Philabuster, as ideal alternatives to long-established favourites.

In summing up, Lee said:

- Sanitation and hygiene were crucial, not only in pack sheds but at every step along the chain – for packers this meant both cleaning down and sanitising daily (with particular emphasis pack lines and coolrooms)
- Product efficacy relied on correct techniques and rates being used
- Fungicides must be rotated (ideally with a change in routine for between two and four weeks during part of the season) rather than used continually.

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Graeme's lasting legacy



GRAEME Sanderson has been described as "the source of all knowledge". Graeme is a humble man so would be embarrassed by the term, but his influence within the citrus industry is profound.

Graeme is retiring from his position at the Dareton Agriculture Institute and was recognised for his contribution to the citrus industry by Citrus Australia chair Tania Chapman at the Tech Forum and Field Day dinner.

He began work at Dareton in 1988 as a horticultural extension officer working on citrus, grape vines and alternative crops.

Graeme Sanderson with Citrus Australia Chair Tania Chapman.

In 1994 he began a horticultural research officer position specialising in viticultural soil and water management. This role expanded in 1996 to include the horticultural evaluation of new citrus variety introductions to Australia.

He currently leads the 'National evaluation of new citrus varieties' project. He leads a team undertaking the independent horticultural evaluation of the majority of new citrus introductions to Australia. NSW DPI Director of Horticulture, Dr Shane Hetherington, has worked with Graeme for 15 years.

"He is the source of all knowledge," Shane said.

"Germplasm is his research area but he a has a rounded knowledge of all things citrus and is always keen to share that knowledge."

Shane said Graeme's involvement in releasing high performance germplasm has been integral to the progression of the industry.

"Graeme has overseen the incredible resource that is the germplasm gene bank at Dareton.

"He took stewardship of that over the course of his career and fostered it, creating an incredible resource both now and for the future.

"He played an integral role in ensuring its relevance to industry.

"That resource allows industry to adapt to different conditions or grow for different markets. We can tailor what we have. For example, if we need to grow sweeter, smooth-skinned fruit, they're available at Dareton.

"That's his legacy."



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Farm biosecurity critical to protect markets

By Stuart Pettigrew

Key points

Nth Australian pest survey in May

Farm biosecurity critical

Biosecurity manual for growers

T is amazing to see the prices being received for Valencia crops – reports of prices over \$800 per tonne have been doing the rounds.

But when we dig a little deeper as the reasons for this, it is not so comforting. The drought in South Africa is something most of us can relate to. But the other major reason for these improved market conditions is the complete disaster that continues to unfold in Florida and Brazil.

These major production regions have been ravaged by Huanglongbing (HLB), killing thousands of trees and taking thousands of jobs. The current season in Brazil (which supplies 80% of the world juice market) is the smallest in 28 years and the reserve juice stocks are the lowest since records began in 2000. The story is no different in Florida with the lowest crop in 56 years.

Australia remains the lucky country when it comes to serious citrus pests, thanks

to a strong biosecurity system. But if for some reason this system fails us, it is absolutely critical that we find these pests quickly – before they find our major production regions.

This is the reason the industry has been focussed so heavily on surveillance, particularly in the north of the country and in regions outside of the major production zones.

And I can say that, despite some serious looking, so far, so good. Nothing of note has been found!

We are currently planning the third in the series of northern Australia surveys — this time around the Darwin and Katherine region. This is likely to take place in May, and like earlier surveys in the Ord River and Atherton regions, this is being done with the support of the Northern Australian Quarantine Strategy — a part of the Department of Agriculture and Water Resources.

But what about at the farm level? There are two things you need to do as a grower to contribute to the overall biosecurity system.

Firstly, ensure you have good on farm biosecurity. The Biosecurity Manual for Citrus Producers (available on the Citrus



Stuart Pettigrew disinfecting his boots before searching for pests.

Australia website) has six key actions you can take to help protect your farm and your industry.

Secondly, as part of the biosecurity project, we have linked with the pest scouts that many growers engage for crop monitoring. As part of this, we are ensuring their knowledge of exotic pests is up to date, and in return, gathering some data on farm monitoring. We aim to collect as much of this data as possible to show evidence of absence of key exotic pests, but also build our understanding of just how much data is being collected and what value this has for industry.

MORE INFORMATION

Contact Stuart Pettigrew on 0429 936 812 or stuart@agdynamics.com.au

The project Protecting Australia's citrus industry from biosecurity threats (CTI2022) has been funded by Horticulture Innovation Australia Limited using the citrus R&D levy and funds from the Australian Government.



SHAPING THE FUTURE OF AGRICULTURE WITH SMART IRRIGATION SOLUTIONS



The dangers of using untested budwood

By Nerida Donovan

Key points

Budwood must be tested New project to improve detection methods

OW do you control something that you cannot see?

It may look like a perfectly healthy bud stick, but dangers could lurk within. The stick could contain tiny disease causing particles — you may see signs of disease in the grafted nursery tree or symptoms may take years to develop in the field. These graft-transmissible diseases have no cure — the only option is to replant and start again.

Many graft-transmissible diseases can cause stunting, yield loss and even death in some scion and rootstock combinations, yet other varieties may be symptomless carriers.

The only way to be sure of what's in your budwood and rootstock seed is to get it from a tested source, as supplied by Auscitrus. Graft-transmissible diseases are spread through infected propagation material and via sap on cutting tools. The Auscitrus source trees are managed using strict biosecurity protocols and are routinely tested for a range of grafttransmissible diseases.

Detecting these diseases can be difficult because the disease particles may be present at low levels and the particles may not be spread evenly through the



tree. The NSW DPI citrus pathology team is working on an industry project, funded by Horticulture Innovation Australia using the citrus R&D levy and contributions from the Australian Government, that's developing improved detection methods for graft-transmissible diseases. If something is there, we want to find it.

Prevention is important for the management of grafttransmissible diseases that we have in Australia and those which we are trying to keep out.

If the systems and culture are already in place prior to entry of a new disease, this increases our chance of eradication and reduces the impact and cost of the incursion.

In recent years we have seen international citrus industries devastated by huanglongbing — the biggest threat to Australian citrus. Recently diseases caused by Xylella have also hit the Nerida Donovan with Citrus Australia board member Ben Cant at the 2017 Citrus Technical Forum and Field Day.

global spotlight, with the Australian government raising biosecurity protocols to reduce the likelihood of entry.

But the Xylella which causes Citrus Variegated Chlorosis has always been on our radar — it is a citrus 'High Priority Pest' and post-entry protocols were already in place prior to the recent government action.

So next time you buy nursery trees, ask where the budwood and rootstock seed came from. Planting untested trees is not worth the risk.

MORE INFORMATION

Contact Nerida Donovan, Citrus Pathologist, NSW DPI, on (02) 4640 6232 or nerida.donovan@dpi.nsw.gov.au

This project is funded by citrus grower levies managed by Horticulture Innovation Australia.

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Past performance is not an indication of future performance





Higher densities could boost fruit yields

By Rosalea Ryan

Key points

High density plantings could benefit citrus

High density is 1000 trees/ha

Would benefit robotic picking

GROWERS who plant fruit trees intensively must be prepared to manage those trees intensively, too, if they are to maximise output from their orchards, participants in the technical forum's *New technologies for future plantings* workshop heard.

Queensland Department of Agriculture and Fisheries (DAF) senior horticulturist Helen Hofman shared that advice as part of her presentation on research into high-density planting of three tropical and subtropical tree crops: avocados, mangoes and macadamias.

Helen told attendees that findings from the *Small Tree* – *High Productivity* Initiative could have application in citrus, which as an industry was already embracing the idea of planting more densely.

The ambitious initiative aims to transform the productivity of the tree crops being studied, but it is acknowledged that it may take 20 years to optimise 'small tree' systems for all three.

The initiative started with a small initial DAF royalty-funded research project,

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Fax

and continues to be led by DAF in its bigger form today. The current project is funded by Horticulture Innovation Australia using the across-industry levy, with co-investment from DAF, the Queensland Alliance for Agriculture and Food Innovation, and the NSW Department of Primary Industries, plus funds from the Australian Government.

She said while citrus was already performing relatively strongly in the tropics and subtropics, the three crops involved in the project were currently "underproductive", with scope for improvement. "Mangoes, macadamias and avocados are all quite low in productivity," she said.

Helen said the research aimed to test four methods that had been used effectively in pome and stone fruit:

- · Managing tree vigour
- Optimising the amount of light reaching trees
- Manipulating tree architecture to create a traditional 'Christmas-tree shape'
- Maximising crop load by thinning manually and/or using plant growth regulators

The average tree planting in Australia is 420 trees/ha.

"We classify that as medium density.

"For our purposes, high density is at least 1000 trees/ha. That's spacings of 2-2.5m in rows that are 4m apart."

Helen said the results of past higher densities in citrus had varied but often yields had peaked early before plateauing at the level of low-density plantings at the 7-10-year point.

"However, unlike our new initiative, most earlier trials did not attempt to actively manage vigour or optimise light interception and were planted on vigorous rootstocks."

Helen said a driver for high-density planting was current research on developing robotic picking, which was most efficient when the machinery was presented with a solid 'fruit wall' of the type created by high-density planting. Other drivers included a shift towards shorter tree life through more rapid turnover of varieties as well as the increasing costs of land, water and labour.







Emerging leader Hugh Tully wins scholarship



RONBARK Citrus operations manager, Hugh Tully, received the inaugural emerging leaders scholarship at the 2017 Citrus Technical Forum and Field Day.

The scholarship, valued at approximately \$10,000, was sponsored by J-Tech Systems, a leading supplier of machinery, packaging and labelling solutions to the Australian fresh produce industry.

J-Tech Systems CEO Cameron McInness, Hugh Tully and Citrus Australia CEO Judith Damiani.

The scholarship includes an intensive three-day course, as well as a global experience — international flights from Sydney, accommodation and entry to the PMA Fresh Summit in the USA.

Hugh has been involved in the citrus industry for three and a half years and has recently purchased a block with his wife, Alicia. Previously working in recruitment, Hugh said he had been on a "steep learning curve".

Hugh said the format of the scholarship would enable him to step back and look at the big picture, and help hone his business acumen.

J-Tech Systems General Manager Cameron McInness said his company sponsored the scholarship to encourage young people in citrus to further develop their skills and knowledge.

"The three-day fully residential format comprises a mix of experiential learning activities, a business simulation, case studies and the application of learning through team presentations to PMA executives.

"These action learning methods will continually link back to the participants' real world issues and situations identified in pre-program goal setting discussions between each participant, their manager and the Program Director."

The candidates were judged by Cameron and Citrus Australia CEO Judith Damiani.

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Knowledge grows

Australian Citrus News Autumn 2017





Barkley rootstock available for mandarin

growers

Key points

New mandarin rootstock

Named after pioneer Patricia Barkley

AusCitrus to distribute

MANDARIN growers can now take advantage of a new rootstock launched in Queensland earlier this month.

An official ceremony was held at Russel and Lisa Baker's Gayndah property to launch the variety, Barkley.

The plant was named after Patricia Barkley, a retired citrus pathologist who was instrumental in bringing new genetic material (rootstocks), including this particular rootstock, to Australia.

Queensland Department of Agriculture and Fisheries (QDAF) citrus breeder,

Malcolm Smith, said the Barkley rootstock showed solid performance over the past 10 years of production in an Imperial mandarin rootstock experiment planted at Gayndah in 2004.

"It was one of 33 different rootstocks tested in this experiment and will now be established by AusCitrus for distribution to Australian growers," Mr Smith said.

"The field day was the first opportunity for growers to see mature trees on these different rootstocks, and consider their suitability for commercial use ahead of anticipated seed availability in a few years' time."

The field day was a joint collaboration between the Queensland Citrus Improvement Scheme, Citrus Australia and QDAF.



Malcolm Smith and Patricia Barkley.

Mr Smith spoke on rootstocks, including Barkley, at the Citrus Technical Forum and Field Day.

He said there was a lot going for the new variety.

"We think it's got some quite good promise, mainly in terms of orchard longevity but also the fruit quality's been good, the timing has been good and in low production it has been good," he said.

MORE INFORMATION

Contact Malcolm Smith, citrus breeder, DAF Queensland, on (07) 4326 1100 or Malcolm.smith@daf.qld.gov.au



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The essentials of degreening

By John Golding

DEGREENING is the process of removing the green colour (chlorophyll) from the skin of fruit after harvest using ethylene gas treatment. Only mature fruit are suitable for degreening.

It is absolutely critical that immature fruit are not harvested and degreened. Immature fruit will have very high acid levels and low sugar levels and will not meet the Australian Citrus Standard (ACS).

Immature dark green fruit will not successfully degreen. Ethylene treatment only helps with the breakdown of the green colour in the skin. Ethylene does not ripen the fruit, the levels of sugars and acids are not affected by degreening. Therefore when degreening, it is critical to selectively pick mature fruit based on colour.

Colour development of the skin in the orchard is promoted by cool overnight temperatures (<15°C).

In the majority of citrus growing regions with a Mediterranean type climate (such as Riverina, Sunraysia, Riverland), cooler temperatures in late autumn promote good colour development. However, in the warmer subtropical and tropical growing regions (such as Queensland) these cooler temperatures may not occur until much later, well after the early varieties are internally mature. Therefore it is common practice to use ethylene gas to degreen early season fruit in Queensland, such as Imperial mandarins.

Pre-degreening fungicide is recommended to prevent any postharvest decay. The degreening process provides the ideal growing conditions (high temperature, high humidity) for postharvest diseases. Postharvest fungicide dips are recommended to control postharvest diseases.

However, it is important not to degreen totally wet fruit immediately following fungicide treatment, but degreen the fruit after the fungicide has well drained and allowed to dry. The success of degreening can vary with variety, the initial colour of the fruit, concentration of ethylene used and the duration of exposure to ethylene.

MORE INFORMATION

Contact John Colding on (02) 4348 1926 or john.golding@nsw. dpi.gov.au

Information for this article was sourced from the Australian Mandarin Production Manual, due for release in mid-2017. The manual's production is part of the upcoming Australian Citrus Postharvest Science Program (CTI5010), which is funded by Horticulture Innovation Australia using the citrus R&D levy, with co-investment from the NSW Department of Primary Industries and funds from the Australian Government.

Best practice tips for degreening

Whilst many growers and packers have been degreening their fruit for many years, this is a timely reminder of the best practice tips for degreening.

- Fruit should have some colour development and not be totally green
- Fruit should be colour sorted when picking
- Fruit should be internally mature and unblemished
- Harvest fruit carefully as any rind damage will be exacerbated by the degreening process
- Treat fruit with a postharvest fungicide prior to degreening
- The success of degreening can vary with different varieties and the initial fruit colour. Consider trialling small quantities of fruit to determine ethylene sensitivity rates and duration.
- Good air circulation in the degreening room is critical – ensure air moves through the fruit load, not around it
- An efficient ventilation system is critical to extract the carbon dioxide (CO₂) generated by the fruit during degreening
- Do not wax fruit prior to degreening as this

will inhibit full colour development

- The greener the fruit the longer the degreening process. The longer fruit are exposed to ethylene the shorter the shelf life
- Fruit treated with a late gibberellic acid (GA) spray will take longer to degreen or may not fully colour
- Fruit treated with an oil spray shortly before harvest (within 2-4 weeks) may not achieve full colour
- High ethylene concentrations cause the fruit calyx (button) to dry out and turn brown. Fruit can be dipped in the synthetic auxin 2,4-D to help keep buttons green, but 2,4-D can also delay the degreening process
- High rates of ethylene, long treatment times and high temperatures can induce the development of the postharvest disease, anthracnose, also known as 'degreening burn'

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New brown spot treatments under spotlight



Key points

Testing Emperor brown spot fungicide treatments

Growers may need to spray more often

Qld growers active trial participants

HROWING open their gates to research teams is par for the course for citrus growers in the Wide Bay-Burnett region of southern Queensland.

