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2020

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Nº3

Talking Avocados

2019/20 FACTS
AT A GLANCE

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COMING

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Talking Avocados

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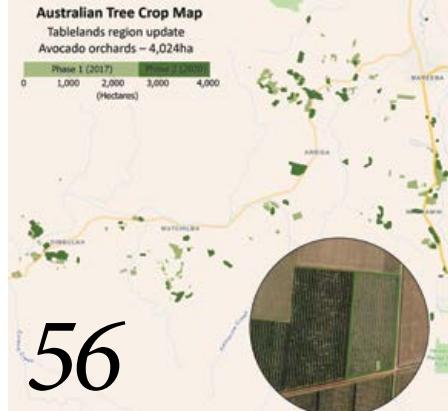
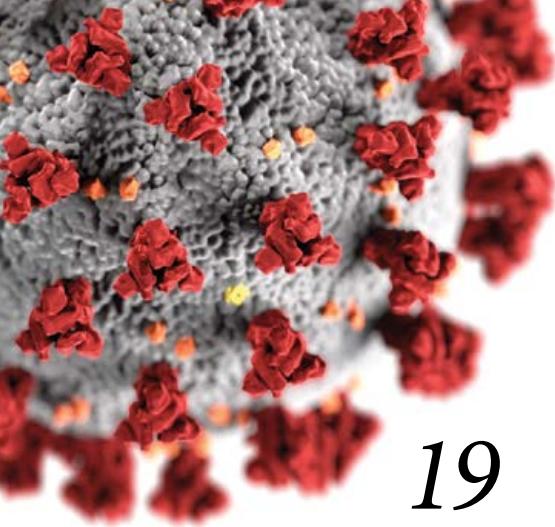
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CHAIR'S PERSPECTIVE

Jim Kochi, Avocados Australia Limited



Well, the global pandemic continues to roll along, and with it a changed landscape in terms of, well, almost everything.

For the Australian avocado industry, I maintain that it's not all doom and gloom, but it's certainly adding difficulties.

As the Western Australian harvest continues, we are seeing a taste of what's to come for the start of the 2021 seasons, mostly centred around labour shortages.

The backpacker cohort we rely on has been rapidly leaving our shores, and there's no positive signs about international air travel re-opening in any significant way. While there are certainly willing workers from some of our Pacific neighbours, we will be competing with not just the national horticulture sector but a range of others, including meatworks, for those who can make their way to Australia.

Avocados Australia is carefully watching the Queensland Seasonal Worker Program trial, where industry and the agriculture department worked to secure an on-farm quarantine option.

We very much need this to be successful, so that the model can then be considered by other states. Allowing incoming workers to complete their two week quarantine period on farm, while working, goes some way to solving two of the difficulties with this program.

The first, is that the cost of flights and quarantine are likely to be covered, at least in part by the labour contractors/growers. Having people out and productive in the orchard will be a definite bonus.

And the second, is that it provides a way around the limited spaces available in hotel quarantine in our major cities.

The Australian Government has a preference that these spaces are used by returning Australians, and I think

we can all understand that. Some people have been trying to get home for months now.

So where does that leave us? It leaves us relying on the domestic labour force to pick up to six million trays just in North Queensland. We are going to be stabbed by a double-edged sword, having a large crop we need to get to market, but potentially insufficient labour.

Now is the time for growers to be very aware and making their workplaces as attractive as possible for staff. These people are coming to work for us, and they are someone's children and we should treat them how we would like our children treated. They are not indentured workers, and as an industry we need to not only make our workplaces safe, we need to have our industry seen as the employer of choice because of it.

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CEO'S REPORT

John Tyas, Avocados Australia Limited



2020 has certainly been an “interesting” year for the Australian avocado industry. We started with fires, we rolled into a pandemic, a new international player entered our market, and we’re facing a summer of “steady” domestic supply. Where to even start for this report?

The entry of Chile

After many years of a summer period supplied primarily by southern Australia and New Zealand, this year we have a new player: Chile. The country received import approval from the Australian Government this year, and after initial airfreight trials, several consignments have been dispatched by seafreight. As at mid-November, Chile has exported some 912 tonnes to Australia, but not all of that has yet arrived.

This activity is a reflection on current domestic supplies (lower than expected, it has to be said) and it’s unlikely this “opportunity window” will exist for Chile (or any other country) in future years.

As Australian production continues to expand, the role of imported avocados will diminish. However, Australian growers and supply chains will have to work harder and smarter to remain competitive.

Quality focus

Quality continues to be one of our highest priorities and I’m pleased that industry can now access avocado retail quality monitoring results via the Best Practice Resource, as a result of the *Avocado Retail Quality Monitoring project* (AV19003). Insights into the performance of the industry and retailers will be updated on a monthly basis. Additionally, insights that track the quality over time for the main varieties (Hass and Shepard) will also be available. The retail quality insights are in the Retail module of the BPR, and you can read more about them on page 14.

Total non-video participants: 5

The global pandemic has pushed a great many events online this year, including our 2020 Avocados Australia Annual General meeting.

Facts at a Glance released

This is an annual publication that provides a good snapshot of our industry and we recently published the 2019/20 *Facts at a Glance*. You can read more on page 23, but it shows we recorded only slight increases for both production and consumption in 2019/20 but the trend is ever upward. Consumption is now at 3.88kg/person/year and production reached 87,546 tonnes in 2019/20. This continues the production growth trend, and we expect to reach at least 115,000t by 2025.

Online forum success

We know that in-person events will return one day, we just don't have a crystal ball to let us know when. Until then, the extension team (AV17005) are committed to bringing you some of the best Australian and international speakers, online.

You can read more about recent offerings on page 25, and you can also access recordings of the webinars in the BPR Library (check under the Event Proceedings heading). I encourage you to contact our Industry Development Manager Liz Singh (idm@avocado.org.au) if you have any suggestions for speakers and/or topics for the Avogrow webinars. Given the popularity of this format, they will no doubt continue to be a feature of the extension program going forward. That said, like everyone else, I can't wait to be able to attend in-person avocado events, and have the chance to take part in the ever-popular orchard walks.

New industry players

We are all aware that the Australian avocado industry is growing, and just how much has been apparent by work

on the National Tree Crop Map (pages 58-60). It has never been more important for us to have a good understanding of our production base. As our production grows, it is important that we tailor our marketing, research and advocacy work to adjust, and we can't do that without good information about what has been planted, by variety and year planted. We also need to ensure that all stakeholders are well informed and have access to our best practice information.

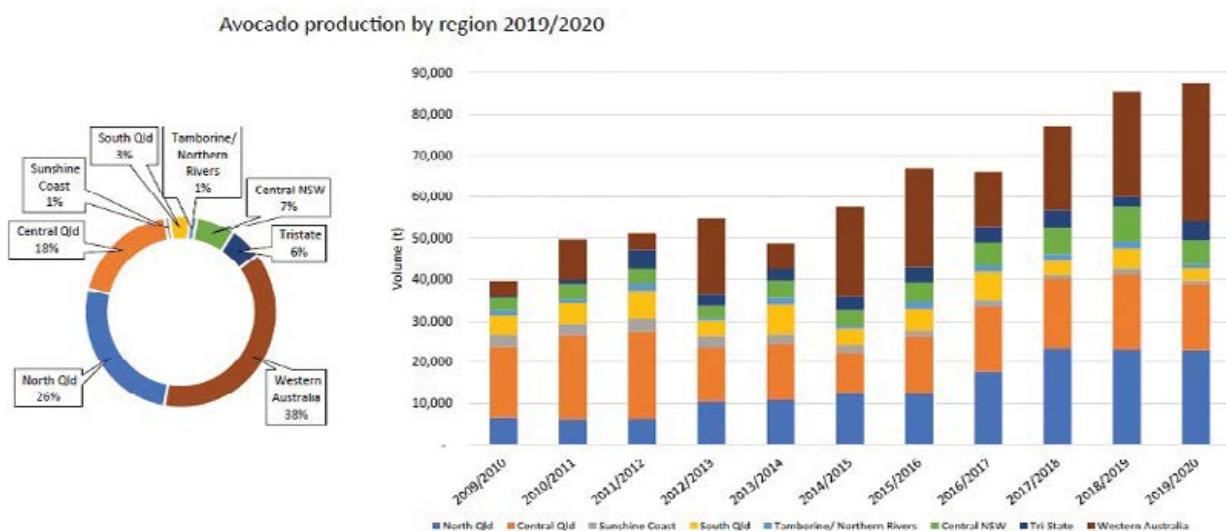
So, do you know a new grower who isn't receiving industry communication or doesn't have access to the our extensive best practice information? We encourage you to recommend they subscribe (for free) to the fortnightly *Guacamole* newsletter, for the monthly *Avo Alerts*, and for this magazine.

Encourage new members of our industry to make contact via admin2@avocado.org.au or by calling 07 3846 6566 for more information about our various publications and activities.

AGM results

Avocados Australia held its first online Annual General Meeting this year, and the incumbent directors were all re-elected unopposed. Tom Silver (Tamborine/Northern Rivers), Kym Thiel (Tristate), Robert Price (Sunshine Coast) and Daryl Boardman (South Queensland) will once again be part of the Board.

I am very proud of the work our team does on behalf of the industry each year, and I encourage you to read our latest annual report. This can be found in the Member Area of the website: avocado.org.au.



One of the diagrams from the *Facts as a Glance* publication. Read more on page 23.

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AROUND AUSTRALIA



TRISTATE

By Kym Thiel

The Tristate is rapidly approaching the end of what can only be described as a disappointing harvest for many. Crops were well down as expected, but fruit quality was the best it has been for a number of years.

Market conditions were strong and consistent throughout the season and this has led to well above average returns for those lucky enough to have some fruit. There was only a brief period where the introduction of imported fruit from New Zealand and Chile caused a minor market disruption and correction.

Imports are something that are here to stay in our industry, especially when strong market conditions exist such as this year. Our region has a number of smaller grower packers who all use a unique sticker to their business but tells the consumer very little about where the fruit originates from, eg is it Australian or imported. I strongly encourage all packers to consider using the Australian industry's Kangaroo Label as nothing is more Aussie than a kangaroo. This is something to think about and will be pushed into the future by the whole industry.

Looking forward, flowering has been strong and it is a little too early to tell what fruit set is like. There was definitely an early set that is well advanced on younger trees and the higher parts of older trees. Time will tell but most growers are expecting their orchards to rebound heavily given the lack of fruit in this past season. There is every chance the whole of the country will be in a relatively strong "on" year which may pose some marketing questions, for which we have been preparing, for a long time now.



CENTRAL NEW SOUTH WALES

By Ian Tolson

The local areas harvest was coming to a close in October. Growers having mixed results with production figures, probably due to the rationing or lack of irrigation earlier in the year. Bellingen are at the end of the Hass with Lamb Hass still to be harvested. Mangrove Mountain had a smaller than expected harvest period.

Comboyne area suffered through the reported hailstorm, fire and drought situations, and once again there were mixed production figures. All growers are appreciating the returns per bin being achieved this year.

Of course, once harvest is over, the usual chores of pruning, maintenance of not only equipment but the orchard are of utmost importance. Now more than ever, fruit quality needs to be the priority! Chilean fruit has landed on Australian shores and into the marketplace. Previously New Zealand was an Australian producer's only opposition. The defence mechanism against consumers purchasing this fruit:

- the "kangaroo" label and
- Country of Origin signage.

If acceptance occurs for this foreign fruit, it could lead the way for further imports from countries like Peru and Mexico, possibly an all year-round supply chain.

If, as a grower you take offence to the presence of this imported fruit, you need to voice your concerns/opinions through as many avenues as possible.

These reports are prepared well in advance of growers receiving them, that being the case it is hoped that all areas have experienced some good rainfall events in the meantime.