Allen and Susan Jenkin of Ironbark Citrus at Mundubbera, about 400km north-west of Brisbane, are among those making parts of their orchards available for use in on-farm trials. The family-owned operation grows, packs, markets and exports Fremont, Sunburst, Nova, Low-seed Murcott and Honey Murcott mandarins — more than 3000 tonnes of fresh fruit annually. In addition, Ironbark is Australia's sole supplier of the exclusive variety Royal Honey Murcott, which was developed by the Jenkins and is usually harvested in June. Ironbark produces more than 540t of Royal Honey Murcotts every year.

Calamondin and Nagami cumquats are a secondary line, yielding about 500 and 750 five-kilogram cartons a year, respectively.

Ironbark is one of the state's biggest exporters of citrus to Southeast Asia, Europe and the Middle East and its leading source of boutique mandarins under the Ironbark and Bluegum labels.

Together, the Jenkins' two properties – Rosewood and Roselea – support about 140 hectares of citrus trees.

Peak production occurs between March and September, with all fruit being treated and forced-air-cooled on farm in a 100-pallet coldroom complex to ensure maximum freshness throughout an extended shelf-life.

New treatment efficacy

The Jenkins' recent trial – known officially as project CT13020 – was led by plant pathologist Dr Andrew Miles, a senior research fellow at The University of Queensland's Centre for Plant Science and Queensland Alliance for Agriculture and Food Innovation. It focused on testing the efficacy of new fungicide treatments against Emperor brown spot, a disease caused by a specific strain of the fungus Alternaria alternata first observed in Emperor mandarins in the 1960s.

For the past 30 years it has been widespread in the Murcott orchards of the Central Burnett region, where the Jenkins farm.

Emperor brown spot produces surface blemishes and in extreme examples attacks the shoots of vigorously growing young trees and leads to fruit fall.

It is not carried by the fruit itself so does not affect either domestic distribution or export.

In the Jenkins' case, participation in Dr Miles' trial yielded less information

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than expected purely as a result of unpredictable climatic conditions.

"This particular disease is very much driven by mild temperatures – 20-25°C – and prolonged periods of leaf wetness: a few days of drizzly rain when things never dry out, or fog," Andrew said.

"In the 2015-16 season we had a very, very dry autumn-winter period. It made for great production — I don't think anyone had a bad year with Emperor brown spot; that was a bonus for the industry — but for us with this fungicide trial it was bitter-sweet.

"The years when we get our best trial results are actually the high-pressure years when much of the industry's struggling to control things."

Andrew said the trial did return results on a secondary level, however.

The absence of background disease in the 2015-16 season allowed the researcher to assess residual efficacy of fungicides as protection in the field. "The classic assumption is that growers should spray monthly but it's actually much shorter than that," he said. "This has shown that the products are in their prime for only about a week and then they start to decline very quickly in how effective they are."

Grower-researcher partnership

Allen said Andrew runs the trial.

"What we do is provide the trees – up to about 80 – and be careful that we don't spray them as part of our normal management practices. Andrew identifies and marks the trees off and we comply with his requests.

"We manage the compliance. If there's a new unregistered chemical, for example, we need to be mindful of how the fruit is disposed of during each trial period.

"As part of his research Andrew comes in and collects that fruit and inspects it all by hand.

"We also take care not to spray the trial trees — that's just a matter of making sure the spray operators know where the trial area is. Andrew has them all well marked out."

Allen said they became involved in the fungicide-trial project through the entomologists who work with them.

"They might know a block that's having a particular problem and they recommend that block to a researcher, who will then come to speak to the landholder.

"Around our district most of the growers have at various times participated and collaborated in research projects with either private researchers like Andrew or work on behalf of the government with the Department of Primary Industries. It's not an uncommon thing to be doing this."

MORE INFORMATION

Contact Andrew Miles on 0412 287 877 or rdpi@tpg.com.au

This project has been funded by Horticulture Innovation Australia using the research and development citrus industry levy and funds from the Australian Covernment.







Compiled by Stefan Worsley Juice Market

Growers benefit from Valencia demand

The forecast of a 30% reduction in Valencia output for the 2016-17 crop was realised and juice processors have been struggling to compete with the fresh fruit market for supplies as a result.

Demand for fresh Valencia fruit from Asia has reportedly been unprecedented, which has exacerbated the dearth and pushed prices higher. Growing regions such as South Africa have been unable to supply the Asian market with the usual volumes and the crop in Brazil was also short. This has meant that the cheapest option for Asian importers is Australia.

While Australian juice producers secure a certain percentage of the fruit needed with long-term forward contracts, they still need to access fruit from the cash market as the season progresses.

Contract prices for Valencia fruit for industrial purposes have been stable for a number of years between AUD250-300/tonne and the spot market typically does not deviate from this price spread too much.

This season, however, Valencia fruit prices on the spot market have skyrocketed to AUD350-700/tonne — a level that the processors say they have been forced to pay due to the commitments they have already made with juice packers, bottlers and end users.

Outlook

Given the current shortage of Valencia, it is likely that the industry will run higher volumes of Navel fruit to juice this year, Navels can be part-blended with Valencia for NFC and can also be processed into orange juice concentrate.

Bundy juice in Queensland have been asking for community to keep buying Australian juice — even if it is more expensive — to support businesses such as themselves during this nationwide shortage of Valencia.

Other companies say that importing juice or fruit is not option, because the labeling says their product is made from Australian oranges and bottled within 72 hours of being crushed.

They are working hard with the suppliers so that they do not have to change formulations. In order to do this, it is likely that prices on the supermarket shelves will climb higher.



Production report

The proportion of fresh orange production used for domestic juice in Australia is forecast to decline in 2016-17 to 70,000 tonnes, according to the USDA (see Table 1).

In 2015-16 the total volume of oranges used for processing was 77,000 tonnes, compared with 115,000 tonnes the previous year.

Fewer oranges are being processed into juice because of falling demand for juice, lower returns for growers and the switch away from Valencia varieties towards fresh Navel orange production for export.

Overseas

Reduced crop in Florida, Brazil

The USDA has lowered its forecast on Florida's 2016-17 orange crop by 1 million boxes to 70 million boxes. If realised, this will be 14% lower than last season's final production.

The frozen concentrated orange juice (FCOJ) futures market has stayed relatively range-bound between USD1.60-1.80/Ib over the past month.

TABLE 2 Australia juice, nectars and still drinks – 2010-16F and YoY percentage growth

| | Category | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016F |
|-----------------|--------------|-------|-------|-------|-------|-------|-------|-------|
| PP Growth (%) | Juice | | -1.18 | -5.44 | -6.32 | -8.30 | -7.66 | -6.53 |
| PP Growth (%) | Nectars | | -1.56 | -2.48 | -3.28 | -3.79 | -2.53 | -3.32 |
| PP Growth (%) | Still drinks | | 15.61 | 14.23 | 0.32 | 2.55 | 1.24 | 1.84 |
| Volume M Litres | Juice | 450.3 | 445 | 420.8 | 394.2 | 361.5 | 333.8 | 312 |
| Volume M Litres | Nectars | 269.8 | 265.6 | 259.0 | 250.5 | 241 | 234.9 | 227.1 |
| Volume M Litres | Still drinks | 23.7 | 27.4 | 31.3 | 31.4 | 32.2 | 32.6 | 33.2 |

Source: GlobalData Wisdom

This follows an extremely volatile market over the past four months.

Over in Brazil, the 2016-17 crop wound up in January with production pegged at 244 million boxes.

A new report from CitrusBR suggests that carry-over stocks on 30 June 2017 will amount to just 70,000 tonnes.

This low level of carry-over in Brazil is reportedly unprecedented. Given that the processors will need these supplies for blending early on in the season, there could be a period around a month before the crop begins when there is no juice available on the global market.

TABLE 1 Australia – Orange juice production, supply and demand statistics

| Tonnes | 2014/15 | 2015/16 | 2016/17 |
|-------------------------|---------|---------|---------|
| Delivered to processors | 115,000 | 77,000 | 70,000 |
| Beginning stocks | 614 | 614 | 614 |
| Production | 9500 | 8100 | 8100 |
| Imports | 31,500 | 32,200 | 31,500 |
| Total supply | 41,614 | 40,914 | 40,214 |
| Exports | 1000 | 800 | 600 |
| Domestic consumption | 40,000 | 39,500 | 39,000 |
| Ending stocks | 614 | 614 | 614 |
| Total distribution | 41,614 | 40,914 | 40,214 |

Source: USDA

The weather has been favourable for the 2017-18 crop in Brazil. In January the USDA forecast the forthcoming crop in Brazil at 340 million boxes.

In spite of the bumper crop, analysts suggest that the extremely low carry over will mean that the supply from the 2017/18 crop will only just meet global uptake assuming consumption remains the same.

Retail sales strong this year

Industry sources say that the juice retail market has been strong over the past few months and that consumers are buying a wide range of orange juice products.

Consumption of orange juice in Australia has fallen over the last decade from 49,000 tonnes in 2005-06 to 41,000 tonnes in 2012-13 with a further fall to 39,000 tonnes forecast by the USDA for 2016-17.

Per capita annual consumption of citrus fruit juice overall has declined over the last five years due to competition with other beverages such as iced tea and sports drinks, as well as a move away from drinks with a sugar content (see Table 2).

MORE INFORMATION

This project has been funded by Horticulture Innovation Australia using the research and development citrus levy and funds from the Australian Covernment.



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DAY 1 - WEDNESDAY 6 MARCH 2019 - HALL M Time Start **Time End** 1. How industry can maintain the momentum 8.30am 8.35am Welcome Ben Cant. Citrus Australia Premier of South Australia, 8.35am 8.45am Official opening Hon Steven Marshall Nathan Hancock, Citrus Australia 8.45am 9.10am Maintaining the momentum after a strong 2018 Beatriz Stein, Citrus Sanitation Centre, 9.10am 9.35am Argentina - competitors in the southern hemisphere Argentina Nate Jameson. 9.35am 10.05am Lessons from USA battle with HLB Brite Leaf Nursery, USA Morning tea (10.05am to 10.50am) 2. Biosecurity – protecting industry's assets from exotic pest threats 10.50am 11.05am Australia's Biosecurity Challenges Peter Creaser, Dept Agriculture Beatriz Stein, Citrus Sanitation Centre, 11.05am 11.30am How HLB is hurting the Argentinian citrus industry Argentina 11.30am 11.45am NT case study - growers' experience in implementing biosecurity plan Josh Clementson, Nutrano 11.45am Nerida Donovan, NSW DPI 12.00pm Biggest threats to Australian citrus production 12.00pm 12.15pm Acting on the risk: Implementing effective on farm biosecurity Jeff Milne, Citrus Australia Lunch (12.30pm to 1.30pm) *Poster session during lunch break 3. Maximising pest control, minimising chemical resistance 1.30pm 1.45pm Agrichemicals - the impending challenges Kevin Bodnaruk, AKC Consulting

Successful use of IPM in resistance situations 1.45pm 2.00pm Dr Paul Horne, IPM Technologies Rethink your use of IPM in citrus orchards - what are the opportunities? Dan Papacek, Bugs for Bugs 2.00pm 2.15pm How to improve applications, increase efficiency and decrease rates of 2.15pm 2.30pm Matt Strmiska, ADAPTIV resistance 2.30pm 2.40pm Managing chemical use to protect available chemistry Justin Lane, MFC Exirel - a practical example for the management of resistance in Fullers rose 2.40pm 3.00pm Geoff Cornwell, FMC weevil control Networking in Hall L

Afternoon tea (3.00pm to 3.30pm)

4. Orchard best management practice

| 3.30pm | 3.45pm | Afourer pruning and management practices to overcome bear older trees | ing issues in | David Stevens, Nutrano; Andrew Harty, Costa Group |
|----------------|---------------|---|-------------------|--|
| 3.45pm | 4.00pm | Fruit fly practical controls | | Dan Papacek, Bugs for Bugs |
| 4.00pm | 4.15pm | SIP fruit fly R&D update | | Dan Ryan, SIT plus |
| 4.15pm | 4.30pm | Advances in irrigation technology | | Peter Stephens |
| 4.30pm | 4.45pm | Long-term weather forecasts | | Darren Ray, Bureau of Meteorology |
| 4.45pm | 5.00pm | Predicting and dealing with frost | | Naomi Benger, Bureau of Meteorology |
| 5.00pm | 5.15pm | Frost management strategies | | Steven Falivene, NSW DPI |
| Official Forum | Dinner (7.00p | m) | Panorama Ballroom | Level 1. Adelaide Convention Centre |

| DAY 2 - THURSDAY 7 MARCH 2019 - HALL M | | | | |
|---|----------------|---|--|--|
| Time Start | Time End | Topics | Speakers | |
| 5. Protectin | g Australia's | brand of safe food (Workshops will run concurre | ntly to these sessions, see below) | |
| 8.30am | 9.00am | Food borne illness in citrus fruit: understanding the food safety risk | SP Singh | |
| 9.00am | 9.30am | Australian fungicide resistance survey | John Golding, NSW DPI | |
| 9.30am | 10.00am | Agrichemicals and the limitations of sampling | David Daniels, Citrus Australia | |
| Morning tea (| 10.00am to 10. | 45am) | Networking in Hall L | |
| 6. Farm tec | h | | | |
| 10.45am | 11.05am | Fresh fruit harvesting using robotics | Gad Kober, FFRobotics | |
| 11.05am | 11.25am | Facts and follies of remote sensing of tree crops | Dr Andrew Robson, UNE | |
| 11.25am | 11.45am | Online tools for Red Scale and Gall Wasp controls | Dr Jianhua Mo, NSW DPI | |
| 11.45am | 12.05pm | Use of deficit irrigation for improved flavour profiles | Dr Tahir Khurshid, NSW DPI | |
| 12.05pm | 12.25pm | Grower experience with deficit irrigation - improved brix is possible | Dean Morris, Morricom Orchards | |
| Lunch (12.30 | pm to 1.30pm) | *Poster session during lunch break | Networking in Hall L | |
| 7. Citrus pl | antings, vari | eties and nursery best practice | | |
| 1.30pm | 1.45pm | 2018 Citrus Tree Census report | Mara Milner, Citrus Australia | |
| 1.45pm | 2.05pm | New variety evaluation | Dr Dave Monks, NSW DPI | |
| 2.05pm | 2.25pm | Building a genetic foundation for Australia's citrus future | Malcolm Smith, Qld DPI | |
| 2.25pm | 2.45pm | Nursery Best Practice | Wayne Parr, Golden Grove Nurseries | |
| 2.45pm | 3.00pm | Protecting Australia's citrus genetic material – netting on nursery | Tim Herrmann, Auscitrus | |
| 3.00pm | 3.30pm | Lessons from citrus incursion, netting nurseries now before potential incursion | Nate Jameson, Brite Leaf Nursery, USA | |
| 3.30pm Closing remarks by Nathan Hancock, CEO, Citrus Australia | | | | |

| DAY 2 - CONCURRENT WORKSHOPS - ROOM L2 | | | | |
|--|---|--|--|--|
| Time Start | Time End | Topics | Speakers | |
| 5. Farm Tech Workshop - Room L2 | | | | |
| 9.00am | 9.15am | Does soil moisture monitoring matter? | Cedric Geffen, CropLogic Australia | |
| 9.15am | 9.30am | Job management & GPS guidance solutions for growers | Michael De Palma and Don Thorp, TracMap | |
| 9.30am | 9.45am | Frost fans and frost protection of citrus | Ben Daking, Australian Frost Fans | |
| 9.45am | 10.00am | New field research finds fit for alternative pest and disease management practices | Matt Sherriff, Sacoa | |
| Morning Tea | (10.00am to 10 |).30am) | Networking in Hall L | |
| 6. Postharv | est Worksho | op 1 - Room L2 | | |
| 10.30am | 11.00am | Introducing Chairman: sour rot control and resistance management | Shaun Hood, Syngenta | |
| 11.00am | 11.30am | New foggers and sanitisers | Craig Wooldridge, EE Muirs | |
| 11.30am | 12.00pm | Citrosol post-harvest precision technologies | Dr Benito Orihuel, Iranzo | |
| 12.00pm | 12.30pm | Fungicide-free control of citrus postharvest diseases | Lluis Palou, Postharvest researcher IVIA. Spain | |
| Lunch (12.30 | pm to 1.30pm) | | Networking in Hall L | |
| 7. Postharv | est Worksho | op 2 - Room L2 | | |
| 1.30pm | 2.00pm | Trends in Spanish postharvest | Lluis Palou, Postharvest researcher IVIA. Spain | |
| 2.00pm | 2.30pm | Hort Innovation postharvest project - Fungicide use, timing, irradiation and chilling review | John Golding, NSW DPI | |
| 2.30pm | 2.45pm | Queensland supply chain research project | Andrew MacNish, QDAF | |
| 2.45pm | 3.00pm | Update of cold plasma project | SP Singh, NSW DPI | |
| 3.00pm | 3.15pm | Reducing export compliance costs | John Golding, NSW DPI | |
| 3.15pm | 3.30pm | Lemon degreening and chilling risk | Andrew MacNish, QDAF | |
| 3.30pm | 3.40pm | New reefer technology | Nick McKenna, MSC | |
| 3.45pm Closi | 3.45pm Closing remarks by John Golding, NSW DPI | | | |

Q1 What is your role in the Australian citrus industry? (Tick multiple if applicable)



| ANSWER CHOICES | RESPONSES | |
|-----------------------|-----------|----|
| Grower | 35.48% | 22 |
| Packer | 20.97% | 13 |
| Processor | 3.23% | 2 |
| Exporter | 9.68% | 6 |
| Commercial provider | 45.16% | 28 |
| Researcher | 8.06% | 5 |
| Sponsor | 17.74% | 11 |
| Total Respondents: 62 | | |

Q2 What were, for you, the highlights of the 2019 Citrus Technical Forum?