SUNSHINE COAST

By Robert Price

Here in the Sunshine Coast, it's safe to say that not much has changed, but everything has changed. In terms of the season, there has been a great variety in the rainfall received, even for orchards only 15km apart. Trees in the drier parts of the Sunshine Coast region are certainly doing it tough. It remains to be seen what this will mean for the 2021 season, and we are certainly hoping there won't be a repeat of the hail of previous years.

In 2020, the prices were quite good, but unfortunately the prices came at the same time as the area had a lot of smaller fruit, reducing the overall volume.

Overlaid across the top of those things we can (somewhat) control in our orchard, are the impacts of the ongoing pandemic, and the entry of Chile into the Australian domestic market. This is a clear reminder that our industry is a global one, and we need to ensure our fruit continues to be marketed

well to our Australian consumers. I am encouraged by news that the current marketing includes not just an emphasis on the nutritional, taste and versatility benefits of Australian avocados, but also the fact that they are Australian avocados.



TAMBORINE AND NORTHERN RIVERS

By Tom Silver

The Tamborine Northern Rivers growing region is enjoying a significantly easier spring than the previous years, with lower temperatures, higher humidity and regular follow up rain events. However, by the time this article goes to publication it's more than likely things will have changed! Fruit set in most orchards looks promising, and fruit size is also good. Many orchards suffered from late October hail storms, and while this didn't knock off much fruit or shred leaves, at least 10% of fruit on this farm is pock marked.

In terms of Australian fruit supply, 2021 is looking like the year "we had to have!". At this stage early crop estimates are going to be significantly up, no doubt as a result of many established orchards having an off/rest year combined with vast new plantings that have gone in, in recent years. The challenge now is to grow the best possible fruit we can! The best money will be on premium fruit supplied direct into the chains, any dumping of lower grade fruit onto the central markets just to simply "see what you can get for it" will drag all prices downwards, but that is next year's worry! For now, we need to ensure we are going to grow the best, biggest fruit we can. If you are unsure regarding sprays, nutrition, pruning, irrigation, etc, have a look at your avocado industry's Best Practice Resource on the Avocados Australia website: avocado.org.au.

Merry Christmas to all.



WESTERN AUSTRALIA

By Dudley Mitchell

Where to start – labour shortages, imported fruit threat, industrial port action, Victorian lockdown, COVID demand (or lack thereof), small crop ... at least the weather has been good ... so far!

The current crop out of Western Australia was well advanced in terms of maturity when harvest began in southern regions at the beginning of October. It will be interesting to see how late fruit performs with this high maturity now. The market has held up for Australian fruit with the major drivers being a lack of supply rather than strong demand and I don't see this changing any time soon. The first class market is fairly



The picking season has finished on Tom Silver's Tamborine Northern Rivers orchard, but the damage from a recent hailstorm might impact on 2021.

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competitive with New Zealand fruit arriving in waves due to port problems. The lack of a robust café culture, especially in Melbourne due to their lockdown, has also created a bottleneck for class one fruit. In general, though, the season is progressing without any major speedbumps albeit without much fanfare.

On farm, labour shortages are a headache even though the crop is down. As we go further down this rabbit hole of COVID and look eight months into the future, there will be some serious issues to face if the international borders do not open soon. For Western Australia, an anticipated reopening of borders in July may be too late to supply the numbers of backpackers required for labour and for Queensland 2021, well they will obviously miss the boat and be in a world of hurt if nothing is done sooner. This could be the biggest threat to our industry over the next year and unfortunately it is out of our control.

Talking about next year, a heavy flowering here in Western Australia has been accompanied by beautiful weather and multiple pollination events over the second and third weeks of October with more to come. Peak flowering in the fourth week of October and first week in November are shaping up to be coinciding with excellent conditions. There is still much time and climate events to come but early signs are promising for a massive year in 2021 – it will be a challenge to get forecasts right.

On that note I wish all the WA growers the best for the coming season and as always please feel free to contact me if you have any questions.



SOUTH QUEENSLAND

By Daryl Boardman

Harvest has finished for the year in South Queensland, and we're all looking to the skies, hoping that the La Nina that the Bureau of Meteorology is forecasting delivers rain, not hail.

Flowering looks very good, but we are in the early stages. If rain does come, we could be in for a very good season in 2021; water availability remains a major issue.

Without major rain to fill underground aquifers, it will be a very tough summer for the region, as we've recently seen, the fire risk is still very high. We have already had several blazes in the South Queensland region.

Regardless of how the season plays out, due to the ongoing pandemic, we will have an issue with labour next year. Our international borders are unlikely to be open, there's only so many Pacific workers who can travel to Australia, and we are all going to be relying more on local, casual labour.

I encourage everyone to start their recruitment process early, and to spread the net wider than usual.

Everyone should talk to their accountants about possible grants or money available from government through the latest budget. Business Queensland has a list here: business.qld.gov.au/covid-assistance.

I want to again thank everyone in the region for entrusting me with the position as your South Queensland director, as confirmed at our latest Annual General meeting. I encourage everyone to consider this position in three years' time, as I feel by then I will have been on the board for nearly 20 years and it may be time for some fresh ideas. Please always feel free to call if you have any concerns or need to provide input into the direction of the industry, or progress new ideas for the benefit of everyone.



CENTRAL QUEENSLAND

By John Walsh

The promised change in the rain has not yet materialised. While we have been teased by storms here in Central Queensland, they have not pushed out through to the coast. The exception is that some significant damage has been done to growers in the Kumbia region.

The fruit set from the flowering is large and all growers will be under pressure to get the crop sizing, so timely rainfall is certainly needed.

By all accounts there will be significant volumes of fruit around next year so growers must be mindful that quality will be an important factor in increasing sales so that returns can be maintained.

I encourage everyone to check the new retail reports available to industry, as they give us a good idea of the quality of our fruit once it reaches supermarkets, independent fruit stores and specialty retailers. Ensuring our customers get good quality available at every shop is a combined effort. We as growers cannot do it alone, and neither can retailers. Read more on page 14.



NORTH QUEENSLAND

By Jim Kochi

As we come out of spring the flowering on both Shepard and Hass looks successful over most areas. Some cold prone areas may have had some cold or even frost at flowering time but generally not as severe as 2019.

My estimate crop forecast in November is for a record harvest of between five and six million trays, for harvest between early

February and the end of June. In 2019, the actual harvest was about 4.1 million tray equivalents.

That works out to a supply line of around 217,000-261,000 trays per week, across a 23 week period, just from North Queensland. This is a result of a better flowering, increased plantings and an extra year's growth on trees planted in the past few years.

Now I know some growers want to be "secret squirrel" about tree numbers to *OrchardInfo* and even more shy about supplying actual despatch and four weekly forecasts through *Infocado* but in my experience over the past 20 years, I firmly believe that the market works best for the grower when all stakeholders understand what is coming down the supply line. (You can read more about why accurate national orchard information is vital on page 60.)

Our industry stands out for being successful against all the other tree crops because we have developed systems to monitor supply into the market, and therefore allowing the market end to plan ahead for sales. However, the recent trends to "secrecy" are putting this success serious risk, and especially for a year like next year where a big crop in forecast.

To those new and older growers in NQ, I ask you to look over your shoulder and think about the reasons you left the crops you grew previously, and what caused you to move into avocado.

The avocado industry became successful through staged growth to meet the growing demand and a decent levy collection to allow the development of programs like *OrchardInfo* and *Infocado* that allows the industry and our other stakeholders to effectively plan ahead. No-one at either end of the market likes surprises and all growers in horticulture have suffered, at some time, from a spooked or surprised event.

I urge all NQ growers, and those in other regions, to come on board with these programs and to provide accurate and timely numbers to the system. Individual information remains within Avocados Australia's systems and is collated so as not to specifically identify individuals.

I truly believe in the value of these systems and I have been a contributor since day one, to both the Avocados Australia systems, and to the Shepard Australia systems that preceded what we have now.



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NEWS

— General News —

Retail avocado quality monitoring: first results

By Adam Goldwater, AHR

The project team for AV19003 has now been sampling and assessing avocados from retail stores in Brisbane, Sydney, Melbourne and Perth for nearly five months.

A total of 2,060 (206 x 10-fruit samples) fruit were assessed as of the end of September 2020, covering 32 Australian suppliers of Hass avocados and purchased from 51 different retail stores.

Many Australian suppliers will now be familiar with the snapshot quality reports which have been emailed out to them the week following sample collection. A similar report (without supplier details) is provided to retailers, and reports for the wider industry have now been added to the Best Practice Resource, in the Retail section (avocado.org.au/bpr/).

Industry close to the target

The good news is that the industry met, or was very close to meeting, their target of 90% acceptable fruit in three out of the five months the project has been running (Figure 1). Unfortunately, quality slipped in August and September. This was a time when retail prices rose, and supply began to shift

from Northern New South Wales, Central Queensland and Southern Queensland to the Tristate, Western Australia and New Zealand.

Bruising accounted for the majority of the decline in acceptable fruit in August 2020. This could be an indirect effect of increased prices, as customers squeezed more fruit searching for that perfect, precious avocado.

Improvements have been made since 2015

The last avocado retail quality monitoring project (AV11015) finished up in 2015. The project concluded that from 2012 to 2015 the average percentage of acceptable Hass avocados (less than 10% internal defects at retail) was 79%. This meant that consumers were dissatisfied with quality of at least one avocado for every five they purchased – hardly a way to encourage sales.

The industry set a target of halving this level of unacceptable fruit, reducing it to no more than 10%. To achieve this, the industry has invested significantly in improving management of production, harvesting, packing, cooling and transporting, including the current Hort Innovation project, *Implementing best practice of avocado fruit management and handling practices from farm to ripening* (AV18000).

This raises the question, “have these investments in quality improvement paid off?”

The good news is that the average percentage of acceptable fruit rose to 86% for the five months to September 2020. While this is promising, it will be good to see the more complete results after 12 months of monitoring, in order to cover all growing regions and times of year.

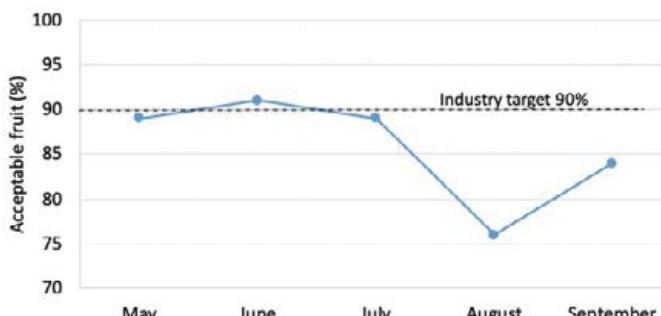


Figure 1. Percentage acceptable fruit (less than 10% internal defects) at retail for Australian grown Hass avocados from May 2020 to September 2020.

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Most suppliers meeting target

Initial project findings suggest that many suppliers are following best practice guidelines, meeting or exceeding the industry target of 90% acceptable fruit. However, three suppliers were well below that target. This is what reduced the overall industry average to 86% acceptable fruit (Figure 2).

Those three suppliers were from different growing regions, so issues with fruit quality do not relate to local growing conditions. The results could be due to any issues from production right through to the retail shelf. For example, it could be that these fruits are staying in the supply chain too long, or they are not being correctly ripened or stored at the correct temperature. This project is closely aligned with AV18000, which is providing support to supply chain members to make improvements.

Bruising remains the major issue

As found previously, bruising remains the main quality problem at retail. From July to September 2020, more than half of the unacceptable fruit were bruised, while flesh rots (body rots and stem-end rots combined) accounted for 29% of unacceptable fruit (Figure 3).

The level of bruising measured in recent months is similar to that reported between 2012 and 2015 (AV11015). It is most likely that much of this is happening at retail.

Previous projects have demonstrated that consumers squeeze more fruit if avocados are \$4.99 compared to when they are \$2.99. They will also squeeze more fruit if consistently ripe fruit are not available. Through this project, major retailers are being sent regular reports on fruit quality in their stores, and are using these to improve the practices within their control, to help reduce bruising and other defects.