Answered: 57 Skipped: 21

| # | RESPONSES | DATE |
|----|--|--------------------|
| 1 | Networking & meeting delegates | 3/18/2019 9:16 AM |
| 2 | new Varieties | 3/17/2019 8:32 PM |
| 3 | networking | 3/17/2019 1:43 PM |
| 4 | Networking and info on HLB | 3/15/2019 6:30 PM |
| 5 | Location and professional presentation | 3/15/2019 1:02 PM |
| 6 | Trade show was great. | 3/15/2019 12:45 PM |
| 7 | discussions on fruit fly, Citrus greening and new varieties | 3/15/2019 11:57 AM |
| 8 | The talk on HLB from Florida | 3/15/2019 9:11 AM |
| 9 | Variety information. Internatonal speakers. | 3/14/2019 7:53 PM |
| 10 | Networking | 3/14/2019 6:16 PM |
| 11 | Networking sessions. Spray application importance - Coverage, Coverage, Coverage | 3/14/2019 4:08 PM |
| 12 | Very good trade display area, lots of interaction in the breaks. | 3/14/2019 4:07 PM |
| 13 | All of Day 1 | 3/14/2019 2:32 PM |
| 14 | Post harvest sessions and knowing how good the industry is going | 3/14/2019 1:51 PM |
| 15 | The variety of speakers and the relevance of the content. | 3/14/2019 10:32 AM |
| 16 | Pre-tour, HLB and Biosecurity, Afourer pruning, Matt Strmiska | 3/14/2019 9:57 AM |
| 17 | Proactive approach to insecticide resistance management and bio security issues. | 3/14/2019 8:40 AM |
| 18 | Various talks | 3/14/2019 8:33 AM |
| 19 | the speakers | 3/14/2019 7:26 AM |
| 20 | good content in speakers and exhibiters | 3/14/2019 7:11 AM |
| 21 | - Information shared by guest speakers and work shops - Networking - Dinner evening on Wednesday | 3/14/2019 6:55 AM |
| 22 | Update on HLB situation and David Daniels statistics talk. | 3/14/2019 12:19 AM |
| 23 | Robotic harvesting | 3/13/2019 8:19 PM |
| 24 | The pre tour was great lots of good places we went to .Woolenook packing shed and Costa packing shed was my high light | 3/13/2019 7:22 PM |
| 25 | The networking opportunities and sponsors area | 3/13/2019 6:15 PM |
| 26 | This was my first congress as I am new to Australia, so highlights were the networking opportunity and informative talks on biosecurity risks, harvesting equipment, David Daniels statitics lesson. Talks on pruning techniques to help growers overcome production problems. | 3/13/2019 6:13 PM |
| 27 | EE Muir bus trip. Listening to all the research outcomes. The cheese platter and talk at the AGM. | 3/13/2019 5:33 PM |
| 28 | Plenary sessions and networking | 3/13/2019 5:11 PM |
| 29 | Level of Speakers was very high. Highly informative. Case studies were great | 3/13/2019 5:05 PM |
| 30 | Meeting many growers in the one spot | 3/13/2019 4:56 PM |
| 31 | Afourer pruning information. Networking with other growers. Auto picking machine | 3/13/2019 4:08 PM |
| 32 | An interesting range of topics in the main theatre sessions. | 3/13/2019 3:59 PM |
| 33 | Well organised and good grower attendance. | 3/13/2019 3:45 PM |

| 34 | Fantastic networking opportunity with citrus growers. Good leads through our trade stand. Frost was an important topic covered and excellent attendance for Ben Daking's presentation within the Farm Tech Workshop. | 3/13/2019 3:32 PM |
|----|--|-------------------|
| 35 | Nate Jameson talk about HLB, Matt Strmiiska presentation on spray coverage, Afourer pruning management, Robotics, tree census and variety evaluation | 3/13/2019 3:13 PM |
| 36 | The post harvest information | 3/13/2019 3:08 PM |
| 37 | d | 3/13/2019 3:03 PM |
| 38 | Talks on innovation and research | 3/13/2019 3:01 PM |
| 39 | Andrew Robinson - Aerial imagry | 3/13/2019 2:58 PM |
| 40 | New varities, HLB/Cancer precaution, harvest automation. | 3/13/2019 2:47 PM |
| 41 | Pre conference bus tour The IPM session | 3/13/2019 2:45 PM |
| 42 | Seeing the industry is healthy | 3/13/2019 2:43 PM |
| 43 | Experiences of overseas speakers re dealing with pest and disease incursions | 3/13/2019 2:38 PM |
| 44 | Networking with customers and supplers | 3/13/2019 2:34 PM |
| 45 | The forum dinner | 3/13/2019 2:34 PM |
| 46 | Networking and talking to different people | 3/13/2019 2:18 PM |
| 47 | Listening to Nate Jameson on HLB was certainly an eye opener and also meeting other growers and networking | 3/13/2019 2:14 PM |
| 48 | Bio security Tree census | 3/13/2019 2:14 PM |
| 49 | KEYNOTE SPEAKER | 3/13/2019 2:10 PM |
| 50 | Grower attendance was key for us | 3/13/2019 2:09 PM |
| 51 | The Pre-Conference Tour | 3/13/2019 2:09 PM |
| 52 | Nate Jameson's talk on Florida issues and his hygene at the nursery | 3/13/2019 2:06 PM |
| 53 | Making sweeter fruits, IPM | 3/13/2019 2:05 PM |
| 54 | HLB awareness Biosecurity deficit irrigation | 3/13/2019 1:59 PM |
| 55 | Post harvest sessions on the second day | 3/13/2019 1:58 PM |
| 56 | the industry dinner and the topics discussed during the forum | 3/13/2019 1:58 PM |
| 57 | Quality of presenters | 3/13/2019 1:57 PM |
| | | |

2019 Citrus Tech Forum - Feedback Survey

SurveyMonkey

Q3 Please provide suggestions on how we could improve the event.

Answered: 49 Skipped: 29

| # | RESPONSES | DATE |
|----|--|--------------------|
| 1 | n/a | 3/17/2019 8:32 PM |
| 2 | Healthier food | 3/17/2019 1:43 PM |
| 3 | Overall really good can't think of how to improve | 3/15/2019 6:30 PM |
| 4 | Accuracy of some of the data and information presented. Promotion of more interaction with displays and sponsors. Perhaps look at one longer time period to spend in sponsors display? Still good to have meal breaks in sponsor area, but allocate a extra hour for example on the first day? Ti felt a bit rushed with growers etc cutting discussions short to get into the next session. | 3/15/2019 1:02 PM |
| 5 | A longer session on day 1 in the Trade Show. Maybe make the lunch session longer and allow people to network a lot more. | 3/15/2019 12:45 PM |
| 6 | having it located one flight from NZ | 3/15/2019 11:57 AM |
| 7 | Very good and well run event. | 3/15/2019 9:11 AM |
| 8 | Less talks that are basically advertisements for suppliers. This really stood out this forum and I found it disappointing. I am a supplier as well so why do some get this captive audience and others dont? More concurrent sessions on specific themes would improve the event. Venue was impersonal. | 3/14/2019 7:53 PM |
| 9 | Less repetition on some talks | 3/14/2019 6:16 PM |
| 10 | Presenters need to be briefed to ensure they get to the point of their presentations quickly rather than spending too much time presenting figures and analysis | 3/14/2019 4:08 PM |
| 11 | No further comments as i believe the event was a major success in a capital city with the venue and speakers | 3/14/2019 2:32 PM |
| 12 | Was really positive | 3/14/2019 1:51 PM |
| 13 | Perhaps a bit more time allocation for key speakers. 15 minutes went quick. Music at the dinner started too early and was loud - difficult to hold discussions / network. | 3/14/2019 9:57 AM |
| 14 | Currently very good as is but perhaps more free time for discussions with exhibitors | 3/14/2019 8:40 AM |
| 15 | Possibly get more commercial providers to have more stands | 3/14/2019 8:33 AM |
| 16 | keep getting good speakers | 3/14/2019 7:26 AM |
| 17 | have the AGM during the conference not the night before | 3/14/2019 7:11 AM |
| 18 | Maybe offer some time for questions. | 3/14/2019 12:19 AM |
| 19 | More trade displays: Tractors, slashers, sprayers, weed sprayers. Weed spray workshop | 3/13/2019 8:19 PM |
| 20 | Have free bottled water available in the main foyer At the main dinner the music was too loud and went on too long | 3/13/2019 6:15 PM |
| 21 | I would like to suggest allowing researchers who have conducted good research on behalf of the industry to present the results of their research on one day of the congress. The research should have been commissioned by the industry or through Citrus Australia. | 3/13/2019 6:13 PM |
| 22 | Nil | 3/13/2019 5:05 PM |
| 23 | List of attendees before the conference would be handy | 3/13/2019 4:56 PM |
| 24 | Some topics of interest were very short. No chance for Q&A | 3/13/2019 4:08 PM |
| 25 | All good | 3/13/2019 3:45 PM |
| 26 | Cover off privacy rules when delegates register so you can share delegate contact list for those who give permission. Include type of contact (grower, packer etc) and email addresses. | 3/13/2019 3:32 PM |
| 27 | General talk was that the field trips where missed, watching the attendance fade away after lunch was I pretty good indicator for that! | 3/13/2019 3:13 PM |
| 28 | First day went too long. There were people leaving after the afternoon tea break which I thought was embarrassing. | 3/13/2019 3:08 PM |

2019 Citrus Tech Forum - Feedback Survey

SurveyMonkey

| 29 | d | 3/13/2019 3:03 PM |
|----|--|-------------------|
| 30 | Not include Cedric Geffens talk. It was a complete wash down of irrigation, with no information and a unconvincing plug for a product at the end. Improve quality of lunch- reconsider how appropriate curry and rice is to 400 people standing up | 3/13/2019 3:01 PM |
| 31 | Look to host in other regions - Qld, WA, Northern NSW | 3/13/2019 2:58 PM |
| 32 | More practical irrigation, fertilizer and crop manupilation. | 3/13/2019 2:47 PM |
| 33 | Ask the band to allow people to talk at the dinner. A little softer music please | 3/13/2019 2:45 PM |
| 34 | The conference is called a Tech conference yet not much time is actually spend researching and providing more detailed information on the available tech which could have an impact on the industry. | 3/13/2019 2:43 PM |
| 35 | More in 'good' research findings - good meaning practical and easy to understand | 3/13/2019 2:38 PM |
| 36 | I can't really think of any at the moment | 3/13/2019 2:34 PM |
| 37 | Maybe some more varied topics, so were a little repetitive. | 3/13/2019 2:34 PM |
| 38 | The event was very good all round. I am sure that people will mention that the music was too loud but if that is the only complaint I reckon you have done it pretty well!! | 3/13/2019 2:18 PM |
| 39 | Venue was great but food could be improved and at the dinner even though music was great to stopped any conversation at the table and if they were not playing then we had the speeches - could do without the band sorry | 3/13/2019 2:14 PM |
| 40 | Loved it, maybe Melbourne next time | 3/13/2019 2:14 PM |
| 41 | TURN MUSIC DOWN A LITTLE AT DINNER | 3/13/2019 2:10 PM |
| 42 | Was well run | 3/13/2019 2:09 PM |
| 43 | 1. There are sessions / presentations that 'deserve' longer time and others the opposite. Consider differentiating between 'major' and 'minor' topics. 2. Start 1st day a bit later than 8:30am 3. Spread meal service area across more laneways so that Exhibitors can get greater exposure to attendees during meal times 4. More than one barista coffee operator 5. Nutrition as a topic was lacking | 3/13/2019 2:09 PM |
| 44 | the food. it was ok, but it would be been nice to feature citrus in each dish. at the AusMac confrence this year every dish featured macadamia's. it gave the event something extra special and meaningful. | 3/13/2019 2:06 PM |
| 45 | More time allocated to how researchers came to a particular conclusion with respect to methods and results | 3/13/2019 2:05 PM |
| 46 | More agricultural scientists presentations and less commercial promotional presentations | 3/13/2019 1:59 PM |
| 47 | I think that you do your industry proud with what you organise and we certainly appreciate all the work that goes into these events. | 3/13/2019 1:58 PM |
| 48 | maybe less discussion about statistics | 3/13/2019 1:58 PM |
| 49 | Nil | 3/13/2019 1:57 PM |

Q4 Did you receive information from any of the sessions that you will apply to your business over the next 12 months?



| ANSWER CHOICES | RESPONSES | |
|----------------|-----------|----|
| Yes | 77.19% | 44 |
| No | 22.81% | 13 |
| TOTAL | | 57 |

Q5 If yes, what information was it?