The main reason we are seeing an improvement in acceptable fruit this year compared to 2012-15 is the reduction in rots

and vascular browning. This could be a result of better pre and post-harvest disease management, as well as cool chain control. It will be interesting to see if this trend continues going forward.

Work to do

In summary, the results so far indicate that most avocado supply chain members are doing a good job, and that quality has improved since 2015. However, there is still work to do, particularly in terms of understanding the high level of damage observed within a relatively small number of supply chains.

More detailed and regularly updated industry quality reports are available in the Avocados Australia Best Practice Resource in the Retail section, under Retail Quality.

So what happens to results from here?

Results will be updated monthly on the Avocados Australia website for industry to understand how quality is tracking across growing regions and retailers to empower adoption of industry best practice throughout the supply chain. Details on how to access and understand data will be communicated via industry channels. Additionally, results will be reviewed with major retailers and Avocados Australia to support improvements at retail point of sale.

More information

For further details, please contact Adam Goldwater at Applied Horticultural Research (AHR) on 0466 080 693 or adam.goldwater@ahr.com.au.

Once you are logged into the Best Practice Resource, you can find the monthly retail quality reports in the Retail section of the BPR: avocado.org.au/bpr/.

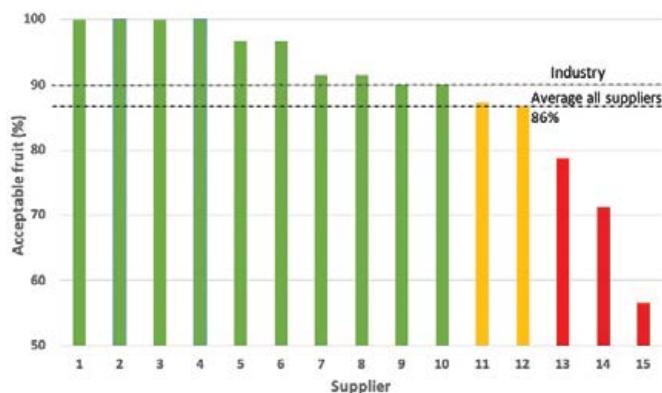


Figure 2. Percentage acceptable fruit (less than 10% internal defects) from Australian suppliers during May 2020 to September 2020. Based on 165 lots of 10-fruit samples collected at retail in Brisbane, Sydney, Melbourne and Perth; numbers of samples vary across suppliers.

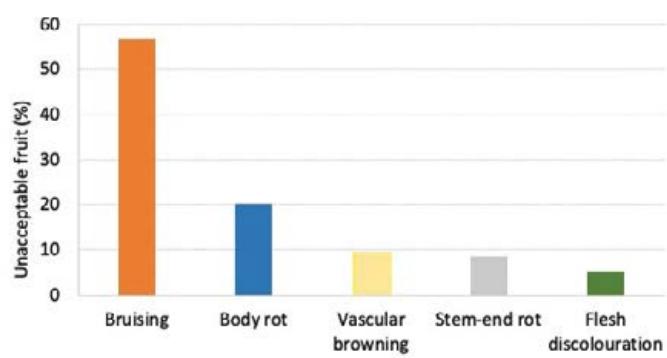


Figure 3. Reason fruit was unacceptable (more than 10% of flesh damaged at retail) in Australian supplied Hass avocados purchased between May and September 2020.

Acknowledgement

The *Monitoring avocado quality in retail* (AV19003) project has been funded by Hort Innovation, using the avocado research and development levy, and contributions from the Australian Government.



AVOCADO
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The *Monitoring avocado quality in retail* (AV19003) project is conducting regular assessments at supermarkets, independent and specialty retailers in Sydney, Melbourne, Brisbane, Perth and Adelaide over three years – providing some 600 separate quality assessments each year. Passing on quality information on specific batches of fruit to packhouses is intended to help businesses identify improvement opportunities and help address any inefficiencies or issues in their operations. De-identified data from the sampling is also being analysed to monitor industry performance on the whole.

In each city, trained retail staff visit a range of major and independent retail stores within a day. Where multiple avocados are present within the store, they identify the largest display and record information such as price, display method and number of layers of fruit stacked on the display. Ten fruit are selected from a single supplier/batch based on the fruit label. Where fruit is taken from a tray that matches the fruit label supplier/brand, the tray label details are recorded. Fruit are selected randomly using a transect approach across a loose display, or randomly from three separate trays, depending on the method of display.

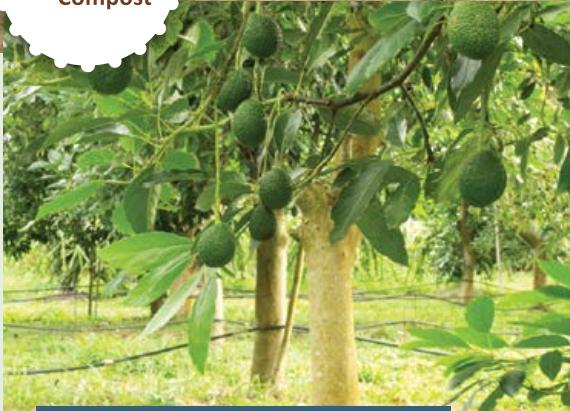
Fruit are purchased, and placed in avocados trays, and transported back to the laboratory. On the same day, firmness measurements are taken using the Turoni durometer (two readings per fruit) to provide an indication of firmness of fruit at purchase.

Fruit are then held at ambient temperatures for 24 hours from the time of purchase, or once the average of the 10-fruit samples reaches stage 5 ripe. The sample is then ready for assessment, and fruit are halved and photographed. The fruit is quartered, skin removed, and defects including flesh rots, bruising, vascular browning and flesh discolouration identified. The percentage damage in each fruit is then calculated by separating and weighing each type of damage, as well as good flesh.

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Engaging with industry's retailers

By Hayleigh Dawson, Avocados Australia Market Development Manager

The key focus of the Market Development role is to focus on leveraging existing activities for greater benefits across the supply chain. Retailers have welcomed the increased engagement and have been highly receptive to increasing the collaboration with industry to drive demand for the category. The key areas in which Avocados Australia is committed to increasing retailer engagement include promotion, quality and supply dynamics.

Promotion

Through consultation with industry, retailers and Hort Innovation, Avocados Australia has developed a promotional engagement plan to ensure we are delivering valuable information at key times to retailers to optimise the value of the levy-funded marketing program. We have been able to increase the engagement with major retailers on the marketing program and align these engagements to retailer planning cycles to increase the opportunities retailers have to leverage off the levy-funded marketing program and its resources.

In addition to our regular engagements with the major retailers, we have been consulting industry on the opportunity to develop a quarterly retail report which provides retailers with details on key marketing activity for the next quarter and results from the last. We are also providing retailers with access to point of sale and store educational material and providing easier access to all the levy-funded materials to create greater opportunities to leverage these resources.

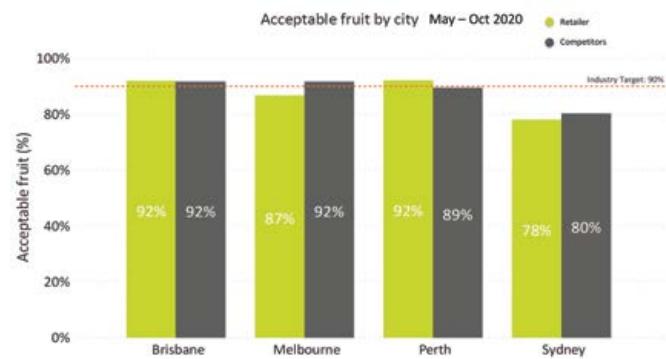
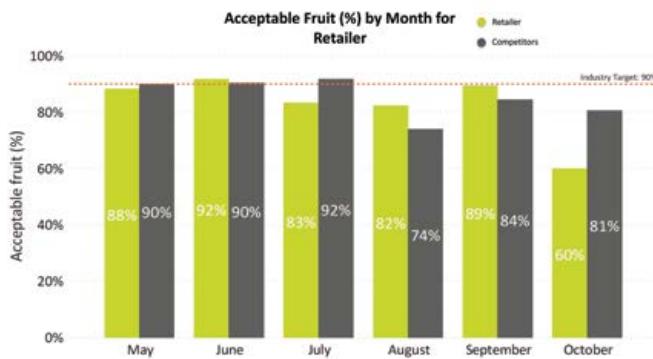
We see increasing knowledge and information sharing as a key area for improvement to really maximise the benefits for industry and will continue to work closely with Hort Innovation to ensure we are providing sufficient detail on marketing program activity to allow industry and retailers to leverage the activity and resources of the levy-funded program.

We also acknowledge the important role independent retailers play and have been exploring opportunities to further support this sector, and grow demand. As the Market Development Manager, I am in regular contact with wholesalers and independents across the Brisbane, Sydney, Melbourne and Adelaide to understand what promotional activity would best support independent retailers. In past months, we have also met with Fresh Markets Australian and A Better Choice program managers to explore opportunities to increase support for independent retail.

Quality

Quality is also an area Avocados Australia had identified as a key opportunity to increase engagement across industry and major retailers. An important activity is the Monitoring avocado quality in retail project (AV19003) which is conducting regular assessments at supermarkets, independent and specialty retailers in Sydney, Melbourne, Brisbane, Perth and Adelaide over three years, read more on page (12). In partnership with the Applied Hort Research project team, Avocados Australia has established quarterly quality reviews with the major retailers to discuss quality performance and empower improvements at retail point of sale. In these reviews, retailers are provided with feedback on how they have performed against their de-identified competitors in parameters such as:

- acceptable fruit quality by month
- major defects by month
- acceptable fruit quality by store location (major city)
- fruit age at purchase
- ripeness at stage of purchase
- layers of fruit on retail display
- ranked performance of individual stores.



In these reviews, retailers are not only presented with their performance data but together we discuss how we can support improvements to offer the best quality avocados to consumers. So far, the support from retailers has been extremely positive with them finding this information incredibly valuable to help them identify and action supply chain improvements. Feedback from retailers is that this information is most useful in aiding feedback to their distribution, quality and store operational teams to encourage improvements. Findings so far highlight that there is still room to improve fruit quality at retail point of sale, read more on page (14). Previous research, as part of the retailer point of purchase improvements project (AV15011) highlights the value of best practice merchandising and the opportunity this presents the industry.

Supply

Avocados Australia is dedicated to working with industry and retailers to effectively manage supply dynamics to enable long-term sustainable growth for the category. Through the Market Development Manager role, we have been able to increase communication with major retailers on the supply dynamics across the various growing regions, seasons and varieties to help optimise their category plans. Retailers have

found this particularly useful during key transitional periods between varieties and regions to ensure they are aligning their transitional plans.

We understand the fine line and potential sensitivity such a task carries and have been actively consulting industry over the past few months. Not only have we sought consultation from key retailer suppliers but also indirect suppliers and independent retailers to ensure any risks are appropriately identified and managed.

We encourage industry to support us, with accurate information being a crucial element. We will continue to encourage industry to supply and update their most accurate forecast estimations and dispatch data, as well as planting data, to allow us to adequately plan for the increase in production expected over the next five years

More information

Please contact Hayleigh Dawson at Avocados Australia on 07 3846 6566 or email mdm@avocado.org.au.

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Pandemic impacts continue

Lisa Yorkston, Avocados Australia Communications Manager

It's now been 10 months since the World Health Organisation put a name to the virus that is still impacting today, COVID-19.

It's fair to say that the challenges posed by the global pandemic are no longer a sprint from one item to the next, but instead a slow, steady marathon.

The various states now have a variety of planning requirements in place (COVIDsafe workplace planning) to help orchards and packsheds and the wider industry remain operational.

COVID fatigue

While all the major issues remain (labour, export availability, cross-border access), there is a growing concern that COVID fatigue is setting in, despite the fact vigilance remains crucial.

It remains important that you maintain and operationalise your workplace plans, and it's crucial that you get tested for even the mildest of symptoms.

This pandemic isn't a sprint any more, it's a marathon to the point where (hopefully) vaccines will allow us to return to some sense of a pre-COVID normal.

Labour

We know labour has been tight in Western Australia, and the ongoing impacts of the pandemic because of the closed borders will be felt when the North Queensland season begins in 2021. It is currently considered unlikely that international air travel will return to pre-COVID conditions until 2024, increasing reliance on the Seasonal Worker Program, the Pacific Labour Mobility Scheme, and the domestic labour force.

Avocados Australia has been supportive as various national and state lobby groups, and national and state government departments, have established both campaigns aimed at the domestic labour pool, and trials to allow seasonal workers from various Pacific nations to safely enter Australia.



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There are no simple, easy answers to the labour issue currently being faced across horticulture.

Avocados Australia resources

Avocados Australia continues to maintain a suite of avocado-industry relevant resources at avocado.org.au, including the latest news, national resources, resources for staying safe in the orchard and packshed, and learnings from other workplace outbreaks (including links to the various state-based workplace plans that might be required).

If you do not have a COVIDsafe plan in place, or your state does not require one, you should update your workplace health and safety planning to include the pandemic, and Avocados Australia encourages you to develop a COVIDsafe plan regardless.

National resources

bit.ly/CV19avo

On this website page, you will find links to health information, export, food safety, federal financial assistance, labour, and workplace information.

Staying safe in the packshed and orchard

bit.ly/CV19shed

This is a more detailed collection of resources, from general tips to assessing the market before picking, additional staff management and sourcing information, workplace health and safety, industrial relations, transport, and audits.

More information

Avocados Australia is endeavouring to keep its online resources as up-to-date as possible, including the above articles, the latest news on the website, via *Guacamole* and for urgent updates, via Grower and Industry notices.

All members of the commercial avocado industry in Australia can sign up for our various communications, check what's available here avocado.org.au/connect/, or contact us on 07 3846 6566.

UQ FOOD SERVICE RESEARCH

In light of the recent pandemic and its impacts on our industry, Avocados Australia has looked at alternate ways to build the industry's knowledge around the place of Australian avocados in the domestic food service industry.

Avocados Australia has worked with University of Queensland agribusiness students and Dr Phil Currey on a market research project into the food service opportunities for avocados.

The purpose of this project was to assemble as much relevant Australian food service avocado market information as possible. This is an initial investigation to provide information that can be used to guide future market research and market development activities.

Students sought to provide additional information to build on past industry research into the usage, opportunities and threats to Australian avocados in the domestic food service industry. As part of the project, students will be reaching out to industry to assist.

This research is solely funded through the University of Queensland and Avocados Australia is leveraging this resource; this project is not funded through levy or memberships, and we'll provide more in the next edition of *Talking Avocados*.

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Positive trends for the Australian avocado industry

By Daniel Martins, Avocados Australia Data Analyst

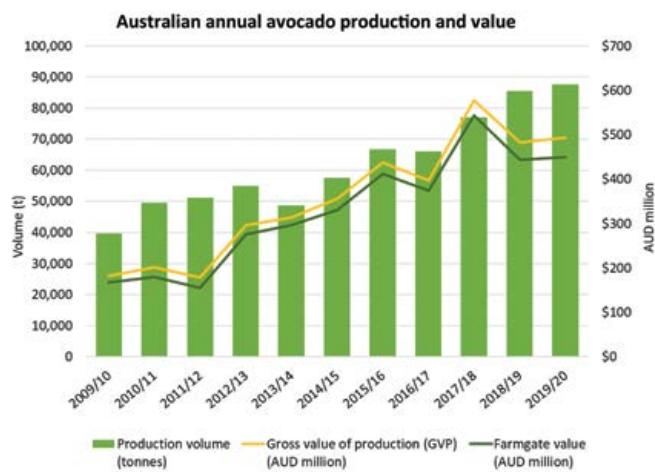
Australians' love of avocados continues to grow, as does the country's domestic production.

Avocados Australia's Chief Executive Officer John Tyas said only slight increases had been recorded for both production and consumption in 2019/20, but the trend was ever upward.

"Consumption is now at 3.88kg/person/year and production reached 87,546 tonnes in 2019/20," Mr Tyas said.

"This continues the production growth trend, and we expect to reach at least 115,000t by 2025."

The 2019/20 period proved to be relatively steady for the Australian avocado industry, with the impact of drought, storms, fires and, of course, the global pandemic all impacting not just on avocados but the community as a whole.



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“During the last 18 months, our growers have faced almost everything, from storm and frosts in Western Australia, to fires on the east coast and the impacts of widespread drought,” Mr Tyas said.

“Despite all of this, our growers still slightly increased production by 2% from 85,546t in 2018/19, to 87,546t in 2019/20, which is an excellent outcome, given the varied weather impacts.”

Both GVP and farmgate value increased from A\$483 million to A\$493 million (+2%), and from A\$444 million to A\$450 million (+1%) respectively. Domestic consumer (retail) market value however, declined from A\$898 million to A\$845 million (-6%).

Exports

2019/20 was yet another year of export dollar growth increasing by 28% from \$AU19.6 to \$AU25 million, largely thanks to increases in volumes of Australian fruit being exported to the following countries:

- Hong Kong: from \$AU2.37 million to \$AU5.61 million
- Singapore: from \$AU7.31 million to \$AU8.93 million
- Malaysia: from \$A8.89 million to \$A8.93 million.

Malaysia and Singapore remain Australia's main avocado export destinations, but the numbers are showing other countries in which Australian avocados are gaining popularity, such as Hong Kong and Indonesia. There are also other, highly promising, export destination prospects.

However, Mr Tyas said the COVID-19 pandemic and tight summer supplies would impact on next year's export report for the Australian industry.

“In 2019/20, we had a record export year, dispatching 4,051t to our markets, primarily in Singapore, Malaysia and Hong Kong. This represented just 4.63% of domestic production, and as production grows, so will our exports.

“We're a small player in the world avocado market, but we were very happy to reach that level of exports, which included our new market in Japan.”

Mr Tyas said due to a combination of a lighter than expected summer crop from Western Australia, and the dramatic drop in airfreight availability because of COVID-19, it was unlikely exports would increase in the current year.

Regions and states

Mr Tyas said Queensland continued to produce the majority of Australia's avocados, accounting for 49%. The North Queensland region supplied the largest proportion of Queensland avocados, at 26% of national production, followed by Central Queensland with 18%, and South Queensland with 3% of the share. The remaining 2% was supplied by the Sunshine Coast and part of Tamborine/Northern Rivers.

The states following in production volumes were Western Australia at 38%, New South Wales, South Australia, and Victoria with 8%, 3%, and 2% respectively.

While in 2019/20 Queensland's volumes declined by 9% and New South Wales declined sharply by 49%, Victoria and South Australia recovered to pre-2018/19 levels. For Victoria, output increased from 225 to 2,203 tonnes (+878%). For South Australia output increased from 828 to 2,448 tonnes (+196%).

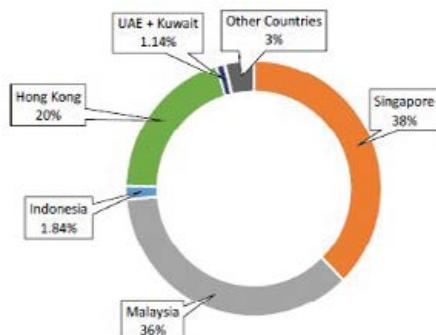
Looking at volume distribution by growing region, Western Australia remains the region that produced the largest share of Australian avocados at 38%, continuing their rapid growth over the past few years.

Varieties

Much like in the rest of the world, Hass remains the main avocado variety produced and consumed in Australia, where it is produced almost all year round. In 2019/20 Hass represented 80% of production at 70,016 tonnes.

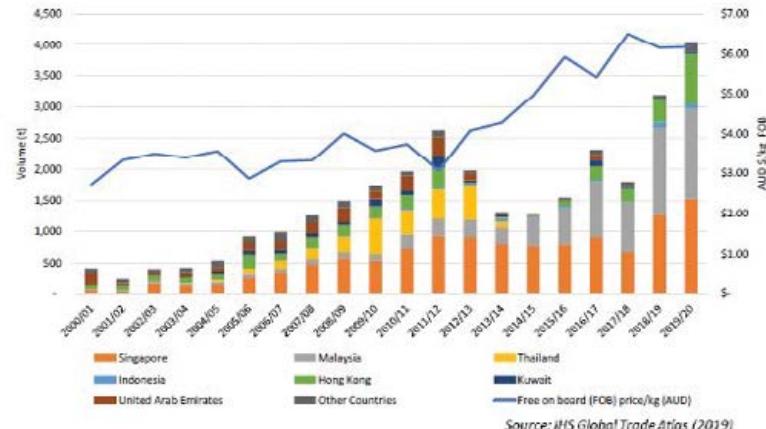
Shepard, grown in North and Central Queensland and

Australia's export markets in 2019/20

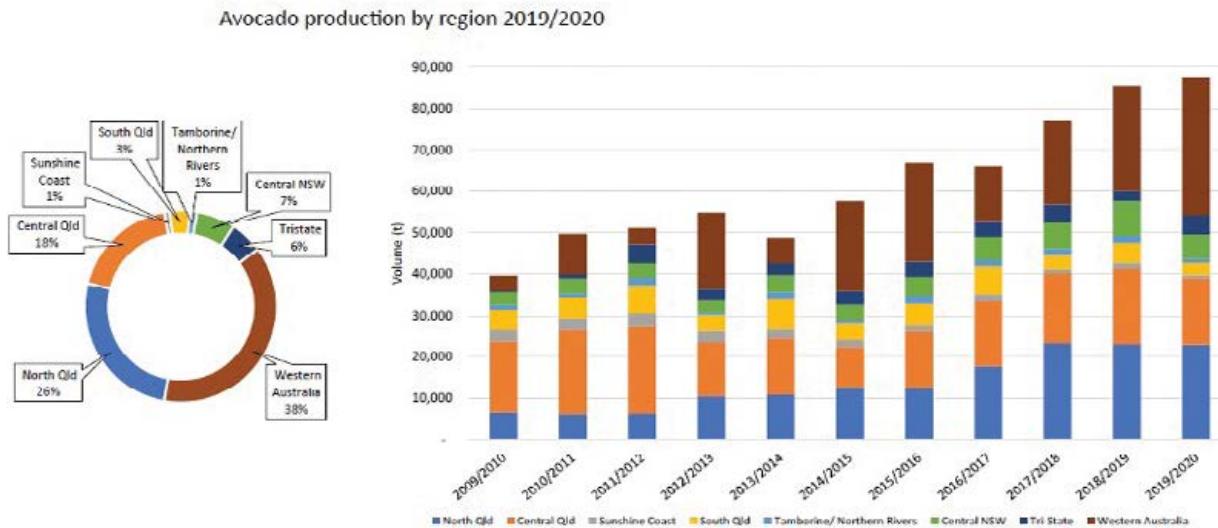


Source: IHS Global Trade Atlas (2020)

Australian annual avocado export volumes in tonnes by country and AU\$/Kg FOB



Source: IHS Global Trade Atlas (2019)



harvested through late Summer and Autumn, made up 17% of production at 14,875 tonnes. Shepard is the only other significant variety, dominating the Australian market for that time of the year, when Hass is hard to find on shelves across the country.

The group ‘Other’ making up 3% of the production volume for 2019/20 is comprised of the following varieties: Lamb Hass (33%), Reed (32%), Wurtz (11%), Gwen (8%), Sharwil (8%), Fuerte (4%), Pinkerton (3%), Gem (1%) and Bacon (0.16%).

Domestic consumption

Mr Tyas said the other piece of the puzzle for a sustainable industry in Australia, was domestic consumption.