Answered: 42 Skipped: 36

| # | RESPONSES | DATE |
|----|---|--------------------|
| 1 | post harvest info & fruitfly control | 3/18/2019 9:17 AM |
| 2 | New pesticide regulations/trends | 3/17/2019 1:49 PM |
| 3 | Irrigation techniques | 3/15/2019 6:33 PM |
| 4 | HLB, CGW and QFF | 3/15/2019 1:03 PM |
| 5 | NA | 3/15/2019 12:46 PM |
| 6 | new varieties | 3/15/2019 11:58 AM |
| 7 | Mainly biosecurity issues | 3/15/2019 9:12 AM |
| 8 | Importance of Spray coverage | 3/14/2019 4:09 PM |
| 9 | nil | 3/14/2019 2:33 PM |
| 10 | Exirel additional information was important. Paul Horne and Dan Papacekwe need to do understand IPM better to become more sustainable. All postharvest information was magnificent. | 3/14/2019 10:21 AM |
| 11 | Increase focus on bio security when going from farm to farm | 3/14/2019 8:41 AM |
| 12 | Nursery info | 3/14/2019 8:34 AM |
| 13 | we where exhibitors | 3/14/2019 7:31 AM |
| 14 | pruning and fruit fly | 3/14/2019 7:16 AM |
| 15 | - Different farming ideas, pruning/irrigation New varieties being evaluated | 3/14/2019 7:00 AM |
| 16 | Packing shed hygene and sanitization info was great and I learnt very valuable information | 3/13/2019 7:24 PM |
| 17 | Pruning, farm Biosecurity improvements | 3/13/2019 6:17 PM |
| 18 | Market opportunities for my new bio pesticide company | 3/13/2019 6:15 PM |
| 19 | pack house sanitation, planning for Afourer pruning, water defect irrigation | 3/13/2019 5:35 PM |
| 20 | size of the industry, relative importance of various pests and diseases | 3/13/2019 5:12 PM |
| 21 | Potential clients for new business | 3/13/2019 5:06 PM |
| 22 | Afourer pruning. Start early and not wait. | 3/13/2019 4:09 PM |
| 23 | IPM, Gall Wasp control | 3/13/2019 4:00 PM |
| 24 | Bureau of Meteorology frost forecasting | 3/13/2019 3:34 PM |
| 25 | Spray coverage, Chemical info, Tree census and new varieties | 3/13/2019 3:23 PM |
| 26 | Automation and future breeds | 3/13/2019 3:02 PM |
| 27 | Spray monitoring | 3/13/2019 3:00 PM |
| 28 | Further messaging on IPM management | 3/13/2019 2:48 PM |
| 29 | Biosecurity and IPM options | 3/13/2019 2:39 PM |
| 30 | Better understanding of the industry as a whole | 3/13/2019 2:36 PM |
| 31 | Chillsafe which is distributed by EE Muir. | 3/13/2019 2:35 PM |
| 32 | Varietal information. Updates on Bio-Security and some measures we can implement. | 3/13/2019 2:22 PM |
| 33 | Disease issues facing us and importance tree quality | 3/13/2019 2:16 PM |
| 34 | Bio security plan | 3/13/2019 2:15 PM |
| 35 | SPRAY COVERAGE | 3/13/2019 2:10 PM |
| 36 | Applying GA with nitrogen after pruning Citrus trees | 3/13/2019 2:09 PM |
| 37 | Nursery Hygene | 3/13/2019 2:07 PM |

2019 Citrus Tech Forum - Feedback Survey

SurveyMonkey

| 38 | HLB awareness | 3/13/2019 2:02 PM |
|----|--|-------------------|
| 39 | Post Harvest Orchard management | 3/13/2019 2:00 PM |
| 40 | Looking at implementing some of the post harvest ideas, its a pity we can not use any post harvest fungicides in NZ as it would certainly help some areas. | 3/13/2019 2:00 PM |
| 41 | Knowledge of the tree planting re crop volume coming. And the networking | 3/13/2019 1:59 PM |
| 42 | Afourer pruning, Insecti | 3/13/2019 1:57 PM |
| | | |

Q6 How would you like further information from the Forum presented?



| ANSWER CHOICES | RESPONSES | |
|------------------------|-----------|----|
| Citrus eNews | 31.48% | 17 |
| Australian Citrus News | 33.33% | 18 |
| Website | 24.07% | 13 |
| Other (please specify) | 11.11% | 6 |
| TOTAL | | 54 |

| # | OTHER (PLEASE SPECIFY) | DATE |
|---|---------------------------------------|--------------------|
| 1 | All of above | 3/14/2019 4:09 PM |
| 2 | Perhaps in an email to all attendees? | 3/14/2019 10:40 AM |
| 3 | All of the above | 3/13/2019 3:23 PM |
| 4 | Email | 3/13/2019 2:50 PM |
| 5 | All of the above | 3/13/2019 2:39 PM |
| 6 | Most economical | 3/13/2019 2:16 PM |

Q7 Do you find the information contained in the following publications relevant to your business?



| | NOT RELEVANT | RELEVANT | N/A | TOTAL | WEIGHTED AVERAGE | |
|------------------------|--------------|----------|--------|-------|------------------|------|
| Australian Citrus News | 1.79% | 91.07% | 7.14% | | | |
| | 1 | 51 | 4 | 56 | | 1.98 |
| Citrus eNewsletter | 1.82% | 87.27% | 10.91% | | | |
| | 1 | 48 | 6 | 55 | | 1.98 |
| Facebook | 13.21% | 39.62% | 47.17% | | | |
| | 7 | 21 | 25 | 53 | | 1.75 |
| Twitter | 15.38% | 25.00% | 59.62% | | | |
| | 8 | 13 | 31 | 52 | | 1.62 |

Q8 What additional information would you like to see in these publications that would benefit your business?

Answered: 23 Skipped: 55

| # | RESPONSES | DATE |
|----|---|--------------------|
| 1 | Current info is adequate | 3/15/2019 6:33 PM |
| 2 | Market and production focused information. | 3/14/2019 7:54 PM |
| 3 | Nutrition | 3/14/2019 2:33 PM |
| 4 | Postharvest | 3/14/2019 10:21 AM |
| 5 | NA | 3/14/2019 8:41 AM |
| 6 | I like technical articles | 3/14/2019 8:34 AM |
| 7 | more on farm stories | 3/14/2019 7:31 AM |
| 8 | Fair work new laws | 3/14/2019 7:16 AM |
| 9 | It would be great to be able to view online the presentations made at the forum by guest speakers | 3/14/2019 7:00 AM |
| 10 | More about orchard management. Managing the spread of citrus blight. | 3/13/2019 8:24 PM |
| 11 | I have not read any of the above publications or blogs so cannot comment on them. I look forward to receiving some of these publications. | 3/13/2019 6:15 PM |
| 12 | | 3/13/2019 5:06 PM |
| 13 | Latest research on major pests | 3/13/2019 4:00 PM |
| 14 | New technology that can be utilized in growing better fruit. | 3/13/2019 3:23 PM |
| 15 | Continued commentary on challenges to industry. Water security is topical | 3/13/2019 2:48 PM |
| 16 | In depth studies & explanations of current equipment & services available | 3/13/2019 2:45 PM |
| 17 | More about crop nutrition | 3/13/2019 2:36 PM |
| 18 | Can't think of anything at this stage. | 3/13/2019 2:35 PM |
| 19 | All information in publications could be sent nowadays as electronic versions rather than wasting money printing them | 3/13/2019 2:16 PM |
| 20 | Foliar trials using potassium and trace elements. | 3/13/2019 2:09 PM |
| 21 | Cultivar and Rootstock informaiton | 3/13/2019 2:07 PM |
| 22 | International research results | 3/13/2019 2:02 PM |
| 23 | orchard management practises from other parts of the world | 3/13/2019 2:00 PM |

AUSTRALIAN

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MAINTAINING THE MOMENTUM 2019 CITRUS TECH FORUM



I2 Hall of Fame inductees

16 Afourer pruning trials 26 Better spray coverage

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Citrus News

In this issue...

CEO REPORT

4 Tech Forum lessons will help us maintain our momentum

NEWS

- **5** Southern competition in citrus exports will grow
- 6 Census reveals rise in lemon, Afourer plantings
- 8 Testing helps deliver quality fruit to consumers
- **9** Samurai® (clothianidin) registered for citrus
- **10** Citrus Tech Forum photos

CITRUS AUSTRALIA HALL OF FAME

- 12 Juice groundbreaker added to hall of fame
- 14 Convenience the way forward for citrus sales

MANAGEMENT

- **15** MFC works with growers on chemical use
- **16** Reversing the Afourer trend after year 10
- **18** Frost protection tools to suit every situation
- 20 'No future' without workers, despite automation
- 24 Technology expands fresh juice export options
- **26** Improving spray coverage best way to lift production
- 28 Back to the future for IPM
- **30** Early results for deficit irrigation trials

BIOSECURITY

- **32** Australia must prepare for devastating diseases now
- **34** Getting on the front foot
- **35** Will your biosecurity plan count when it matters?

INNOVATION

- **36** Commercial pilot for SITPlus
- **38** Top Spanish researcher shares knowledge with NSW DPI
- **40** Optimising degreening conditions to reduce chilling injury in lemon exports

Cover image: Judy Skilton and Aaron Sanderson, Ban Ban Orchards, Queensland, with Tina and Jeff Knispel, of Nippy's, during the 2019 Citrus Technical Forum tour in March. Full story Pages 24-25

OUR CORPORATE PARTNERS





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Tech Forum lessons will help us maintain our momentum

It was excellent to catch up with so many growers at the Citrus Technical Forum and the pre-Forum tour in March.

Coming together to learn new methods of farming, share current techniques with peers, and being aware of potential opportunities and risks outside the farm gate puts our industry on a strong footing.

Adoption of new technology and techniques presented at the Forum will lead to better quality fruit - necessary to maintain our advantage over our competitors - and greater profitability.

As we share in this edition, growers can gain immediate results by improving spray coverage (page 26) and afourer management (p16); and think longer-term through deficit irrigation (p30), and going back to the future on IPM (p28).

And while we must concentrate on continual improvement on farm, the Technical Forum reinforced the necessity to strengthen biosecurity onfarm and nationally.

US nurseryman Nate Jameson stole the show with his passionate presentations on biosecurity, imploring Australia to prepare now for a potential disease incursion.

Nate, who has seen firsthand the devastation HLB has caused in his home state of Florida, spoke passionately on how the US responded, the cost to do so, and what can be done in Australia to strengthen our ability to prevent an incursion.

At the conclusion of the Technical Forum, I announced Citrus Australia will form a committee to address pest and disease issues, including HLB.

I am recommending that we adopt the Californian Citrus Pest and Disease Prevention Committee (CCPDPC) as a model. A group of Australians, who attended the 6th International Conference on huanglongbing (HLB) in California in March, were invited to participate in a meeting of the CCPDPC.

Citrus Australia's deputy chair Richard Byllaardt was nominated as chair of



Nathan Hancock with SA Premier Steven Marshall, who officially opened the 2019 Citrus Technical Forum

the Australian committee and Richard and I will work on its structure and call for nominations.

The Australian tour group to the US was part-funded by Hort Innovation and coordinated by Citrus Australia. I hope that future opportunities such as this are taken up by industry in good numbers as industry must take the time to familiarise itself with these serious threats

The take home message from the conference in California was the need to prevent the Asian Citrus Psyllid (ACP) from entering Australia.

Minimising the potential spread of HLB is critical to industry success in remaining free of the exotic disease.

ACP surveillance and mandatory nursery regulation are key tools that must be implemented and are part of our strategy.

Our group visited orchards in Florida and saw psyllid and nymphs as well as typical HLB and citrus canker symptoms; feedback from the group was that this experience was invaluable. A report will be completed and available to industry soon.

The Federal Government recently earmarked \$27.5 million for biosecurity in its latest budget, targeting three species of invasive ants. Citrus Australia will lobby for increased biosecurity funding to help ensure our borders are protected from illegally imported budwood and plants, and to fund improved biosecurity measures within our borders.

However, it is up to every individual grower to ensure their business remains pest and disease free by adopting a biosecurity plan and ensuring they know what to look for.

Joshua Clementson from Nutrano provided an excellent case study (p34) of implementing such a plan for their business and I encourage you to learn more.

NATHAN HANCOCK Chief Executive Officer, Citrus Australia

Southern competition in citrus exports will grow

Citrus production and citrus exports are expected to grow in South Africa, Chile and Peru over the next few years, with Argentina expanding lemon production and lemon exports.

Beatriz Stein provided an update on Australia's competitors in the southern hemisphere at the 2019 Citrus Technical Forum. These competing countries have lower costs of production than Australia.

Beatriz is a recently retired Director of Argentina's Citrus Sanitation Centre, which is responsible for the provision of certified citrus material for northwest Argentina.

She has also seen firsthand her country's re-entry into several important export markets - evaluating the arrival of lemons from Tucuman to Japan from 2003-2006, and evaluating the quality of lemons in the USA when this market was reopened to northwest Argentina this year.

Much of the growth in these countries has occurred over the past decade, Beatriz said

The top six countries - Argentina, Spain, USA, Turkey, Italy and South Africa produce 78% of the world's lemons. Argentina alone produces 1.5m tonnes or 24% in total. Chile increased exports of lemons, oranges and tangerines in this time, with 90% of exports sent to the USA. The USA was once a major importer of Australian citrus, but this market has been eroded due to low cost alternatives in the southern hemisphere.

Chile's exports rose from 100,000t in 2009 to 380,000t in 2018. There has also been significant growth in mandarins in this time from almost 35,000t in 2009 to almost 180,000t in 2018. South Africa has increased exports over the last decade, with 50% of their exports sent to Europe and the Middle East. It has increased the area planted to citrus in the last five years, particularly lemons, which will create further competition for Australia and exacerbate the need for Australia to grow more export markets for lemons.

South African lemon exports have doubled to almost 300,000 tonnes in the past decade. Its total citrus exports were 1.8m t in 2017 - a rise of 400,000t

Key points

- Argentina lemon exports to grow
- mandarins
 - last five years

in the past decade, fueled primarily by arowth in lemons.

South African orange exports have also grown significantly from 35,000t in 2009 to 100,000t in 2018. Beatriz said Peru has proven a surprise to its competitors over the past decade.

"Nobody knew what was going on in Peru the country," Beatriz said.

"In eight years, they have increased fresh citrus exports 2.7 times. from 68,000t in 2010 to 186,555t in 2018. They are focusing on mandarins, but all citrus crops are growing."

Peru mandarin exports have grown from 20,000t to more than 90,000t in that time.

Although Argentina has been the world's 8th largest producer of citrus



Beatriz Stein



Peru focusing on

Growth in South Africa

for the past 10-15 years, Beatriz said exports have fallen overall in the last ten years, due to internal costs and disease, although lemon exports continue to rise.

Argentina will remain a significant competitor to Australia of lemon exports. It's an important point to consider with the extra plantings of lemons in Australia.

Argentina now produces 24% of the world's lemons and 65% of all lemons in the southern hemisphere. In the last decade, Argentina's lemon plantings increased 23%, from 43.800ha to 53,900ha, producing 1.67 million tonnes Total citrus exports from Argentina have fallen from 685,303 tonnes in 2007 to 352.617t in 2017 but it still 17.2% of all international lemon exports come from Argentina.

Argentina has signed a memorandum of understanding with India, while exports resumed to Vietnam and the USA last year.

They will remain a threat to Australian exports, but as Beatriz has shown, they are not the only one.

See video of Beatriz Stein's Citrus Technical Forum addresses at www.facebook.com/CitrusAustralia

Census reveals rise in lemon, Afourer plantings

Growth in Afourer mandarin and lemon plantings, as revealed by the 2018 Citrus Tree Census, could lead to an oversupply and affect prices for growers.

The 2018 Citrus Tree Census has revealed citrus plantings have increased in all categories and all regions since the last census was conducted in 2017.

The Citrus Tree Census is an online database developed by Citrus Australia to collect national production statistics about variety, rootstock, tree age and hectares planted.

Only 4% of Australian lemons are currently exported, with 9% going into processing and 87% sold onto the domestic market.

Afourer plantings have also grown significantly and Citrus Australia CEO Nathan Hancock said growth in this popular variety could also test the domestic market.

"I urge all growers to access the full report and use the information when planning future plantings, taking domestic and export trends into consideration," he said.

Compared to the last census in 2017, plantings have increased:

- 71⁄2% in lemons to 1396ha
- 16% in Afourers to 1817ha
- 43% in red flesh navels to 573ha



Mara Milner presents Citrus Tree Census findings at 2019 Citrus Technical Forum.

Imperial plantings are tapering, primarily because of reduced plantings in Queensland. The total number of hectares planted to Imperials has only increased by 1%.

Plantings of oranges (common, Navels and Valencias) have increased 1% in the past 12 months.

For this census, 1217 orchards responded from 1367 orchards contacted. It is estimated that an additional 2500 hectares are not represented in this report.

It was revealed that since 2014 total hectares of citrus planted

nationally have increased by 17% to 25,655ha. Including:

- Murray Valley 20% rise to 5342ha
- Queensland 17% rise to 4592ha
- Riverina 11% rise to 7673ha
- Riverland 9% rise to 5600ha
- WA 6% rise to 1022ha
- Other 58% rise to 1426ha

Other national trends reveal:

- 8% rise in orange plantings (common, Navel and Valencia) to 16,588ha
- 28% rise in mandarin and tangelo plantings to 6956ha
- 37% rise in lemon and lime plantings to 1739ha
- 39% rise in grapefruit and pummelo plantings to 372ha

The Citrus Tree Census project has been funded by Hort Innovation using the citrus industry levy and funds from the Australian Government.