“Australians are the highest consumers, per capita, for avocados in the English-speaking world, a title we’ve kept in 2019/20,” he said.

“We were especially heartened during the pandemic, when after an initial dip in demand, our consumers proved more

than happy to eat their smashed avocado at home.”

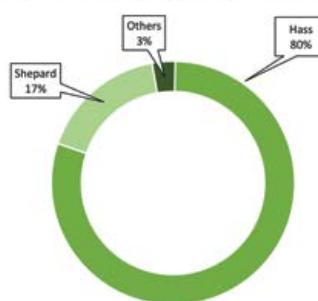
Consumption in 2019/20 reached 3.88kg/person, a 2% increase from the 3.81kg/person of the past financial year. These amounts are derived by adding production (fresh + processed) to imports, subtracting exports and dividing by population, which at the time was 25.6 million people.

Imported New Zealand fruit supplements Australian supply during their harvest season over Spring and Summer. For 2019/20 Australia imported 16,121 tonnes of avocados from New Zealand, a 11% increase from the 14,561 tonnes imported in 2018/19, and a reduction of 31% from the peak 23,355 tonnes imported in 2016/17.

Projection

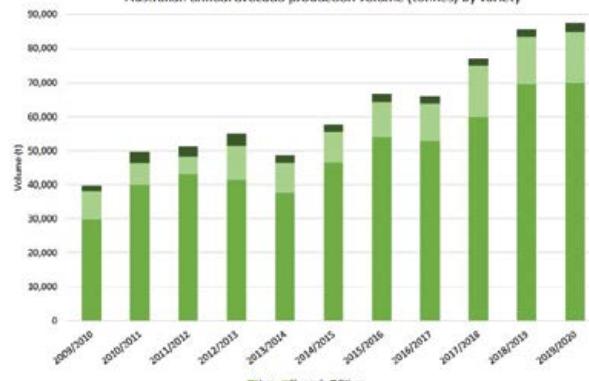
The 2019/20 production figure is tracking well in line with forecasts made in previous years that indicate Australian production may be reaching or surpassing 115 tonnes/year by 2025.

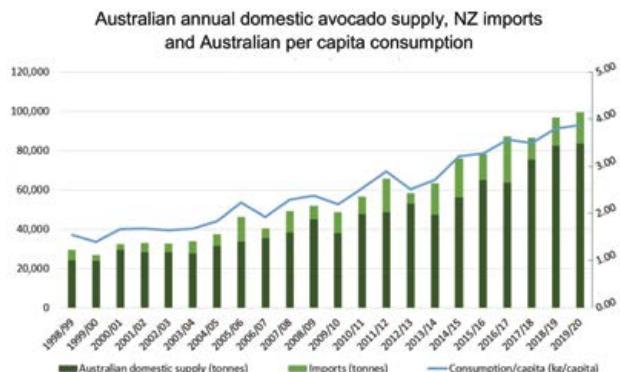
Australia's avocado production by variety in 2019/20



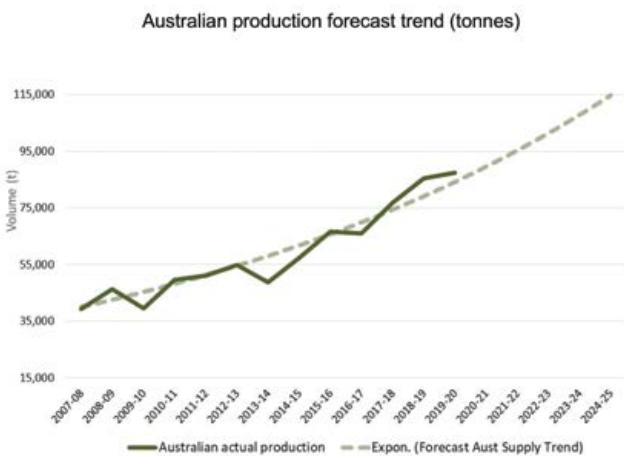
The three percent of fruit which is not Hass or Shepard is made up of the following varieties, listed in order of volume produced: Lamb Hass, Reed, Wurtz, Gwen, Sharwil, Fuerte, Pinkerton, Gem, and Bacon.

Australian annual avocado production volume (tonnes) by variety





Sources: Infocado, IHS Global Trade Atlas (2020) and population based on ABS data



Sources: Infocado, Avocados Australia analysis

However, 2020/21 is likely to record a big dip in production due to the lighter crop in southern Australia this year, but this will most likely be reversed in the 2021/22 season.

More information

The full Avocados Australia 2019/20 *Facts at a Glance* is available online at avocado.org.au/news-publications/statistics/.

Acknowledgement

The *Avocado industry data capture and analysis 2020-2023* (AV20000) project has been funded by Hort Innovation, using the avocado research and development levy, and contributions from the Australian Government.

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Growing Avocados in Chile

Liz Singh, Industry Development Manager

Keep an eye out for the exciting industry wide Avogrow webinar series, replacing Regional Forums until further notice in response to COVID-19.

COVID-19 has hampered our ability to visit the regions, but it has opened a world of possibilities with international speakers sharing their avocado growing experiences.

Sixty-seven avocado growers and industry members joined the online North Queensland Regional Forum to hear from Dr. Francisco Mena Völker. *If you weren't there, you can still watch the recording located in the BPR Library under Events.*

Francisco Mena Völker is a partner in the horticultural consultancy and research company GAMA Ltda, located near Santiago in Chile. Francisco presented information on the Chilean avocado industry and the use of irrigation, nutrition and plant growth regulators.

Chilean industry

At its peak in 2007, approximately 40,000ha were planted to avocados. Even following a loss of 10,000ha to frost and drought, the current industry at 30,000ha is still more than three times the size of the Australian industry, given the

high-density plantings present (1,600 tree/ha). There are two distinct environments for growing avocados, coastal (cool/windy/400mm/year) and inland areas (warm/dry/200mm/year). Many orchards are planted on steep hill sides (Figure 1).

Irrigation

Irrigation in Chile is essential for avocado production. The industry has been working with weather stations and evaporation pans to determine tree water requirements. The Kc factor (crop coefficient) only varies from 0.72 to 0.75 throughout the whole season. The soil types are all very different and variable across blocks making uniform water management difficult. If irrigation is not managed well, it becomes obvious with marked differences in tree growth, development and health.

Irrigating from flowering to 100 days after fruit set is set at a refill threshold of 25% of plant available water. After this the refill point is set at 35% of plant available water because fruit size has already been defined. This allows for longer periods between watering and more air capacity in the soil and root zone. Root activity and soil moisture is monitored by regularly digging holes and the use of capacitance probes (20, 40, 60 and 80cm sensors).



Figure 1. Chilean avocado orchards grown on steep hill sides and mounded. Image: Francisco Mena Völker.

Water is maintained down to the 80cm sensor, in case of irrigation equipment breakdowns. Dendrometers were trialled, but soil moisture monitoring equipment was found to provide better information. Work examining drip versus micro jet sprinkler determined that sprinklers on average produced five tonnes per hectare more fruit than drippers.

Nutrition

Francisco spoke extensively about the fertiliser types, volumes and application timings that are used as a guide for Chilean avocado orchards during his webinar with the Australian industry. He presented results from fertigation trials and spoke about the impact of nutrition on next seasons' productivity. For more information, you can read the meeting minutes located in the BPR Library under Events.

Plant Growth Regulators (PGRs)

Soil applied PGRs are used to maintain smaller tree canopies. Francisco presented results from several trials. One trial applied Cultar (Paclobutrazol) when the growth above the last set fruit was 25-30cm (to support the growth and development of set fruit), using different irrigation systems. Results produced reduced internode growth (Figure 2) and compact growth habits with more lateral horizontal branches. Pruning was made easy by just removing vertical branches above a specific height, while maintaining productive horizontal limbs. An increase in yield was seen due to increased flowering (Figure 2). Francisco also indicated that the more restricted the rootzone (high density plantings), the better the PGR results than if applied in a bigger volume of soil. More information can be seen about the best PGR timing and residues in the recorded video.



Figure 2. Results of soil applied Cultar (Paclobutrazol). Normal internode growth length (left bottom). Cultar application reduced internode length (left top). Cultar application increased flower bud development (right). Courtesy: Francisco Mena Völker

The AV17005 project team would like to thank Francisco and all other speakers for contributing their time to the online forums. Their dedication to the avocado industry has provided a great information resource. All meeting minutes and presentations including webinar recordings are located in the BPR Library under Events.

More information

Check the fortnightly *Guacamole* newsletter and the events calendar at avocado.org.au for future dates. If you would like more information on the project, contact Avocados Australia Industry Development Manager Liz Singh, 0499 854 111 or idm@avocado.org.au (Mon-Thurs 9am-3pm), or at DAF, contact Simon Newett, simon.newett@daf.qld.gov.au or 07 5381 1326, or Bridie Carr, bridie.carr@daf.qld.gov.au or 07 5381 1327.

Acknowledgement

The *Avocado industry development and extension* (AV17005) project has been funded by Hort Innovation, using the avocado research and development levy, co-investment from the Queensland Department of Agriculture and Fisheries, and contributions from the Australian Government.

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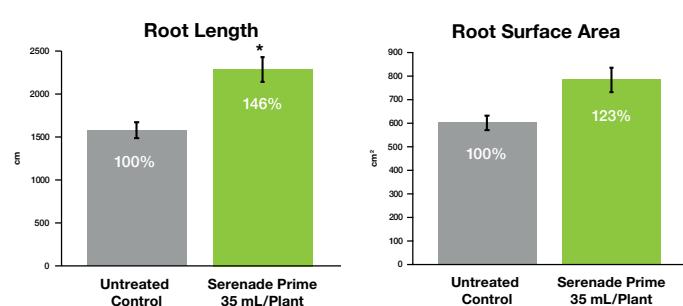
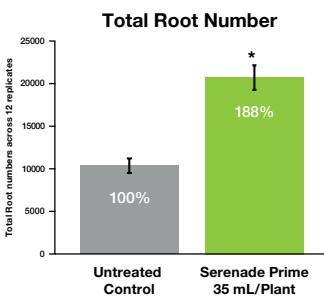
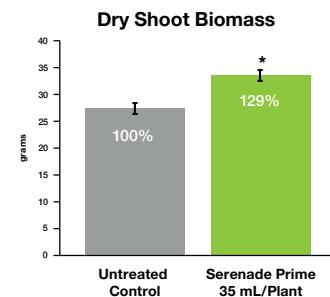
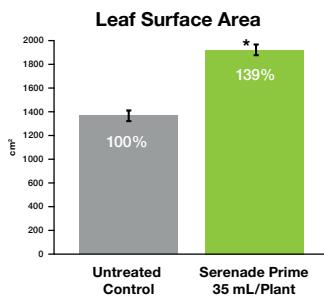




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Avocados love oxygen

Liz Singh, Industry Development Manager

Avocados require an aerobic root environment for maximum growth and production. This environment is flooded each time an irrigation event occurs. While both water and oxygen are important for production, irrigation scheduling that maximises oxygen in the rootzone may benefit orchard production.

Roots need oxygen for respiration, allowing carbohydrates produced by photosynthesis to be converted to energy. Ferreyra *et al.* 2007 established that avocados grow best in soils with 30% volumetric air content and showed that damage to roots (hypoxia) would occur in soils with $\leq 17\%$ volumetric air content.

Root hypoxia in avocados causes a reduction in canopy function (stomatal conductance, photosynthesis, transpiration, assimilation), canopy growth and often causes leaf wilting as well as reduced root function (growth and health – necrosis) (Schaffer *et al.* 2013). Ferreyra *et al.* 2010 demonstrates the impact oxygen levels have on potted tree growth with a 29% soil air capacity (Figure 1 - left) and a 7% soil air capacity example (Figure 1 - right).