Hort Innovation Strategic levy investment CITRUS FUND



Contact ANFIC on (07) 3491 9905 or Email: info@anfic.com.au







MANDARIN & TANGELO GRAPEFRUIT **LEMON & LIME ORANGES*** & PUMMELO **65%** 7% 1% 27% OF NATIONAL HECTARES OF NATIONAL HECTARES OF NATIONAL HECTARES OF NATIONAL 6,956 ha 16,588 ha 1,739 ha 372 ha 2014 - 69% (15,307 ha) 2014 - 24% (5,451 ha) 2014 - 6% (1,268 ha) 2014 - 1% (268 ha) LARGEST LARGEST LARGEST LARGEST PRODUCTION REGION PRODUCTION REGION **PRODUCTION REGION RIVERINA QUEENSLAND** QUEENSLAND **RIVERINA** 7,012 ha 879 ha 108 ha 3,533 ha 2014 - 6,522 ha 2014 - 2,058 ha 2014 - 683 ha 2014 - 79 ha

*Orange category is made up of 60% Navel oranges and 40% juicing oranges (common & valencia)

THE MARKED IN

| N/ | 25.0789 | | | |
|-------------------|-------------------------|-----------------------|------------------------|----------------------|
| REGIONS | EARLY SEASON (ha) | MID SEASON (ha) | LATE SEASON (ha) | RED FLESH (ha) |
| MURRAY VALLEY | 805 | 535 | 1786 | 196 |
| QUEENSLAND | 19 | 52 | 3 | 3 |
| RIVERINA | 339 | 1120 | 1283 | 213 |
| RIVERLAND | 529 | 787 | 1293 | 120 |
| WESTERN AUSTRALIA | 106 | 153 | 205 | 31 |
| OTHER | 79 | 120 | 173 | 10 |
| NATIONAL TOTAL | 1,877 ha | 2,767 ha | 4,743 ha | 573 ha |

MANDARIN CATEGORY SIZES BY REGION

| REGIONS | AFOURERS (ha) | IMPERIALS (ha) | MURCOTTS* (ha) | OTHER** (ha) |
|-----------------------|------------------|-------------------|-------------------|-----------------|
| MURRAY VALLEY | 615 | 336 | 4 | 265 |
| QUEENSLAND | 290 | 827 | 1817 | 599 |
| RIVERINA | 161 | 72 | 5 | 147 |
| RIVERLAND | 570 | 318 | 79 | 423 |
| WESTERN AUSTRALIA | 125 | 65 | 1 | 110 |
| OTHER | 56 | 8 | 2 | 63 |
| NATIONAL TOTAL | 1,817 ha | 1,626 ha | 1,908 ha | 1,607 ha |
| * Includes low seeded | ** Other inclu | udes 35 varieties | | |

| LE | MON & | LIME | |
|--------|----------------|------|-------|
| CATEGO | RY SIZE | BY R | EGION |

| REGIONS | LEMONS (ha) | LIMES (ha) | | |
|----------------------|----------------|---------------|--|--|
| MURRAY VALLEY | 234 | 4 | | |
| QUEENSLAND | 593 | 286 | | |
| RIVERINA | 165 | 2 | | |
| RIVERLAND | 241 | 33 | | |
| WESTERN AUSTRALIA | 45 | 10 | | |
| OTHER | 118 | 9 | | |
| NATIONAL TOTAL | 1,396 ha | 344 ha | | |



Testing helps deliver quality fruit to consumers

Citrus Australia worked with growers in Queensland, the Riverland and the Murray Valley in March and April, sampling and testing fruit quality pre-harvest.

The Australian Citrus Quality Standards program provides critical information to growers on how to test the internal maturity of their fruit and the acceptable limits for harvest timing.

It is an initiative by industry to increase consumer demand by making citrus more palatable.

Any fruit that does not meet the quality standards but is picked and sold will have a detrimental effect on consumer sales for the entire season.

The Citrus Category Manager for Woolworths, Cara Reynolds, told last year's Citrus Australia Market Outlook Forum that Woolworths supported the Australian Citrus Quality Standards because customer research showed there was a minimum acceptance level at which customers would enjoy a piece of fruit, which then turned into repeat purchases.

Research has shown that customers who purchase and eat a piece of poor quality fruit will not re-purchase that fruit again for four to six weeks.

In Queensland in March, Citrus Australia's Mara Milner and Nicole Zerveas conducted testing on Imperial and Goldup mandarin samples taken directly from orchards in the Central Burnett region.

Eight growers were visited and

samples were taken from a total of 16 properties. 30 fruit were taken per sample site and individually tested against the BrimA standard.

The average results showed that half of the samples tested achieved the minimum standard, 1 sample was marginal, and 7 of the samples did not meet specification.

"This exercise demonstrated the variability between samples and importance of thorough testing before harvest," Mara said.

The report also showed the average size and BrimA result taken from the same site this time last year. The majority of the samples showed that the 2019 season is slightly behind in size and maturity compared to 2018.

Growers can test their own fruit by utilising ACQS tools at: https://www. citrusaustralia.com.au/growersindustry/citrus-quality-and-maturity

Mara advised growers to:

- Aim to exceed the minimum standards, not simply achieve them
- Test a truly representative sample of each variety and each patch
- Know that more than one test may be required before compliance is achieved

In his talk on 'the limitations of sampling' at the Citrus Technical Forum

in March, Citrus Australia Market Access Manager, David Daniels, who has a keen interest in statistics, said he has observed and questioned the sampling techniques used in the industry over many years, and the conclusions that we arrive at from those samples.

"Growers put so much effort into growing the best fruit but when it comes to sampling and looking at sufficient numbers of fruit, there are certainly some shortcomings," he said.

David said growers can be confident in Citrus Australia's conclusions about fruit maturity, granulation, seed content and a range of other quality attributes based on the samples that are collected currently.

However, he believes there are further gains that can be made in efficiency and effectiveness when it comes to sampling, and urged supply chain members, researchers and technology developers to work towards that aim.

"Hopefully my presentation can kick-start some conversations about introducing new rapid technology to enable us to take large samples very quickly.

"Imagine an instrument that could take hundreds of Brix and acid measurements in orchards rapidly and in in a non-destructive way - that could be a reality one day." •

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In other crops, Samurai is registered to control aphids, mealy bugs, fruit flies and moths.

Citrus Australia Market Access Manager, David Daniels, said the news comes after more than five years of collaboration between Citrus Australia and Sumitomo Chemicals.

"The challenge is always convincing the chemical companies to invest in our industry and to demonstrate that there will be a return on their investment," he said. David said it was also important to acknowledge the efforts by the APVMA.

"Regulatory approval of new molecules is a lengthy process and understandably, the APVMA requires a high level of confidence before approving products.

"Relatively speaking, we gained access to this important molecule in good time. The APVMA contains dedicated staff and we thank them for their efforts."



While Samurai has been used to control gall wasp under a permit held by Citrus Australia for the last couple of years, the label claim now firms up uses against other pests and could help reduce costs when registering orchards for export.

"Being a fairly new product, we encourage growers to gather as much information as possible on the product before application and please do not apply until two weeks after flowering has finished."



+ Safe



Growers can find high-quality information via the Sumitomo website at: https://sumitomo-chem.com.au/ samurai-systemic-insecticide David said Sumitomo's technical advisors are happy to assist growers. For more information contact the Sumitomo Regional Manager, Frank Gallucio, via email Frank.Galluccio@sumitomo-chem. com.au or on 0418 502 466.





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GET READY

Juice groundbreaker added to Hall of Fame

As a founding member of the Quenchy/Quelch plant at Leeton in the Riverina, John Davidson was both a grower and a processor of oranges for more than 40 years and a pioneer (alongside the Morris and Harrison families) of juice production in Australia.

John, who died in August 2017, was inducted into the Citrus Australia Hall of Fame in March at the Citrus Tech Forum dinner in Adelaide

His legacy includes the Quelch brand dating from 1974, two orchards at Leeton now run by his widow Carol and son Justin and his wife Carla, and a bright-orange, late Valencia selection from his own property, DV Valencia, which is entering commercial production in Australia and being trialled in South Africa and Spain.

"For me growing up, everything was about citrus," Justin said. "Even when juice was at a really bad point Dad was always looking at ways to better it through benchmarks and focusing on the good farms. He never needed us personally to be the best; he just wanted to help the industry wherever he could."

Justin says "having to tell other growers, as part of his job as the factory's fruit purchasing manager. that the price had just dropped was probably one of the hardest things he had to do - it was a big challenge for him"

"But, somehow he was able to inspire them to keep going - not to pull out and plant grapes or Navels or something else.'

John was at various times a member of the Riverina fruit fly group, Leeton and District Citrus Growers, Riverina Citrus, the Murrumbidgee Valley's Irrigation Research and Extension Committee and Citrus Australia's Riverina regional advisory committee.



Justin Davidson accepted his late father's Hall of Fame award on behalf of the family

In the late 1970s he advocated for the introduction of the Hamlin orange to Australia: an original trial block from that time continues to produce 60-80t/ha, Justin says.

NSW Department of Primary Industries (DPI) research horticulturist Graeme Sanderson describes John as "a good industry man who gave support to the NSW DPI over many years".

Graeme cites one instance in which a Valencia orange research project

"initiated through discussions between John, Riverina Citrus and the DPI in 2005" investigated high-producing selections of Valencia from within the Leeton district with which to replant old blocks.

"As well as being the main driver in getting the project funded and established, John provided a site for the commercial-scale planting and gave ongoing support to DPI research and extension staff to manage and harvest the trial," he said.

Justin represented his family at the Hall of Fame induction, during which the industry acknowledged John's lifetime contribution with a standing ovation. Justin's sisters (two of whom live in Western Australia and a third who had given birth in Sydney earlier in the week) and mother (who was in Sydney caring for her daughter's elder child) sent their apologies.



In 2016 John Davidson posed in a family portrait with his son Justin and grandson Jack in one of their orchards at Leeton to help illustrate the evolution of Berri fruit juice and the Quelch brand, which are now part of the Lion Foods portfolio.

Service to Industry awards



Damiani was the inaugural CEO of Citrus Australia and held the role for 10 years, before stepping down

She was recognised for her stewardship in the establishment of Citrus Australia, dedication to raising the profile of the Australian citrus industry, and ability to communicate its needs and achievements with all stakeholders including growers, government, corporate stakeholders, retailers and cross industry bodies as well as developing international trade.



Pest Management. forums across the country.

> His work is recognised across many agricultural industries and also at the various government levels, which raises the profile and integrity of not only his work but also the Australian citrus industry.



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Citrus Australia bestows these awards to recognise effort and contribution to the citrus industry.

Entomologist Dan Papacek, Bugs for Bugs, was recognised for pioneering the way the Australian citrus industry approaches its management of fruit fly, and his passion for Integrated

Dan has been very giving of his time to promote/assist fruit fly management at countless industry



Nerida Donovan is a citrus pathologist with NSW DPI and leads a coordinated citrus pathology program conducting diagnostics,

extension and research activities.

The citrus pathology team has a national role and works closely with the Australian citrus and nursery industries to minimise the impact of established pathogens and prepare for the arrival of new diseases.

Through Australian aid projects, Nerida has contributed to capacity building of international scientists and development of improved programs for germplasm maintenance and nursery management in developing countries.

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Convenience the way forward for citrus sales

Producing flavoursome easy-peel fruit and continuing to make inroads into countries such as China are keys to further success for Australian citrus growers, Citrus Australia Hall of Fame inductee Andrew Weigall says.

"The industry's on the right track because it's growing things people can eat," Andrew said. "These days people have forgotten how to eat an orange - or perhaps they're so young they've never learnt. We have to be giving them convenience food.

"The quality of mandarins now is so good people can't resist buying them. They're easy to peel, they're low-seeded or seedless and they're healthy."

Andrew - a former citrus growermarketer who established Yandilla Park, founded Vitor Marketing (originally as Highland Citrus) and led the formation of the Tangelo Growers' Unit Trust and So Aussie Fresh - first settled in the Riverland in 1969, having left behind a career as a financial journalist in Melbourne.

"My wife and I bought a small mixed property at Glossop, near Barmera, where we had citrus, white winegrapes and a few other things. The following year we moved to a purely citrus block at Renmark.

"The fruit - mainly oranges - went to the local co-op. The industry was almost totally focused on Valencias and navel oranges in those days."

Frustrated by making financial losses on the crop at times, Andrew decided to move into packing and marketing his own fruit.



Andrew Weigall was inducted into the Citrus Australia Hall of Fame at the Citrus Tech Forum dinner in Adelaide last month. Unfortunately, Mr Weigall could not attend due to surgery.

"In 1972 we built a shed, acquired some second-hand machinery and set up a packing house. It was a bold move - at that time the co-ops were supreme."

As a relatively new arrival on the citrus scene he was not constrained by traditional thinking. "I was from outside the square," he says.

"It was around then that the Australian Government removed tariffs on imported produce, which took away the price support for Valencias, and things became very much harder."

Andrew persevered, expanding his share of export sales into Malaysia and Singapore and refining his production methods, including by using drip-irrigation for the first time in citrus.

Eventually joining forces with a British-owned company's Australian subsidiary, East African Coffee Plantations, Andrew traded a half interest in Yandilla for three farms near Mildura, a management role and capital with which to develop an independent property at Renmark West, Greenhill Orchards - "possibly one of the biggest citrus developments at that time", he says.

He and his partners sold their business to the Costa Group in 2006 but Andrew retained a separate farm on which to produce new varieties of mandarin using close planting and a hydroponic irrigation system until his retirement several years ago.

Recovering from recent kneereplacement surgery, he was "not painfree enough" to travel from his home in Victor Harbor to Adelaide to attend the Hall of Fame inauguration.



MFC works with growers on chemical use

Mildura Fruit Company has produced a pesticide strategy management book for its growers to help them manage integrated pest management (IPM) with a rational use of chemicals to protect available chemistry.

MFC Grower Services Technical Manager, Justin Lane, told the Citrus Technical Forum that proper management of chemicals will help protect available chemistry for longer.

Justin said the book is market driven as MFC, like all packers, needs to ensure all fruit meets MRL requirements for all available markets.

MFC has more than 140 growers of varying supply volume and exports about 80% of its fruit.

MFC has put a big focus on the KCT (Korea, China, Thailand) markets over the past 7-8 years and new chemistry for the KCT program includes Samurai (now registered for Fullers Rose Weevil, Citrus Gall Wasp, Red Scale and leafminer) and Exirel (foliar spray) (for Fullers Rose Weevil (suppression), Light Brown Apple Moth and Kellys Citrus Thrip)

Justin said the booklet and its approach helps it try to protect the longevity of these important chemicals with growers.

"Most chemistry eventually develops resistance so we try to rotate chemical groups to ensure longevity," he said.

"Our pesticide strategy includes chemical options for target pests at specific timings - we understand 'not one size fits all'."

Justin said MFC has worked closely with chemical companies to rotate chemistry and protect longevity.

"We try to encourage growers to rotate their chemistry and not use a particular product or product group for more than two consecutive years or three at the most.

"Good products need to be protected. Products like Movento for Red Scale in our growing areas should be rotated out every few years.

"We encourage the use of Paraffinic oils and products like Wetcit where appropriate."

Key points

- - MFC produce grower
 - booklet Chlorpyrifos ban a
 - game changer

Within the pest management strategy booklet, MFC have:

- Two different strategies for the KCT program » Neonicotinoid (systemic soil
- applied insecticides and foliar applied) - two chemistry options » Non-Neonicotinoid - five
- chemistry options • One strategy for non-KCT growers

with four chemistry options

"We try to help our growers as best we can with this book to understand chemistry groupings and rotating these to protect their longevity.

"An example of this is Samurai and Confidor Guard which are systemic insecticides with different active ingredients, however they are in the same family 'Neonicotinoid's' which are Group 4A insecticides.



Justin Lane



Management will prolong chemical availability

"Simply rotating from one of these products to the other will not help protect the longevity of this family or group of chemicals - an insecticide from another group will be needed.

"We try to simply give options to rotate to and protect the longevity of all of our available chemistry."

Justin described the ban of Chlorpyrifos in the USA as a game changer and MFC's growers will not be using it at all from next season. They will be updating their MFC Pesticide booklet to reflect this.

Justin said neonicotinoids are also receiving bad publicity in the UK.

"We're not sure of the lifespan of these products being used on fruit going to these markets. Unfortunately, this is most likely limited."

Justin said growers should always work closely with their packer to ensure their fruit will meet specific market requirements of their designated country.

MFC assesses spray diaries and declarations of all growers prior to each season and also encourages its growers to investigate and utilize IPM programs. ●

Taming the Afourer trend after year 10

Afourers can produce yields of up to 100 ton per hectare in uncontrolled trees in year 8, but falling yields from the tenth year have prompted trials at Costa Exchange farms to reverse the trend.

Nutrano consultant David Stevens told the Citrus Technical Forum that Afourers "are a very easy tree to get along with for the first 8-10 years."

Yields of up to 100 ton per hectare can be achieved on uncontrolled trees in good health on dense plantings - more than 650 trees/ha - in year 8.

However, once trees start to look congested with crossover limbs and dead wood the yields fall.

"Smaller pruning cuts have very limited regrowth with little fruiting potential and Afourers do not like to reshoot lower in the canopy without severe

limb prunina."

David said better early canopy pruning management could produce more consistent yields for longer.

He also suggested:

- Top hedging for thinning crops in on-vears
- Other methods of thinning, including thinning sprays and hand thinning
- Effects of rootstocks for tree development and crop density
- 3% plus Lo-Bi Urea spravs to help with flowering potential

David said the following season's

yield for Afourers will be affected by over cropping in any season, and by extending harvest into September or later

"If the season needs to be extended, harvesting between hedge rows will help the following yield," he said.

"Early pruning in the tree's life will also help with annual balance cropping in the present and future.'

Mr Stevens said scaffold limb replacement after year five is considered essential by most growers with trees over 10 years old.

"Most growers who have left this to



Y pruning costs per hectare. Information: Costa

conservis

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Year from planting. Information: Costa

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"Most growers who have left this to later in the tree's life wished they'd started earlier"

September, 2016

he said.

later in the tree's life wished they'd started earlier."

Certain rates of GA at petal fall help hold up to 38% more crop, with a two count size increase. Winter GA treatments also help to reduce flower numbers and increase incidence of terminal flowers, producing stronger, larger fruit.

David said Afourers tend to fruit at the top and grow long unproductive middle branches, so Y pruning and severe hedging are options to consider.

Andrew Harty and the team at Costa have conducted both Y pruning and severe hedging trials at Costa's Kangara farm at Murtho, SA, over the past 2 years.

Andrew said the Y pruning concept was pioneered on Satsuma mandarins in New Zealand. It exposes the inner canopy to light by cutting a wedge into the top of the tree.



Andrew Harty discussing afourer pruning on the Citrus Technical Forum tour.





16 | Australian Citrus News

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This helps achieve 'walls of fruit' on the inner faces and is similar to having two small trees on a mature trunk.

Costa conducted their Y pruning experiment on 10-year-old trees on citrange rootstock - 6m x 2m spacing (833 trees/ha). This was done in

Trees were lightly hedged on top and sides, 3-4 upright scaffold limbs were removed and stubs were intentionally left to encourage lower shoot growth.

The third season following pruning, some internal fruit has set and regrowth needs ongoing work.

"Bending and tucking regrowth shoots may be better than ongoing cutting,"

Andrew said 'walls of fruit' - similar yields to the peak - have only partially been achieved after three seasons.

"It's too early to say if we've stabilised yield and bearing pattern," he said.

"Light hedging has produced a more stable, accessible tree.'

A severe hedging experiment - using machines to hedge the sides and tops of Afourers - was trialled in September 2017 to see whether expensive manual pruning could be avoided.

In the first season after hedging, there was a light crop and strong regrowth on the hedged side. Hedged trees returned 42t/ha, compared to 56t/ha on unhedged trees.

In the second season after hedging, Andrew reported a good fruit set for the 2019 harvest, and said they may only need to hedge one side every 3-4 years. •



Frost protection tools to suit every situation

Over the past few seasons frost has been an issue in the south east growing regions of Australia. It mostly affects isolated parts of the region and on high risk parts of an orchard (i.e. low lying areas).

A significant frost event can make all fruit unmarketable whilst a mild frost event can cause damage sporadically in the orchard and within the tree resulting.

This results in frost damaged fruit occasionally being packed in quality fruit boxes undermining the good reputation of Australian fruit.

There are a few orchard practices that can provide 1 to 2°C of protection; in a mild frost one or two degrees of protection can make the difference between damaged fruit and an unaffected orchard.

However these practices will be ineffective in a moderate (e.g. temperatures below -5°C) or severe frost event.

These practices include cultivating the inter row and maintaining moist soil to store heat from sunlight to provide warmth during the night and turning on under tree sprinklers during a frost event.

There are more reliable options that provide reasonable protection for moderate or severe frost events. The two most practical and common methods are overhead irrigation or frost fans.

Overhead irrigation has provided consistent protection, even in the 2007

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Steve Falivene presents frost mitigation tips at the Citrus Technical Forum.

severe frost events.

This would provide the ultimate protection however it is only suitable where water is available during winter and the soil is free draining.

In the Murrumbidgee area water is often restricted for a short period during winter.

Only a portion of orchards in the southern growing regions are on free draining soils. however some have

poor draining subsoils that can guickly result in waterlogging.

Frost fans are the next best option. They can provide up to 8 ha of protection in a mild frost, however in a severe frost protection might be reduced to 3 ha per unit.

Positioning the fan correctly is very important and a consultant can conduct an orchard topography frost assessment.

Mobile fans have less power and can do less area than permanent fans, however they can be moved around the orchard as blocks are harvested to protect different parts of the orchard.

Other options include; helicopters, however a considerable sized orchard is required for this to be cost effective; oil burners, used in the United States; and burning hay bales. Burning hay bales or wood piles days prior to the frost has been done and anecdotally there is an effect but the effectiveness is not well documented.

Steven Falivene is a citrus development officer with

SACOA

NSW DPI. For a copy of his presentation, email Steven at steven.falivene@dpi.nsw.gov.au

Silvan's Avo Jet tall tree sprayer

Silvan Australia released its new Avo Jet auxiliary spray unit in 2017 designed for targeted spraying in medium to tall trees such as citrus, avocadoes, mangoes and macadamias and it popularity is continuing to grow.

A key feature is the hydraulically driven fan that delivers a high velocity air stream into the top of the canopy. When combined with Silvan's patented Radak convevor, the Avo Jet provides complete tree coverage.

The Avo Jet is fitted with four adjustable cannon jet nozzles per side assisted by five air outlets to direct the chemical into the top of the tree which can be difficult to reach and is often the area where pest and disease pressure is at its highest.

When fully extended for spraving. the Avo Jet stands five metres above the ground and is mounted to a hydraulically controlled frame which can be conveniently lowered from the tractor cab for road transport and storage. The Avo Jet can be fitted to any Silvan 4000L orchard sprayer in conjunction with the Radak conveyor.

Silvan Australia's spraving product specialist David Carr says that his company's long experience and leadership in spraying equipment and accessories confirms that it is important to adapt to the changing needs of farmers

"We are regularly talking to farmers about the challenges they face in managing pests and disease".

"The development of the Avo Jet was a direct response to listening to the needs of fruit growers for a product that directs chemical into the top of



spray head for road transport and storage.

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tall trees and compliments the proven Silvan Radak conveyor" Mr Carr says.

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The Silvan Avo Jet auxilliary sprayer compliments the Silvan Radak conveyor to obtain effective spray penetration tall trees such as avocadoes, mangoes and macadamias.

Standing five metres above the ground, the Avo Jet has a hydraulically controlled frame to lower the



'No future' without workers, despite automation

Key points

- Investment in automation
- Automation can't replace every task
- ✤ 24-hour turnaround of fruit

"Good people are critical to any business," Ben Haslett, manager of Woolenook Fruits, says. "There's no future without them."

Ben - who as a 2015 Nuffield Australia scholar researched how rural communities could be competitive in a world market - runs his family's citrus, sugar plum, almond and winegrape growing, packing and contractharvesting operation at Murtho, near Renmark in South Australia, where mechanical modifications in the packing shed have reduced reliance on human workers for tackling straightforward day-to-day tasks.

"The key is what those people are doing," he says. "If there are highly repetitive jobs, those are good candidates for automation, leaving the people to deal with the highly variable or adaptive-style problems.

"Ultimately they will work out systems for these which can then, hopefully, be automated while they move on to the



Ben Haslett with delegates on the Citrus Technical Forum tour through his family's packing shed at Murtho.

next challenge - and we will always have another 'challenge'," Ben says.

Ben says the impetus for Woolenook's move to automate was a mix of cost and quality.

"I think all businesses in Australia are mindful of the labour component in the products we produce," he says. "Obviously, Australia's not a low-cost competitor with respect to many of our international rivals so technology relating to efficiencies and consistent product delivery is important to our ability to maintain long-term profitability."

By area, citrus covers 40% of Woolenook's Riverland orchard, with mandarins accounting for 90% of this.

"It's a single location with significant new citrus projects in the developmental stage," Ben says.

The property - established by Ben's parents. Peter and Ludi, in 1985 - uses three fruit labels: two domestic and one export.

"There are some old Washington navels that were here when Mum and Dad arrived; they're still in reasonable condition and have a few seasons

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left in them. Our mandarins are more newly planted and are replaced as the need arises

Woolenook targets the premium market segment, Ben says, and where citrus is concerned aims to pick, pack and dispatch within 48 hours.

"It's vital we deliver a consistent. high-quality product. It's our view that freshness - that is, how guickly we can get fruit of the correct ripeness from the tree to the customer - is one of the keys.

"In general terms we think it's best to pick the crop at the correct maturity and fashion the processing capability and marketing around that; otherwise, it's difficult to continually deliver a high-quality product of optimal maturity."

Ben says minimising the time fruit spends in the shed has always been a priority at Woolenook.

"Coming from a small domestic market base it's something we've always done, and as we've expanded we've continued with this philosophy."

However, he says this approach is not necessarily the right one for all producers all the time. Varietal variability with regard to the development of skin disorders (for example, oleocellosis), seasonal conditions and the collation of export orders can mean a short turnaround is not always achievable.

"For our business it's just about understanding our niche in the market and supplying what our particular customer wants. There's a range of customer requirements out there and a single packing house can't supply them all "

Ben says his family was shown the value of consistency in branding when it considered updating the brand 'Woolenook Fruits'



Citrus Tech Forum tour delegates inspect the Woolenook Fruits packing shed.



" 'Woolenook' comes from the bend in the river where the farm's located." he says. "It's certainly a mouthful - I can't count how many times a day I have to spell it out over the phone - so as a marketing name there are some drawbacks

"About 10 years ago we investigated choosing something easier but we met resistance from the market saying customers knew it and trusted it, so changing would not be a good idea."

In addition to handling its own fruit, Woolenook packs for a number of neighbouring growers.

"Over the last 20 or so years the percent volume has depended on our capacity based on supply from our own orchard," Ben says. Recently completed modifications to their shed have boosted that capacity, he says, enabling the Hasletts to take on "a bit more contract packing than we have in the past".



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Consumers embrace long-life 'fresh' juice

If it looks like fresh juice and tastes like fresh juice then fresh juice it must be – at least, that's what consumers assume where Nippy's long-life chilled juice products are concerned.

In actual fact, four of the multiple varieties of fruit and vegetable juice rolling off the production line at Nippy's at Moorook, South Australia, now have a potential shelf-life of at least a year.

The acquisition of an AsepTec linear filler late last year has allowed the family-owned business to produce long-life juices that closely mirror fresh orange, cloudy apple, blood orange and pink grapefruit juice in both flavour and appearance.

Now in its 52nd year of manufacturing, Nippy's has been processing long-life juice and flavoured milk since the mid-1980s.

Its history as a producer of fruit stretches back even further: to the 1930s, when Alic Knispel started growing and packing citrus in the



Jeff Knispel addressing delegates at the 2019 Citrus Tech Forum tour.

Key points

- Longer shelf life for fresh juice
- Long-life juices mirror fresh juice
- Juice in Japanese
 7-11 stores

Riverland. With about 300ha of orchard the Knispels currently provide 20-25 per cent of their own juicing requirements.

"In recent decades we'd been doing long-life juice in a one-litre pack called Combibloc – a flexible foil-paper packaging," says Alic's son Jeff, the company's managing director.

"Our market in Japan was buying this product for the food-service sector but not doing particularly well with it, and as it happened the machinery we were using was becoming quite old and the supplier informed us there would be a limit to how long it could go on providing spare parts and maintaining it.

"We needed to consider either buying the next generation of filling machine or maybe deleting the product; we needed to rethink what we were doing with long-life processing of fruit juice and where we were going to market it."

In the end Jeff and his team decided that rather than simply replace like with like they would invest in a major upgrade.

"Our research showed that a plastic bottle would be the favoured container for this type of product for the next few years so then we thought we'd see if we could find a PET filler that would not only produce a long-life product but also, hopefully, do more than one sized packaging so we could explore possibilities other than just the one-litre market."

The Knispels' ultimate choice of equipment "essentially fills in a much cleaner environment," according to Grant Day, sales manager - liquid foods for JBT, which installed the filler.

"Aseptic filling is simply filling in a sterile environment and avoiding the possibility of recontamination.

"It is that clean filling environment, combined with a sterile container and barrier properties of the bottle that contribute to extending the shelf life.

"This means that a premium notfrom-concentrate juice can have a significantly longer shelf-life while keeping the transparent PET bottle





Above: Judy Skilton and Aaron Sanderson, Ban Ban Orchards, Queensland, with Tina and Jeff Knispel, of Nippy's, during the 2019 Citrus Technical Forum tour in March. Right: Jeff leads delegates through the plant.

with a single-stage, tamper-evident cap that consumers are accustomed to for fresh juice."

In the case of Nippy's, breaking with tradition by introducing a new container type was the impetus for elevating the product into a higher value category.

"Because we were starting something new, we said to the market in Japan 'We want you to do something else as well: treat this as a cool-chain product'," Jeff says.

"It's cold-pressed from chilled fruit and cold-filled, we sea-freight it refrigerated and they warehouse it refrigerated, and it goes into refrigeration in the retail outlets the dairy cabinet as opposed to the dry grocery aisles. Not only does this preserve the fresh flavour and appearance of the product but it also creates a perception with consumers that if it's with the yoghurts, cheeses and milk it must be a fresh product, too."

Jeff says while Nippy's could confidently assign all four juices a shelf life of at least 12 months it prefers to specify only half of that to encourage repeat sales and ensure the product is consumed before any slight deterioration in quality occurs.

"We're doing a one-litre and also a 300-millilitre single serve that's already in 7-Elevens in Japan, for example," he says.

While exporting the new long-life



juices began only in late December, Jeff says sales have boomed from about one container a month of the original product to 20 containers since Christmas. It is also sold domestically.

"At this rate we're probably going to be hunting around for every last blood orange and ruby grapefruit in Australia for juicing," Jeff says. "Because of the way the Japanese market has responded we're reluctant to start new customers just yet for fear of not being able to keep up with growth."

The 2019 Citrus Juice Forum will be held in Griffith, NSW, on June 12-13, 2019. Visit www.citrusaustralia.com.au for more information.

Improving spray coverage best way to lift production

Improving spray coverage of your trees to its fullest potential is the best way to improve production and minimise disease resistance, according to US spray consultant Matt Strmiska, but how do you know if this is being achieved?

At the Citrus Technical Forum, Matt provided the example of a citrus grower in the US, who were losing 75% of their crop each year to disease. After three years of research with no change in results, they decided to inspect their spray coverage.

After optimizing coverage, they rectified the problem in the first season

Matt stressed that calibration was not coverage.

"There are a lot of documents available to us on improving calibration. It's not complicated. But, with coverage, it's a very pie in the sky idea. You walk behind the sprayer and it looks good, but how do you know what you're looking at?"



Matt Strmiska

Matt developed a system with the US Department of Agriculture which correlates coverage of water-sensitive paper with coverage in a tree. The simple system has stages. (Figure 1)

Matt said with most modern fungicides, 30% of coverage on a target will likely result in failure. Some pests, particularly red scale, require 100% coverage.

"We did some work on one property who had used Surround and at first glance, the coverage looked good, but upon closer inspection with spray cards the coverage was patchy.