Irrigation frequency to balance the tree's access to oxygen in the soil will depend on your soil type, bulk density and soil condition. What happens to the volumetric air content under different irrigation scheduling in a loamy soil with 50% porosity is illustrated in Figure 2 (Ferreyra *et al.* 2010)

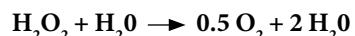
As can be seen the high frequency (daily), high volume irrigations keep the soil moisture above field capacity and

the air content is around the 17%, the threshold for avocado root hypoxia. Decreasing the frequency of irrigation and the volume supplied can increase the soil air content as shown by the other two irrigation methods.

For avocados already growing on heavy soils, oxygation may be worth investigating to improve oxygen levels in the rootzone during irrigation events. Oxygation is defined as irrigating with aerated water using air injection system or hydrogen peroxide generally with subsurface drip.

Central Queensland University researchers (S.P. Bhattacharai & D.J. Midmore) have successfully shown improvements in annual crops (growth and production) grown on heavy soil types by increasing oxygen content in irrigation water using a Mazzei air-injector or the Seair Diffusion System (Chen *et al.* 2011). While this research has not been conducted in trees, Zhao *et al.* 2019 showed in grapes that by aerating the irrigation water, new leaves, fine roots and branches were promoted.

Gil *et al.* 2009 also suggested the addition of hydrogen peroxide to irrigation water is another method to increase oxygen levels in the soil profile during irrigation events. Hydrogen peroxide naturally degrades to provide oxygen and water as follows:



Gil *et al.* 2009 demonstrated that injecting hydrogen peroxide in the irrigation water significantly increased the growth of



Figure 1. Two-year-old Hass on Mexicola rootstock growing at 29% (left) and 7% (right) soil air content. Images: Ferreyra *et al.* 2010.

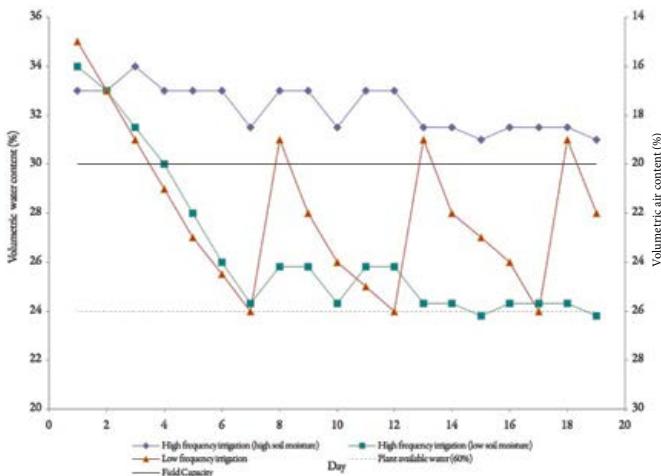


Figure 2. The influence of high and low irrigation frequencies on soil aeration. Total porosity = 50%; FC = field capacity; AWD = available water depletion. *Image: Ferreyra et al. 2010.*

the avocado trees (Figure 3). While the experiment was done on potted trees it showed promise for improving oxygen levels in air deprived soils.

Irrigation focuses on meeting tree water requirements to achieve production goals. However, given the soil water to air ratio could significantly impact production goals, understanding your soil's field capacity and air content when irrigating provides the opportunity develop new irrigation

strategies that could benefit production.

Note: Hydrogen peroxide is a highly corrosive product that can cause human and infrastructure damage if not used correctly with the proper precautions. Seek professional advice before using.

Acknowledgement

The Avocado industry development and extension (AV17005) project has been funded by Hort Innovation, using the avocado research and development levy, co-investment from the Queensland Department of Agriculture and Fisheries, and contributions from the Australian Government.

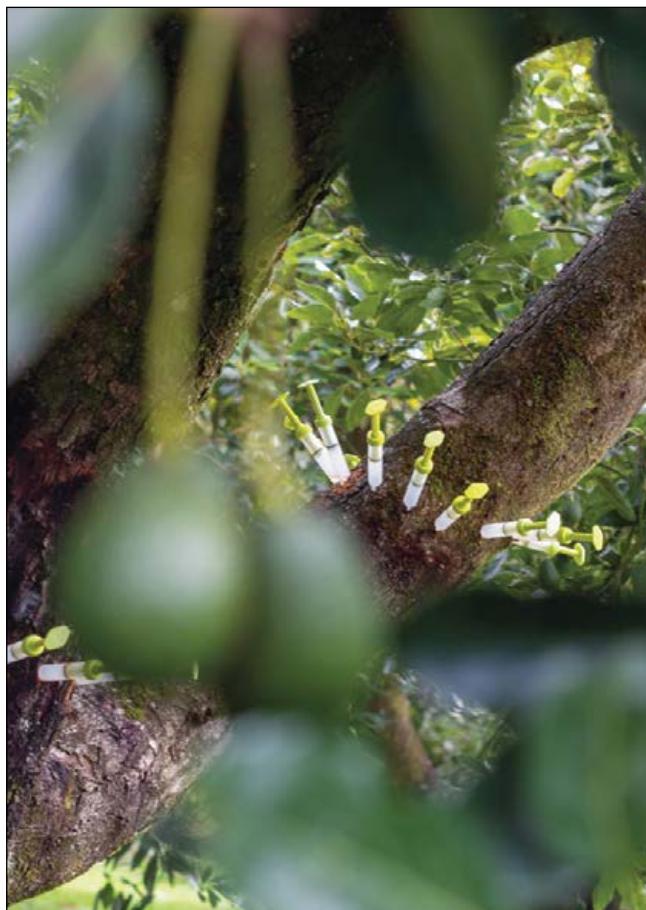


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Tmt	Total biomass	Wood biomass	Leaf biomass	Root biomass	Leaf area	WUEb
	g dry weight				cm ²	g L ⁻¹
T ₀	2 706.6 ± 149.8	877.32 ± 26	833.26 ± 75	996 ± 158	66 524 ± 8.1	2.41 ± 0.1
T ₁	3 181.9 ± 147.1	1 111.50 ± 24	1 067.48 ± 13	1 003 ± 171	95 185 ± 11.8	2.83 ± 0.1
Sig.	*	**	**	NS	**	**

Values represent treatment means ± statistical error. * P ≤ 0.1; ** P ≤ 0.05.

NS indicates no significant difference between treatments according to Bonferroni test (P > 0.1); T₀: control treatment; T₁: H₂O₂ injection treatment.

Figure 3. Final biomass, leaf area and water use efficiency (WUEb) of avocado trees treated with Hydrogen peroxide. Both T0 and T1 are Hass avocado on Mexicola seedling rootstocks grown in heavy loam clay soil. Both treatments were watered to maintain field capacity T0 is the control and T1 was injected with Hydrogen peroxide. *Image: Gil et al. 2009.*

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Fruit fly notification process

By the National Fruit Fly Council

If you trade produce interstate you may have wondered what would happen if live fruit fly larvae were found in one of your consignments at its final destination.

Rodney Turner, Chair of the Subcommittee on Domestic Quarantine and Market Access, said there was a nationally agreed process for reporting and investigating incidents like the detection of live fruit fly larvae in produce certified to meet interstate quarantine requirements.

This process is outlined in the Rules for Operation of the Interstate Certification Assurance (ICA) Scheme. The process not only applies to produce certified under the ICA scheme, but also produce which has been either certified by a government inspector or by a business operating a non-ICA accreditation arrangement.

Fruit fly and avocado

Avocados are a non-preferred host of fruit fly, which essentially means they can be affected but they are less attractive to fruit fly than other fruits and vegetables. Avocados picked in hard green condition should have a decreased chance of a fruit fly attack. That said, there are many factors including fly species, fruit variety, damage, stage of fruit ripeness and availability of other more suitable hosts, which may increase the chances of a fruit fly attack. Hass avocados are not a host of fruit fly when they are on the tree and in the hard condition.

The process

Mr Turner breaks down the incident reporting and investigation process followed by state and territory governments when live fruit fly larvae are detected into four main steps.

Step 1: Confirm fruit fly was found

"If a suspect detection of live fruit fly is made in your consignment in another state or territory with quarantine restrictions in place for the pest, the first step is for them to confirm it is live fruit fly which has been found," he said.

"A suspect detection of live fruit fly may be reported to another state prior to confirming live fruit fly has been found.

"Reporting a suspect detection puts the state or territory the produce originated from on notice of a possible critical incident."

The suspect specimen will be transferred to an accredited laboratory for identification under secure conditions to ensure its integrity.

Step 2: Report a detection to the jurisdiction which the consignment is from (up to five days)

"Once the presence of live fruit fly is confirmed, the state or territory which made the detection has up to five days to notify the state or territory from which the consignment originated in the form of an Incident Report," Mr Turner said.

"Though they have five days it usually happens within 24 hours.

"At the same time, the state or territory receiving the produce would take steps to contain and secure the detection such as removing product from shelves and tracing the produce back to its point of origin.

"Steps may also be taken to contain produce consigned immediately prior to the detection and any consigned after."

Step 3: Initiate investigation (up to five days)

Mr Turner said once the state or territory received the Incident Report, they had to start a formal investigation into the incident within five days.

"Within 30 days of receiving the Incident Report, your state or territory also has to reply with an Investigation Report," he said.



Queensland fruit fly. Image: GT O'Loughlin, Department of Agriculture, Bugwood.org

"Your state agricultural department will conduct an audit to determine where the breakdown in treatment may have occurred by examining critical control points and assessing treatment, packaging and transport processes."

Step 4: Notify the consigning business

"Once your state or territory is notified and the detection of live fruit fly is confirmed, they will contact the business that consigned the produce interstate," he said.

"If you were not the consignor and your produce was distributed through another business (eg, a produce market agent), you may be contacted by either the consignor of the produce or your state agriculture department.

"As the consignor of the produce is responsible for ensuring quarantine requirements are met you will not normally be notified of the incident by your state or territory government.

"If the investigation finds that the produce failed to conform with the receiving state or territory's quarantine requirements the consignor may be suspended from sending produce until appropriate action is taken to prevent an incident happening again.

Mr Turner said that if a business was suspended from sending produce, it could use an alternative quarantine entry requirement to continue trade to fruit fly restricted interstate markets.

The future

Plant Health Committee, which includes each state and territory Chief Plant Health Manager, is working with industry to consider how the efficiency of the process could be improved to ensure growers are notified as soon as practicable.

More information

For more information about the ICA scheme visit interstatequarantine.org.au

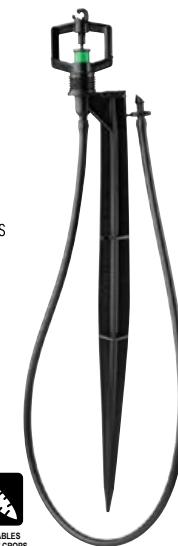
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Workplace safety and issues

Between January and June this year, 33 on-farm deaths were reported in Australia, according to the latest report from AgHealth Australia, for AgriFutures Australia.

During January-June, the report found most of the death were related to quadbikes, tractors and utes. In addition, there were 71 non-fatal on-farm injuries reported, with more than 70% involving quads, horses, tractors and motorbikes. You can read the report at bit.ly/311acci.

Fines over 2017 heat stress death

A sole trader who used backpackers to pick produce in the Burdekin area of Queensland has been fined \$65,000 over the heat stress death of a worker.

The employer pleaded guilty to breaching Queensland's Work Health and Safety Act 2011, failing to comply with his health and safety obligations. The Magistrate found complacency to be a factor.

The defendant employed about 200 people each year, mainly backpackers, who were to be trained by the defendant, supervisors and experienced pickers.

Instead, the court heard that in late October 2017, the defendant employed a backpacker new to Australia who was not inducted in the operation's work system, although he was shown how to pick produce. On just his fourth day on the job, the worker was picking when he collapsed and subsequently died as a result of heat related illness.

An investigation by Workplace Health and Safety Queensland revealed the defendant's system for instructing workers, particularly new ones, was inadequate in that very limited information was provided to them on heat related illness, how to self-manage and determine their work capacity, as well as the requirements for hydration and nutrition to alleviate the effects of working in a hot thermal environment.