"Using cards provides a good assessment, but sometimes it just takes an attentive eye to look at the target. We walked behind one sprayer spraying water and it was not fully wetting the wood as it was intended. They were spraying 10,000 litres per hectare. It's scary to think that much water could be so misused."





Matt said recently published university research showed at least 90% of what is spraved for insecticides is lost to off target locations within the orchard. With some pyrethroids 90% off target will reduce the effectiveness of the spray by a minimum of 25%.

One key part of the problem is incorrect speed of the sprayer. (Figure 2)

"I think every Australian spray rig must have a V8 in it. You need to slow down. Published research has shown 3.2km/ hour is the best average speed for coverage. Go slower than this if you do not have strong enough equipment."

Matt said the average sprayer delivers the majority of water down low and very little up high. The goal for all growers should be uniform coverage from top-to-bottom and throughout the canopy.

"A common mistake is to use a single uniform nozzle size. If you deliver a uniform water amount through the canopy, it often means not enough up top and over saturating down low.

"You need to look at the density of the canopy to water volume. For example, if you have 60% of biomass in the top third of the tree, you need





MANAGEMENT



Growers on the Citrus Tech Forum tour follow the sprayer to inspect the result. The demonstration was held at Costa Group's Murtho farm, Kangara.

Figure 2

60% of water up there. You can do the calculations to work out biomass or make a sensible judgement call on how much is there"

Matt said he has worked with growers who have applied these lessons who are now spraying significantly less often.

"Maybe their tank mix winds up to be more expensive, but they are producing better IPM and getting higher yield or cleaner crops because they just took a look at how they're spraying."



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Back to the future for IPM

Entomologist Dan Papacek told the Citrus Technical Forum that growers need to get back to the basics of best practice IPM, following a shift away from IPM practice over the last 15 years.

Dan, who established Bugs for Bugs in the 70s, said history is effectively repeating itself, as the industry has been moving back towards reliance on 'silver-bullet' chemical solutions.

However, an over-reliance on chemicals will lead to increased resistance. so "effective IPM will help to conserve valuable chemistries."

"Citrus, almost more than any other crop, has a long history of biological control." Dan said.

"There are 192 beneficials listed for citrus in Australia alone - and this is not all of them."

Dan said resistance to organophosphate pesticides in the 70s, particularly red scale and mites that became uncontrollable, drove innovation in IPM.

Aphytis mass rearing began in South Australia and Queensland at that time in a bid to manage red scale. 3-5 releases from early spring occurred at three week intervals and systematic monitoring procedures were developed for both pest and beneficial insects.

Predatory mites were also recognized as valuable aids to mite control. Pollen proved to be a supplemental food that enhances predatory mite numbers. Alternate slashing was developed as a way to provide food and improve environmental conditions for mites and other beneficial species.

Over 20 years, Queensland growers steadily adopted IPM.

Dan said several new compounds then became available in citrus - including Applaud, Confidor Guard, Admiral, Movento and Transform.

They have all proven very effective, and are compatible with biological control agents, although they are still prone to resistance development.

Key points

- Growers moved away from IPM
- Chemicals not the silver bullet
- IPM needed to protect chemical availability

"Over the last 15 years or so we have seen a shift away from IPM practice. The industry has been moving back towards reliance on silver-bullet chemical solutions." Dan said.

"Chemicals are not the problem - the way we use them is the issue."

Dan told the audience that although they "probably want to hear about new IPM chemicals, new bugs and new technology, we already have an excellent range of tools".

"The opportunities lie in better integrating them. This means getting back to the basics of best practice IPM."

For Best Practice IPM:

- Manage the crop environment to encourage naturally occurring beneficials and maximize the value of any introduced biological control agents
- Introduce biological control agent early in the crop, before pest build up
- Regular introductions work best
- Implement a range of complementary strategies
- Monitor regularly, both pests and beneficials
- Use pesticides sparingly, wisely and with a clear understanding of any side effects



Dan Papacek

Dan said there are new developments occurring, including new species; more efficient production methods, which will lead to more affordable products; and more efficient release technology, which will improve distribution and reduce labour costs.

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Early results for deficit irrigation trials

The production of high quality citrus is critical to sustain and grow consumer demand in both domestic and export markets.

Asia is the major market for Australian citrus exports and Asian consumers prefer sweeter fruit.

Dr Tahir Khurshid, a research physiologist with NSW DPI, says citrus growers exporting to Asia face a challenge of consistently supplying fruit that meets or exceeds consumers' expectations.

"Replacement of existing citrus orchards with new varieties more palatable and appealing to consumers in Asia is neither economically feasible nor practical," he said.

"It is therefore essential for growers to adopt smart, innovative, agronomic practices that can deliver improved fruit quality suitable for Asian markets."

Dr Khurshid said Chinese consumers preferred fruit with low fruit acidity (about 0.6%) and that fruit acidity above 0.8% was considered as lesser quality "sour" fruit.

Minimum acceptable individual fruit Brix levels was 10.5° to 12° and with high preference around 14°.

"Increasing the Brix and maintaining acidity within acceptable levels is an important factor to increase the demand for Australian citrus in Asian markets," he said.

Dr Khurshid said global research

reveals fruit quality, especially sweetness, can be improved through manipulation of tree physiology.

Regulated deficit irrigation (RDI) is one practice that can be applied during different phenological stages to enhance fruit sugar content, with the added bonus of significant water savings.

"However, successful adoption of the RDI technique requires optimisation of irrigation scheduling, understanding the stage at which to apply deficit irrigation stress, and investigation of potential negative effects on fruit quality and long-term tree health," he said.

RDI is not widely used commercially in Australia to enhance sugar levels in navel oranges and there has been no research done in Australia.

Dr Khurshid is leading a research program on regulated deficit irrigation.

The objective of this project is to increase sugar levels in Navel oranges without compromising the final fruit size at harvest

"Australian citrus exports are mainly based on selling large-sized oranges, which have a higher return for growers.

"The RDI is expected to enhance sweetness, save water and reduce



This stressed tree was part of the research trial.

electricity costs for growers. This will reduce inputs and increase fruit prices of sweeter oranges."

Ultimately, a set of guidelines will be developed for growers to use the RDI method to suit their Navel crops based on their varieties, rootstock and soil conditions.

A large replicated trial over 1.5 hectares has been established at NSW DPI's Dareton Research Institute, using three Navel varieties M7 (early maturing), Houghton (mid-maturing) and Lane Late (late-maturing), grafted to Poncirus trifoliata or Troyer citrange rootstocks. The project uses over 1000 trees (8 years old).

A range of RDI treatments were applied in the first year to the above rootstock/scion combinations.

The first year was spent investigating the best time for RDI application and the length of RDI application which can effectively increase the sugar levels in Navel oranges.

RDI treatments were applied between mid-February, mid-March or mid-April, 2018, to three Navel varieties.

RDI treatments with 50% of the control (full irrigation - 100%) were used for 60 days for February, March or April RDI treatments.

Full irrigation was resumed after 60 days after the completion of RDI. Table 1 shows the un-stressed and stressed trees during the RDI experiment.

The results from Table 1 indicate that both the February and March treatment was able to enhance sugar levels in all three Navel varieties.

Regulated deficit irrigation treatment in February was most effective for M7 Navels as compared to the control and March RDI treatment. However, the

effects were more pronounced in Troyer citrange rootstock as compared to Tri22.

February and March RDI treatments enhanced sugar levels in both Houghton and Lanes late varieties and these effects were higher for Troyer citrange rootstocks as compared to Tri22.

Table 2 suggests that the fruit size was decreased with both February or March RDI treatments for all three Navel varieties as compared to control.

This reduction was more pronounced for February RDI treatment in particular in Troyer citrange as compared to control.

The increase in BrixO values for Navel varieties was a positive output but this increase came with a cost of fruit size at harvest.

There is a need to quantify the sugar

for 2018 growing season.

| | M7 | | Houghton | | Lane Late | |
|---------|-------|--------|----------|--------|-----------|--------|
| | Tri22 | Troyer | Tri22 | Troyer | Tri22 | Troyer |
| Control | 13.8 | 14.1 | 12.8 | 13.1 | 12.9 | 12.8 |
| 15 Feb | 15.1 | 15.9 | 14.4 | 14.7 | 14.3 | 14.9 |
| 15 Mar | 14.8 | 15.4 | 14.1 | 14.4 | 14.4 | 14.9 |

 Table 2. The effect of February and March RDI treatments on % fruit size <88 count or >75
 mm at harvest for M7, Houghton and Lanes Late Navel on Tri22 (Poncirus trifoliata) and Troyer citrange rootstocks for 2018 growing season.

| | M7 | | Houghton | | Lane Late | |
|---------|-------|--------|----------|--------|-----------|--------|
| | Tri22 | Troyer | Tri22 | Troyer | Tri22 | Troyer |
| Control | 62 | 43 | 74 | 61 | 81 | 75 |
| 15 Feb | 40 | 20 | 56 | 37 | 63 | 45 |
| 15 Mar | 48 | 39 | 53 | 48 | 67 | 56 |





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levels in Navel fruit without the reduction in fruit size.

Therefore, this growing season, Dr Khurshid is adjusting the deficit irrigation treatments in a bid to enhance sugar levels with the least reduction in fruit size.

Dr Tahir Khurshid is a Research Physiologist with the NSW Department of Primary Industries.

This research has received funding from the Hort Innovation Citrus Fund





Table 1. The effect of February and March RDI treatments on BrixO values at harvest for M7, Houghton and Lanes Late Navel on Tri22 (Poncirus trifoliata) and Troyer citrange rootstocks

Australia must prepare for devastating diseases now

Australia is in the fortunate position to be able to plan for potential disease incursions now, while it is free from major pests and disease, and it would be in its best interests to act.

This was the message from Nate Jameson, who owns Brite Leaf Nursery in Florida, USA, and has seen firsthand the devastating effect of HLB in his country.

Nate was a key note speaker at the 2019 Citrus Technical Forum in Adelaide and is also Presidentelect of the International Society of Citrus Nurserymen.

HLB has devastated the citrus industry in the USA, first in Florida and now in California, where findings of the disease have risen 400% in the last few months.

In Florida, where it has cut the citrus industry's production area by almost half, it was first detected in a backyard before spreading rapidly through the State.

"It's not that we sat on our haunches and didn't do anything," Nate said. "It shows how quickly it can spread."

"You guys are so blessed in the way you have the opportunity to sit around the table and have a rational discussion on what you're going to do.

"You have time to be proactive. That's a valuable thing in itself.

"You have time to have those discussions. You don't have to reinvent the wheel. You can survive infection.



Nate Jameson said Australia is fortunate that it can plan for a potential disease incursion before it happens.

"Almost half the citrus industries in the world have done it or are in the process of doing it.

"Remember there is a lag time between infection and detection!"

The timeframe between infection and detection of the disease is three years. Nate provided examples of how the nursery industry in Florida is retrofitting its nurseries but also focused on the bigger picture.

"The biggest challenge you have as an industry is getting your head around a rule. You need a federal rule with teeth so it can deal with those that intentionally break the rule," he said.

"The rule should create a level playing field. You cannot as an industry say Queensland has to have a rule and WA does not

"You also cannot impose a financial burden on one segment of industry and not impose that burden on another.

"You can't say to a commercial citrus nurseryman, you need to make this big investment, but not deal with those making propagations in the backyard. If you do that, you allow one person to benefit by cheating a rule. A rule with teeth is needed for those who refuse to understand or refuse to comply, and that rule needs to be enforced.

"That part of the decision is critically important - there must be an even playing field for everyone on a federal level."

Nate said that was one of the mistakes made in Florida.

"We did not put enough teeth in the rule, we had to go back and amend the rule to deal with it.

Nate said the nursery industry is a critical part of protecting the industry from disease, but any plan needs to include all aspects of the industry.

"We made a mistake in Florida thinking one segment can have a significant



Fully enclosed greenhouse at Briteleaf Nursery.

effect on survival of HLB. It does have a significant effect but it is not the only one."

He also said planning needs to focus on more than one disease.

Disease incursion requires multi-million dollar changes

Nate and Anna Jameson have been selling plants from their Florida-based nursery to commercial growers since 1998.

In 2006, following the statewide spread of citrus canker, the Jamesons built a new facility and moved their nursery 120km north of the original premise, to isolate themselves from commercial nurseries.

The production system changed to a fully enclosed protected culture program requiring multiple layers or steps to prevent disease entrance. The lavers include double entrances with air curtains at all external

entrances, a walk-through foot bath and spray booths and clothes changing are required for everyone prior to entry into any of the seedlings, tree or budwood production areas. Hand washing is also required for everyone when transitioning from one area to another.

Any citrus nursery that is in business in Florida is legally required to have a greenhouse with screen on all sides with a "double entrance" and positive air pressure to prevent insects entering the structure

To maintain profitability in this type of system, a high plant density is required to generate the dollars per square foot needed to cover the cost of construction.







"Our Brazilian friends spend more money controlling black spot than HLB. In your discussion processes you need to look at the big picture. Don't become myopic and focus on one disease or you will end up retro fitting."

Nate also said traceability was essential and random inspections of garden centres are also required to ensure compliance.

Nate Jameson's trip to Australia was part-funded by Auscitrus.

This high density inside fully enclosed structures creates another problem increased moisture. As one part of the structure changes, further changes will likely follow.

Nate said all citrus nursery growers in the United States are individually making multi-million dollar investments to do everything possible to prevent the spread of disease.

The cost of retrofitting all nurseries in Florida to ensure exclusion of potential pests and disease is passed onto industry through increased tree costs. In Florida, the price of the tree doubled in 12 months



Getting on the front foot

When citrus canker was detected in the Northern Territory last year, Nutrano Produce Group made immediate changes to protect its Katherine farm against potential incursion.

General Manager of Nutrano's Katherine farm. Joshua Clementson. told the Citrus Technical Forum that first and foremost, it tightened all biosecurity measures.

Joshua said these measures could be applied on all farms:

- Ensure production material is purchased from accredited suppliers with appropriate plant health certificates.
- Monitor orchard frequently for presence of new pests and investigate sick plants for unusual symptoms.
- Ensure staff and visitors adhere to orchard biosecurity and hygiene practices.

Nutrano also trained all relevant staff to be able to identify symptoms in both packing shed and farm. Joshua said that citrus canker can easily be confused with other citrus diseases. citrus scab and alternaria.

Following the detection of citrus canker in the NT (it has been found predominantly in suburbs of Darwin), Nutrano obtained citrus canker property freedom accreditation so it could return to trading of citrus.

This involved two surveys of the orchard by the Department of Primary Industries and Resources. NT. one at petal fall and the second prior to harvest

Each survey accreditation involved inspecting 600 trees throughout the orchard

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Joshua Clementson

There have been four surveys completed, three in 2018 and one in 2019 to achieve property freedom accreditation.

It then created a comprehensive biosecurity manual for the Katherine farm, with the assistance of the Department of Primary Industries and Resources (DPIR), NT.

New measures include:

- All employees park at office car park with no external vehicles entering the orchard
- · Visitors dip boots to avoid potential bacteria contamination
- All workers and visitors are transferred to the orchard on farm buses
- In-house trucks used to transport fruit to packing shed

Changes have also been made to the packing shed since the citrus canker outbreak, including:

> Total Value per grade - Whole 1.8ha Block Harvest \$80,000 +\$12.730 \$70,000 \$60,000 \$50.000 \$40,000 \$30.000 \$20,000 \$10,000 0 1st Grade 1st Grade 2nd Grade 3rd Grade Total Value Seasol treated Untreated

 Installation of chlorine dip to completely wet fruit in accordance

Fruit must remain completely

wet with solution of chlorine for

• All fruit graders have been trained to

The pack house has been audited by

house registration and the company

A further three audits have occurred

Now, 2% of all consignments leaving

They also identify and document the

risks along with the measures taken to

"Ensure your records are always up to

date and you document everything

He advised businesses wanting to

create a biosecurity plan to use as

to overcome these risks without

to work in conjunction with local

all operational procedures.

many practical measures as possible

creating huge capital expense, and

"They are there to help," he said. •

government authorities to comply with

the packing shed are inspected for

now keeps treatment records for a

the DPIR for Nutrano to gain pack

of available chlorine

detect for citrus canker

minimum of 24months.

since registration.

citrus canker.

mitigate these.

required," Joshua said.