The investigation also revealed the defendant did not consider whether there was a need to provide or organise shelter at the client farms or to organise and plan how the picking work could be done outside the hottest part of the day.

Magistrate Ross Mack found the defendant had become complacent and the information provided to workers, including the team members, was insufficient to identify heat related illness, noting the deceased had displayed obvious signs on the day of his collapse.

The defendant was fined \$65,000, plus court costs of almost \$1,600. No conviction was recorded.

WA: preventing falls

Western Australia's Department of Mines, Industry Regulation and Safety has released a code of practice for the prevention of falls from height. This code of practice applies to all workplaces in Western Australia covered by the *Occupational Safety and Health Act 1984*. It provides detailed guidance on the prevention of falls from height at workplaces, including agricultural properties. There is an entire section (11) on the use of temporary working platforms, with a checklist. Read the code: bit.ly/311falls.

NSW: farmers urged to buckle up

The NSW Government has launched a new campaign urging farmers using side-by-side vehicles to wear seat belts following a spate of deaths across the state.

Better Regulation and Innovation Minister Kevin Anderson said the campaign focused on lifting on-farm safety following a rise in preventable deaths in side-by-side vehicles.

"Seven people across NSW have lost their lives in the last 12 months in side-by-side vehicle accidents, which may have been prevented if the right safety measures were taken," he said.

The NSW Government offers safety rebates to help farmers, including \$2,000 for the purchase of a safer side-by-side vehicle, \$600 for the purchase of an operator protective (rollover) device, \$90 for the purchase of a compliant helmet and \$500 for the purchase of a drone.

SafeWork NSW has also partnered with Tocal College to deliver free side-by-side vehicle accredited training. For more information visit bit.ly/311buckle.

Queensland: jail time for wage theft

Employers found to be deliberately stealing from their workers will now face jail time under new laws passed in the Queensland Parliament on 9 September 2020. Industrial Relations Minister Grace Grace said wage theft affected one in four Queensland workers.

"And it takes \$2.2 billion dollars out of Queensland workers' pockets each year in unpaid wages and superannuation," she said.

Ms Grace said under the new laws, the maximum penalty for stealing by an employer would be the same as the current maximum penalty for 'stealing as a clerk or servant', which was 10 years' imprisonment.

It will also now be easier and quicker to recoup unpaid wages. For more information, visit bit.ly/311wage.

Western Australia: new education program

The Chamber of Commerce and Industry (CCI) WA and the National Retail Association will use a new state government grant to develop and implement an education initiative to raise awareness among small business employers on their employment obligations and the penalties for non-compliance of employment laws.

A 2019 inquiry into wage theft in WA found one of the reasons wage theft occurs is due to a lack of understanding of employment rights and obligations. It found the most high-risk cases of wage theft occurred for workers in cleaning, retail, cafés and restaurants, and horticulture.

CCIWA Workplace Relations Director Ryan Martin said regional areas were in need of increased support.

"Being able to reach those non-members, and educate regional, small and medium-sized businesses on the State versus Federal system and the different awards and how to classify employees, we hope will go a long way to reducing incidences of underpayment and making sure that they understand the framework and can avoid the issues and also understand the penalties for non-compliance," he said.

Queensland: new record keeping requirements

The requirement to make and keep records of chemical use and new minimum training requirements has been extended to all users of agricultural and veterinary (agvet) chemicals under amendments to the Chemical Usage (Agricultural and Veterinary) Control Regulation 2017.

The amendments, which came into effect on June 19, reflect a nationally harmonised approach regarding record keeping and training for all agvet chemical users.

The regulation now stipulates what information must be recorded; who must make and keep records; who must be provided with a copy of the record; timeframes within which a record must be made; and the length of time for which the record must be kept. There are specific requirements for those in Reef catchments.

More information is available at bit.ly/311agvet or by calling Biosecurity Queensland on 13 25 23.

Quad bike measures mandatory

All new and imported second hand quad bikes sold in Australia must now meet the first stage of the government's mandatory safety standard after it came into effect on 11 October.

All new and imported second hand quad bikes sold in Australia must now be tested for lateral static stability, display the angle at which the quad bike tips onto two wheels on a hang tag at the point of sale, and carry a roll over warning

label on the quad bike. The owner's manual must also include roll over safety information.

Additionally, the quad bikes must be fitted with a spark arrester that conforms to the Australian or United States standard, and meet certain requirements of the United States or European quad bike safety standards. These relate to equipment such as brakes, clutch, throttle, tyres, drive train, handlebars and foot wells, maximum speed capabilities and the provision of safety information through warning labels and hang tags. Read more: bit.ly/311quad.

Look up and live

A Queensland farmer (broadacre) has been fined \$16,000 because of a 2017 incident where a worker received electric shocks after a grain auger contacted an overhead powerline. In a more recent case, a farm worker received a shock while bagging bananas on a plant that had contacted high voltage overhead powerlines. Read more on powerline safety: bit.ly/311power.

More information

The avocado WHS module in the Best Practice Resource features avocado industry-specific hazard checklists, management tools, safety guides and safety induction information. Visit avocado.org.au/bpr/.



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Class exemption will enable small businesses to collectively bargain

An ACCC class exemption due to commence in early 2021 will allow small businesses, franchisees and fuel retailers to collectively negotiate with their suppliers and processors, franchisor or fuel wholesaler respectively, without first having to seek ACCC approval.

Businesses will be able to use the class exemption after the period for parliamentary disallowance expires in early 2021. This collective bargaining exemption is the first class exemption to be introduced by the ACCC.

Although collective bargaining by small businesses generally does not harm competition, it involves competitors acting together, and those businesses therefore require some form of exemption to avoid the risk of breaching competition laws.

Currently this is only available via the ACCC's 'authorisation' or 'notification' processes, but this new class exemption will remove the need for most small businesses to use those processes.

"We hope this class exemption will help a range of Australian small businesses and franchisees," ACCC Commissioner Stephen Ridgeway said.

"There can be many benefits for businesses negotiating as a group rather than individually, including sharing the time and cost of negotiating contracts, and potentially giving group members more of a say on contract terms and conditions."

"There are often also time and cost savings for the suppliers or franchisor the group is bargaining with. This change will mean the benefits for all parties can be gained through a much simpler and quicker process," Mr Ridgeway said.

The class exemption will apply to businesses and independent contractors who form, or are members of, a bargaining group, and who each had an aggregated turnover of less than \$10 million in the financial year before the bargaining group was formed. This will cover more than 98% of Australian businesses.

In addition, all franchisees and fuel retailers governed by either the Franchising Code of Conduct or the Oil Code of Conduct will also be able to collectively negotiate with their franchisor, regardless of their aggregated turnover.

Bargaining groups will only have to fill out a simple, one page form, and provide it to the ACCC. Legal protection from competition laws will then commence automatically. There will be no fee for lodging the form.

"The class exemption will also increase levels of awareness among small businesses about the potential benefits of collective bargaining which, along with the simpler process, may encourage more businesses to collectively bargain," Mr Ridgeway said.

The ACCC will release further information about the class exemption, including the form businesses need to lodge with the ACCC and a guide to using the class exemption, in early 2021 when the class exemption becomes available for use.

More information

Read more from the ACCC: bit.ly/313ACCC.

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Make sure workers understand safety

By WorkSafe Queensland

Simple changes made after free advice from Workplace Health and Safety Queensland inspectors have helped a major farming business better target worker safety.

The Howe Farming Group (HFG) at Walkamin in FNQ called in WHSQ after an incident involving a piece of plant and equipment (bagging machine) rolling over into a drain. An investigation revealed foreign workers struggled to understand procedures, policies and pre-start checks.

HFG farms bananas, avocados, sugarcane, peanuts, blueberries, cotton, and coffee, employing up to 500 workers, including full time, casuals, locals, backpackers and seasonal workers from Vanuatu and Solomon Islands. General Manager Kimberley Mastin said the company wasn't aware of the issues at the time.

"We assumed that if they could work and physically perform the duties, then they understood the procedures. This was not the case," she said.

"It was suggested by WHS inspectors to look at translating our guidelines, induction paperwork and pre-start checks to our workforce's first languages.

"We considered a couple of companies and were quoted \$80,000-\$140,000 for 40 documents to be translated into five languages. It

was then decided we would use Google translate and get some of our crew to proofread to ensure the grammar was correct.

"The translated documents are now part of our induction and training process. Once a full understanding of the job is done through the guidelines, the normal training occurs.

"Show the team member what to do, assist them to the job and then watch them do it. Repeat if necessary."

HFG now also trains all operators of plant, equipment and vehicles on their roles and responsibilities so they fully understand how and why pre-start checks are done. Translated documents are added to employee packs and guidelines and a pictorial of a pre-start check was also prepared to ensure full comprehension of the machines and process.

Workers now have a better understanding of why procedures are implemented – for the safety of all employees. Workers are more familiar with company plant and equipment and safety strategies, with workplace testing showing a massive rise from 12% to 96% in workers scoring top marks for knowing correct procedures and operating instructions.

More information

You can find more about workplace health and safety in the avocado industry within the Best Practice Resource (www.avocado.org.au/bpr/), including links to all the various national and state authorities and bodies.



The Howe Farming Group has found improving training and communication for workers pays big safety dividends. Image: Howe Farming Group.

Avocado Fund report released

An intense and unpredictable year, 2019/20 certainly dealt challenges for the world, for Australian horticulture, and for Hort Innovation. There was ongoing drought, a devastating bushfire season, intense floods, and, of course, the global and ongoing COVID-19 pandemic.

Through it all, though, activity in the Hort Innovation Avocado Fund remained strong. While some activities inevitably changed under COVID-19, it was still a record year of investment. There was some \$3.28 million invested in R&D for the industry (including into 10 new projects), and another \$3.21 million in marketing.

Overall, there are 39 active R&D investments in the Avocado Fund, an \$7.42 million in levies were collected by the Australian Government and passed onto Hort Innovation for investment.

You can download a copy of the report from: bit.ly/AvoFund.



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Growers, traders in dispute urged to contact Ombudsman

The Australian Small Business and Family Enterprise Ombudsman Kate Carnell is encouraging growers and traders in disputes that fall under the Horticulture Code of Conduct to contact her office.

"The Horticulture Code is a mandatory code that aims to improve the clarity and transparency of trading arrangements between growers and traders," Ms Carnell said.

"My office can provide growers and traders with information and assistance with dispute resolution, including access to mediation services and produce assessors.

"Mediation is a far more cost-effective and timely way to resolve disputes than taking legal action.

"Our website also features a list of horticulture produce assessors who can help resolve a disagreement by investigating and reporting on matters linked to a horticulture produce agreement."

Ms Carnell said assessors could address issues such as whether a trader was entitled to reject produce or whether a grower has received the correct payment from the trader.

"Once an assessor is involved, all parties have to comply with the assessor's reasonable requests and failure to do so can attract a penalty," she said.

"At the end of the day we want to keep small businesses out of the courts, where let's face it, the only winners are lawyers.

"The good news is that the majority of small business disputes my office assists with are resolved at mediation or before.

"Since my office opened four years ago, we have provided free assistance to over 20,000 small businesses nation-wide. Two-out-of-three of those disputes were successfully resolved at mediation or prior to that through contact with our assistance team."

Ms Carnell said the goal was to help small businesses resolve their disputes as quickly as possible.

More information

Small businesses that need information about the Horticulture Code or help with resolving a dispute that falls under the Code can visit asbfeo.gov.au or call the hotline 1300 650 460.



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Love avocados? Thank the toxodon

Jeffrey Miller, Colorado State University

Given avocado's popularity today, it's hard to believe that we came close to not having them in our supermarkets at all.

In my new book *Avocado: A Global History* I explain how the avocado survived a series of ecological and cultural close calls that could have easily relegated them to extinction or niche delicacy. Instead, the avocado persevered, prospered – and became one of the most Instagrammed foods in the world.