2 minutes

with APVMA permit with 200ppm

Will your biosecurity plan count when it matters?

The majority of the Queensland growers who attended a biosecurity workshop in Mundubbera in February said they have started a biosecurity plan for their business, but now believe it should be improved.

Citrus Australia organized the workshop with their Queensland Regional Advisory Committee. It was presented by National Citrus Surveillance Coordinator Jeff Milne. and Citrus Australia's Mara Milner.

"The workshop was held to help growers recognize the need for biosecurity, and to discuss the barriers in developing a biosecurity plan."

The Biosecurity Manual, which is available from the Plant Health Australia website, includes a template to help arowers with their biosecurity plan, including tips on simple preventative measures, monitoring, and reporting.

Using the Manual, participants in Queensland were able to:

- Identify biosecurity issues
- Assess the risks
- Develop a biosecurity plan to safeguard their business in the event of any incursion

Simple preventative measures, monitoring, and reporting that will reduce the risk of a new pest, disease, or weed establishing in the orchard are listed in the Manual. These include:

- Monitor the orchard for pests
- Report anything unusual
- Use pest-free propagation material
- Manage produce carefully
- Manage people movements



Jeff Milne at the recent biosecurity workshop in Mundubbera

 Reduce risks from vehicles & equipment

> Jeff said orchard biosecurity not only protects the individual grower's business, but is an integral component of effective national biosecurity.

> "As the old saying goes, you're only as strong as your weakest link."

> established in an orchard would far outweigh the cost of establishing effective biosecurity, as it would reduce productivity in terms of yield and quality; increase production costs; and, reduce market access.

what is required of them when on the property



He said a new pest becoming

Once the biosecurity plan is developed arowers need to:

· Train and inform staff and visitors on



- Allocate responsibilities
- Review the plan annually or when threats change
- Audit the plan's implementation
- Incorporate the biosecurity plan into their Quality Management System

More than half the producers who attended the Mundubbera workshop believed their knowledge of exotic plant pests had increased as a result. Most said they would recommend the workshop to other growers.

Citrus Australia will be holding future workshops in other regions throughout the year. For further information, or to develop a biosecurity plan for your business, contact Jeff Milne via jeff.milne@citrusaustralia.com.au or 0427 352 742.

The national surveillance coordinator position is part of the project 'Improving Biosecurity Preparedness of the Australian Citrus Industry which is led by Plant Health Australia with funding from Hort Innovation. The program is helping to implement the National Citrus Biosecurity Surveillance Strategy 2018-2028, developed by Citrus Australia, PHA and the Department of Agriculture and Water Resources.







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Commercial pilot for SITPlus

Sterile Insect Technique (SIT) is a method of pest control using area-wide releases of sterile insects to reduce reproduction in a wild-population of the same species. SITPLus Program Director Dan Ryan provided this update.

It is employed to combat the impacts of Queensland fruit fly (Qfly) on Australian horticulture through the creation of the SITPlus[™] partnership in late 2014. Since then, thanks to a major investment of money and time by a wide range of partners, this national, long-term strategic research and development partnership has achieved great success in building foundations crucial for future commercial application of the integrated pest management solution. A wealth of knowledge has been both drawn on and developed, resulting in the successful development of a SIT factory in South Australia. The factory can now quickly produce large quantities of sterile flies. As a result, SITPlus ™ is now moving into a commercial pilot phase.

The pilot release program will provide proof of concept for Qfly SIT across a range of applications, including eradication, prophylactic release, area-wide management, and urban suppression. Funded for three years, the pilot will enable development of procedures and budgeting that will allow ongoing commercial or public SIT use in management of Qfly.

The release of SITplus[™] flies for eradication began in early 2018 with their use in finalising eradication in two urban Adelaide outbreaks. With both eradications achieving success, the method is now being employed for eradication in the Riverland Pest Free Area.



Dan Ryan at the 2019 Citrus Technical Forum in March.

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Prophylactic release is being trialled along the Murray River, to the east of South Australia, and west of Mildura. Due to the nature of these landscapes, release has been by plane. The aim of this component of the program is to limit fly movement along the river towards the Riverland. The river is believed to be one of two key pathways for Qfly movement from the Sunraysia towards the Riverland. The other key pathway for movement is believed to be by road, with the Yamba roadblock being successfully used to attempt to mitigate movement.

All Riverland releases will be conducted by SARDI. Pupae (the fly stage before adults) for the Murray River releases will be reared in a specialised facility located at Netley, South Australia, with pupae for the Riverland eradication rear-out at Loxton.

Area-wide management is planned to be trialled in the Hillston, NSW region. Hillston is well suited to the application due to its relative isolation and poor habitat outside susceptible farms. The area has four major farms susceptible to Qfly, plus a low-level urban population. Release will be conducted across the major farms and township, with an aim to suppress Qfly numbers to a sub-detectable level. Release over the township is important to prevent farm workers from carrying Qfly from the township to reinfest managed farms. Town release will also have the major social benefit of allowing back yard fruit and vegetable production.

The Hillston releases will be managed by NSW DPI. Pupae for the Hillston releases will be reared at Yanco, NSW in new purpose-built facilities.

The last planned use is for an urban release program. This program is being conducted over Cobram, Victoria; aiming to suppress an urban population to prevent it moving out into the surrounding horticulture. Cobram was chosen due its existing intensive trapping grid, the proximity of horticulture to the town, and the support of Cobram Fruit Growers and the Moira Shire Council. It also has a reasonably similar township nearby, Maroopna, that can be used as a comparator when assessing impact. Release commenced on March 20 to attempt to suppress pre-winter population and will recommence in early spring before Qfly becomes active.

Cobram releases will be managed by Agriculture Victoria, with pupae reared in a specialised facility located at Tatura, Victoria.

All four trial uses are part of a Hort Innovation pilot project, as part of its Hort Frontiers Fruit Fly Fund: 'FF17000 - Post Factory Pilot of SITplus[™] Fly Production'. The project is led by Macquarie University, with SARDI, Agriculture Victoria, NSW DPI and Plant and Food Research also collaborating with the project. Biosecurity Tasmania are a funding partner alongside the collaborating organisations. No national R&D levy funds are being used in the release pilot. Trials will continue over 3 seasons and focus on the release of both male and female sterile Qfly. In associated work. NSW DPI will conduct trials to determine the risk of damage to fruit by sterile female Qfly.

The pilot operation of the factory will continue under a new Hort Innovation project, as part of its Hort Frontiers Fruit Fly Fund: 'FF18003 - Port Augusta QFLY SIT Factory Pilot Operation'.

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Top Spanish researcher shares knowledge with industry

Leading postharvest Spanish researcher, Prof Lluís Palou, joined Australia's citrus postharvest research team in NSW in March, helping develop practical treatments to control postharvest decay.

Prof Palou is the Director of the Postharvest Technology Centre at the Instituto Valenciano de Investigaciones Agrarias (IVIA) in Valencia, Spain and is a world leader in the postharvest control of citrus fruit decay.

He joined John Golding and his team at the Centre of Excellence for Horticulture Market Access in the NSW DPI facility at Ourimbah, NSW, for a week after the Citrus Technical Forum in Adelaide, where he was a keynote speaker.

In Adelaide. Prof Palou discussed the major trends in the production and handling of citrus in Spain, where there is increasing restriction in the use of postharvest chemicals.

Citrus growers and packers in Spain have not been able to use the postharvest fungicide guazatine for many years to control sour rot, and now propiconazole is due to be phased out this season in Europe.

This leaves Spanish producers with few options to control sour rot. In addition, Prof Palou outlined the current review of the commonly used fungicide, imazalil, which is currently underway in Europe.

The current risk of fewer postharvest chemicals and many markets wanting fewer chemical residues have resulted in a growing research focus on 'fungicide-free' control of citrus postharvest decay.

John Golding, NSW DPI, who leads the Australian Postharvest Science Project, funded by Hort Innovation and the NSW DPI, said the development of effective decay control management strategies is critical to the export of Australian citrus, where long-term shipping and storage is essential.

Prof Palou said that the foundation of any developments in the control of postharvest decay is the knowledge of pre- and postharvest factors that affect decay during storage.

Managing these factors at the right time is essential to control decay.

The range of alternatives to conventional fungicides to control decay are:

- · Physical treatments, such as heat treatments, gas treatments (such as ozone) and UV treatment
- Alternative low toxicity chemical controls, such as natural compounds and food additives
- Biological control methods, such as micro-organisms
- Combination of alternative methods. For example adding different treatments to get better decay control



Prof Lluís Palou with John Golding, NSW DPI.

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Prof Lluís Palou with John Archer, NSW DPI.

Prof Palou outlined the commercial application and limitations of these alternative decay control methods. His talks are available on the Citrus Australia website.

John said Prof Palou's visit to the NSW DPI research facility helped develop a stronger collaborative research program.

"The exchange of research and practical ideas to improve decay control and optimise fruit storage will assist both the Australian and Spanish citrus industries." John said.

"Whilst here, Lluís assisted the trial of 'generally regarded as safe' (GRAS) food additives such as salts for their control of postharvest decay.

"These new potential treatments not only have to be effective at controlling decay, but also be compatible for incorporation into commercial situations."



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Prof Palou explaining the control of postharvest decay at NSW DPI at Ourimbah.

Prof Palou's travel and visit was supported by the 'Australian **Postharvest Science Project'** (CT15010) funded by Hort Innovation and NSW Department of Primary Industries.





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Optimising degreening conditions to reduce chilling injury in lemon exports

Australian lemon exports have increased by 3- to 9-fold since 2012/13 (ABS, 2018). Maintaining this market growth requires production and delivery of consistent quality fruit for customers and consumers. The Serviced Supply Chains (AM15002) project led by the Department of Agriculture and Fisheries in Queensland is supporting export development by working closely with citrus exporters to demonstrate the benefits of improving fruit degreening practices and cold chain management to reduce loss of quality during distribution.

Lemons from Queensland production regions often need degreening to obtain marketable yellow skin colour. Treatment with 5-50 ppm ethylene for 1-3 days at 20-30°C is recommended for degreening lemons (Hardy 2004, Porat 2008). It is a balance between enhancing the rate of loss of green colour and minimising the development of quality defects such as chilling injury, skin browning and disease. In 2017, we identified considerable variations in ethylene concentration, temperature and treatment duration across several commercial degreening rooms in Queensland's Central Burnett. We completed three trials in 2017 and 2018 to evaluate the impacts of these variations on fruit export quality. We found that to balance between obtaining desired colour and minimising defects, we recommend that early or mid-season lemons for export market should be degreened with no more than 5 ppm ethylene and at 20-24°C for 3 davs.

Accelerated degreening can increase skin defects

Late-season 2017 'Eureka' lemons were exposed to 0, 5 and 29 ppm ethylene at 24, 29 and 34°C for 3 days to reflect conditions observed in commercial practice. They were stored at a cold disinfestation protocol temperature of 1°C for 21 days to simulate sea freight to export markets. Previous shipment temperature monitoring indicated that temperatures could drop as low as 1°C, which could cause chilling injury to the fruit. They were then kept at 20°C for 6 days to assess fruit quality under simulated air-conditioned retail conditions. Key findings were:

- Degreening with 5 or 29 ppm ethylene accelerated the loss of green skin colour at all tested temperatures, but stronger effects were found with 29 ppm ethylene at 34°C.
- Exposing lemons to 5 or 29 ppm ethylene during degreening at 29°C or 34°C was associated with increased chilling injury (pitting and discoloured sunken lesions) and rots following cold disinfestation (Figure 1).

- Fruit held at 34°C without ethylene developed more chilling injury and rots after cold disinfestation and holding at 20°C than fruit degreened with 5 ppm and 29°C and 24°C (Figure 2)
- The best combination for colour development and minimising skin defects was 5 ppm and 24°C.

Finding the optimal time x temperature combination

This trial aimed to identify the optimal time and temperature to degreen lemons without increasing the risk of skin defects. Early-season 2018 'Eureka' lemons were degreened with 5 ppm ethylene at 20, 23, 26 and 29°C for 0, 1. 2. 3 and 5 days. They were stored at 1oC for 21 days and then held at 20°C as described above. Key findings were:

- Using a colour meter, we observed that fruit colour at harvest had a hue angle between 100° (light green) and 113° depending on seasons and decreased to about 96° or 93° (full yellow with no obvious green colour) at the end of degreening.
- Exposure to 5 ppm ethylene for 3 days at 26°C or 29°C was sufficient to achieve a hue angle of 96° (very, very light green). When degreened at 23°C and 20°C, exposure to 5 ppm ethylene for 4.5 and 5 days, respectively, was required (Figure 3).

- The skin hue angle continued to decrease during simulated sea shipment from about 96° after degreening to 94-95° at outturn. If fruit of 96° hue is required at outturn, the duration of degreening at 26-29°C could be reduced to 2 days while treatment at 20-23°C could be reduced to 3 days.
- While there was still a tendency for more defects to develop on fruit degreened at 29°C, the fruit used in this experiment developed relatively few skin defects following disinfestation compared with the 2017 trial, probably because season or production practices increased fruit tolerance to the degreening treatments.

Optimising ethylene concentration for effective degreening

The aim of this trial was to identify the most effective ethylene concentration for degreening at 24°C for 3 days. Mid-season 2018 'Eureka' lemons were degreened with 0, 5, 10, 20 and 30 ppm ethylene at 24°C for 3 days. They were stored at 1°C for 21 days and then held at 20°C as described above. The keys results were:

- · Increasing the ethylene concentration accelerated the loss of green skin colour as reflected by a decrease in hue angle. The greatest reduction occurred between 0-10 ppm, as compared with 10-30 ppm.
- The loss of green skin colour continued during cold disinfestation. which was consistent with results from the above trial.



Figure 1. The effect of degreening temperature and ethylene concentration on the incidence of rots on 'Eureka' lemons that developed following simulated sea freight plus 6 days at 20°C. Treatment differences greater than the Lsd bar represents a statistically significant treatment effect



chilling injury (right).



Figure 3. Effects of the duration and temperature of a 5 ppm ethylene degreening treatment on lemon skin colour (hue angle) at removal from the cold disinfestation treatment. Fruit with an average hue angle of about 960 appear as very, very light green, and fruit with 930 have no green colour (fully yellow).

- A higher percentage of fruit developed skin browning after shipment when degreened at 30 ppm ethylene as compared to the lower concentrations.
 - The incidence of chilling injury and rots was relatively low following cold storage and during holding at 20°C when compared to 2017 season results, possibly in part because degreening was completed at 24°C.

Conclusions and recommendations

The most effective ethylene concentration for promoting adequate loss of green skin colour in early- and mid-season fruit at 24oC was 5 ppm.

The benefits of degreening late-season fruit with 5 ppm ethylene at 24oC may be outweighed by the increased risk of chilling injury and rots.

Taken overall, the ethylene concentration used for lemon degreening should be the minimum



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Figure 2. Photographs of 'Eureka' lemons showing oleocellosis (left), skin browning (centre) and

required to promote loss of green skin colour without stimulating skin defects following cold disinfestation and distribution in export markets.

To balance between obtaining desired colour and minimising defects, we recommend that early or mid-season lemons for export market should be degreened with no more than 5 ppm ethylene and at 20-24°C for 3 days.

Where exposure to low disinfestation shipment temperatures is not required (e.g. domestic markets), fruit could be degreened with 5 ppm at 20-24°C for 4.5-5 days or at 26-29°C for 3 days.

Article submitted by Hung Duong, Lawrence Smith, Andrew Macnish, Andrew Mead, Peter Hofman, DAF.

For more information contact: Hung Duong, Research Horticulturist, at DAF; hung.duong@daf.qld.gov.au or 07 53811356.

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References ABS (2018)

Hardy, S. (2004), "Growing Lemons in Australia-a Production Manual." New South Wales, Australia: NSW Department of Primary Industries Porat, R. (2008). "Degreening of citrus fruit." Tree and Forestry Science and Biotechnology 2: 71-76.







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