A 'ghost of evolution'

Avocados are in the laurel family, the same group of plants that includes bay leaves and cinnamon. Laurel trees prosper in warm subtropical climates, and the avocado evolved in the warming climates of Central America during the Neogene period, roughly 10 million years ago.

During the Pleistocene era, which followed the Neogene, the biggest animals on Earth were what we call the megaherbivores – giant animals that subsisted almost entirely on a vegetarian diet. Most of these, like the giant ground

sloth, would have dwarfed today's largest megaherbivore, the African elephant. The giant herbivores of Pleistocene Mesoamerica like the gomphothere, the giant armadillo and the toxodon needed hundreds of pounds of food a day just to survive. Since food like leaves and grasses are so low in calories and fat, the animals prized any energy dense and fatty foods. Enter: the avocado.

Megaherbivores didn't peel the avocados and eat the green meat like we do today. Instead, their throats and digestive tracts were so large that they would simply swallow the avocado whole and excrete the undigested pit. In a process known as endozoochory, the pile of manure would serve as food for the next generation of avocado trees. As these giant animals roamed and grazed on avocados, they spread the fruit across what is now central Mexico.

But once the megaherbivores died off, the fruit was in a bind. The herbivores that were left had throats far too small to ingest a whole avocado seed, and dropping a giant seed at your own



A toxodon – an extinct animal bigger than an elephant – grazes. Megaherbivores like the toxodon were the avocado's best friend.
Robert Bruce Horsfall 1913/Wikimedia Commons

roots is a poor survival strategy for a tree; to thrive, it needs to disperse more broadly.

Avocados became what the botanist Connie Barlow calls a “Ghost of Evolution” – a species that should have gone extinct but was somehow able to survive. What the avocado had going for it was the lifespan of its trees, which survive much longer than most fruit trees. There are 100-year-old trees still producing fruit in California and 400-year-old trees in central Mexico.

By living so long and being so well adapted to their ecological niche, avocados were able to hold on until their next dispersers – *Homo sapiens* – came along.

More stops and starts

The earliest humans in Mesoamerica were quick to appreciate the virtues of the avocado. Groups like the Olmecs and the Maya started the first avocado orchards and began cultivating specimens that tasted the best and had the meatiest fruits, a process of trait selection that gave us the kinds of avocados we love today. Avocados were so important to the Maya that the 14th month of their calendar was named for them.

In the 1830s, Floridian Dr. Henry Perrine was introduced to avocados while serving as US consul in Campeche, Mexico, and thought they would be an excellent addition to Florida's horticultural offerings.

He sent some seeds to a friend on Indian Key in Florida who planted them. Not long after Perrine returned, the Second Seminole War broke out. Perrine and his family sought shelter from the fighting on the key, but he was killed during a raid on the island by one of the warring factions. The island was abandoned and the avocado trees were forgotten.

Hot and humid Florida had been hospitable to the avocado, but California has enough cold snaps in the winter months to make it difficult for most avocado varieties to thrive there. This could have been another dead end for the fruit, but early settlers in California took another stab at establishing them in the U.S. After a few failed attempts in the 1850s and 1860s, grower Judge R. B. Ord obtained a few cold-hardy specimens from central Mexico. A cold-tolerant variety was needed if California was to have a profitable avocado industry. Without it, the avocado might have remained a delicacy local to Mexico and its neighbours.

One of the earliest cold-hardy specimens was a variety given the name “Fuerte,” which means “strong” in Spanish. The Fuerte avocado earned its name because it was one of the few varieties that survived the famous “Freeze of '13,” a spell of cold weather that nearly ruined the nascent fruit industries of Southern California in the winter of 1913.

Until the 1940s, the Fuerte was the most popular avocado variety in America and made up about 75% of avocados sold.

The Hass comes to pass

The Fuerte has since been relegated to niche product, and represent only about 2% of the California market. Instead, the lion's share of avocados sold today are the variety known as Hass, which rhymes with “pass.”

But were it not for a couple of kids with precocious palates, the world may never have tasted a Hass avocado, with the fruit remaining an odd delicacy for the well-to-do.

The Hass avocado is named for Rudolph Hass, a mailman who lived in La Habra, California. Originally from Milwaukee, Hass joined the thousands of Americans who went west to California in the 1920s and 1930s.

After reading a brochure about the money to be made in avocado ranching, he borrowed enough money to buy a small plot of land with Fuerte avocado trees on it. In the late 1920s, Hass bought some avocado seeds to grow rootstock for his budding nursery. One of these seeds grew a funny tree that rejected the Fuerte limbs that Hass wanted to graft onto it – a process that involves combining two tree plants with distinct characteristics. He was about to cut the misbehaving tree out, but his kids told him that these odd little avocados were their favourites, so he relented and kept the tree. After trying them himself, he thought they had marketing potential and began selling them to people at work and at a market in town.

Hass avocados slowly caught on, and in 1935 Hass patented the tree, the first patent awarded for a tree in America. But most growers, instead of buying his tree, evaded his patent and simply grafted their cuttings themselves. This practice was illegal, but enforcement in the 1930s was spotty.

Today, Americans eat 100 million pounds (45,000t) of avocados on Super Bowl Sunday alone, and Hass should have died a rich man. Instead, he never earned enough to quit the post office. It's estimated that he only made about US\$5,000 on the patent in his lifetime.

Acknowledgement

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MARKETING UPDATE

Marketing Australian avocados

The avocado marketing program aims to increase domestic demand for Australian avocados by at least 20% by 2021. There is a focus on reminding consumers of the health benefits of avocados, inspiring them with delicious meal ideas, and building their confidence in selecting, storing and ripening avocados at home.

Australian Avocados has launched the marketing program for the 2021 financial year across radio, social media, digital media and out of home platforms across the country. The program is composed of two phases; Phase 1 will run from October 2020 to Feb 2021 and Phase 2 will run from March-June 2021.

New content coming

Australian Avocados has recently shot a range of new recipe content with chef Tom Walton, for use in both domestic and export market campaigns. There

are 16 new Asian recipes featured, with 16 images and four stop motion videos to promote the recipes. These will be featured in the social media calendar, and during other campaigns, taking advantage of the ongoing “cook at home” trend driven by the global pandemic.

Public relations

To cut through in a cluttered editorial landscape (especially in the lead-up to Christmas) and to drive coverage above food and lifestyle outlets and into news, Australian Avocados needed a headline-grabbing idea that provided the opportunity to land the “Add an Aussie Avo” & “Buy Aussie Avos” messages via earned media.

The primary role of PR is driving awareness and building saliency, while also encouraging consumers to consider and buy Aussie avos in the summer season.

First, Australian Avocados partnered with Grassy Knoll Brewing to bring two Aussie icons together: beer and avocado. Straight from the tree to the esky, the Aussie Avo Ale is a refreshing full bodied, cream ale brewed with fresh Australian Avocados. To complement this, Grassy Knoll Brewing have added a generous dry hopping for a tropical pillow experience. Adding to this PR activity, Australian chef Hayden Quinn has created a selection of recipes to encourage avo lovers to try Avo Ale braised pulled pork tacos (among other delicious avocado recipes). You can read more about this campaign in the BPR Library.

Australian Avocados also worked with *Urban:List* for the first Isolation Degustation event, a virtual event where participants had a four-course dinner delivered to their doors across Brisbane, Sydney and Melbourne. The event was sold out, and featured two hours of live streamed entertainment and music.

Radio

The most recent activity in 2020 on radio, is the Have-A-Cado competition, where listeners need to share how they like to eat their avocados, for a share of a \$5,000 cash prize pool. The radio version of the #smashanavo advertisement has also been on the airwaves.

Social media

Social media is used to consistently remind target audiences to buy Australian avocados by delivering reasons why avocados make everything better. The ‘always on’ approach to this activity ensured avocados remained top of mind for consumers throughout the year.



Australian Avocados teamed up with Grassy Knoll Brewing to produce an avocado craft beer.

Among the recent activity this quarter has been a competition with Budgie Smugglers, to drive engagement and awareness. Avo lovers were encouraged to share why they loved avocados via Facebook and Instagram, for a chance to win a prize pack including both budgie smugglers and avocados.

Australian Avocados also partnered with TikTok and Instagram influencer Brad Canning, a Melbourne-based plant lover, who shared how to grow an avocado plant from seed at home (for aesthetics, not fruit). The objective was to build engagement and awareness and offer a fun how-to for avocado lovers,

ultimately driving home the brand love message.

Australian Avocados is also working with a range of micro influencers on social media. While these influences have smaller communities, they are very engaged so work will focus on creating delicious avocado content to share.

The content will be focussed on avocado snacks, whether it's as simple as scooping out the avocado flesh with some olive oil and salt, or something a little more adventurous like avocado cacao bliss balls. Australian Avocados

will encourage content creators to include health messaging in their captions to cement the positioning of avocados as the ultimate good mood food snack to showcase the nutritional value of avocados. The objective of this campaign is to create new, delicious content that can be shared on the Australian avocados' channels, as well as to amplify reach of inspiration and education messaging. Results from this round of activity aren't in, but the last micro influencer campaign earlier in the year generated 18 posts, delivered to a combined follower number of 546,416, resulting in 9,971 total engagements.

Australian Avocados delivered more than 30 million impressions via social media in 2019/20 via the campaign's Facebook (facebook.com/AustralianAvocados) and Instagram (@AustralianAvocados) pages. These activities exceeded all key performance indicators and generated over 4.8 million engagements including 3.7 million video views.

How Do You Have-A-Cado?



Australian Avocados make everything better. Smoothies, salads, sandwiches, and lots more are even better when you add an Aussie Avo!

What's more, Aussie Avocados are bursting full of nutrients, healthy fats, vitamins and minerals.

And when you eat better, you feel better!

Radio listeners across a range of stations are being encouraged to share how they like to Have-A-Cado to win a share of \$5,000.



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australianavocados Do you think you can take the crown as Australia's #1 avocado fan? 🥑 We have teamed up with the legends at @BudgySmuggler to offer one avocado lover the perfect summer avo prize for you and a friend! 🎉

To enter all you have to do is tell us why you love Australian avocados and how they make everything better. 😊 You must be following @australianavocados to be eligible to win! 🎉

The huge prize pack includes:
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2 Smashed Avo bucket hats

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Have you ever tried to grow your own avocado plant?



@leafy.lane

Tune into our Instagram Story Thursday 15 October as Brad Canning, aka @leafy.lane, shares his tips for growing your own Aussie avo plant 🌱

Send Message

In October, Australian Avocados teamed up with Brad Canning of @leafy.lane to show avo lovers how to grow a plant from seed.

The use of social media influencers ensured Australian Avocados produced new and relevant content throughout the year and produced more than 19 million opportunities for people to see and nearly 4.5 million engagements.

Television

In 2019/20, television played a key role in driving mass awareness of avocados and ensuring key messages for Australian Avocados were established in both metro and regional markets. As detailed in the latest Hort Innovation Avocado Fund report, the goal was to reach 30% of the target audience (grocery buyers aged 25 to 54) at least twice with the ad, across several key metro and regional networks, including Seven, Nine, Ten, WIN, Southern Cross Austereo (SCA) and Prime.

The Australian Avocados TV campaign launched in market in early March 2020, securing a spot in Channel 9's *Married at First Sight* and aligning with the top peak programming the networks had on offer such as *My Kitchen Rules*, *Australian Survivor* and Channel Seven's *Doctor Doctor*. Driving efficiencies through daytime

TV, Australian Avocados featured in general entertainment programming as well. Finally, the Avocados TV buy was underpinned by the news and current affair programming slate of the networks including Seven News, Nine News, *A Current Affair* and *The Project*.

My Market Kitchen

As reported in the last edition of *Talking Avocados*, avocado recipes and growers were featured as part of the Hort Innovation partnership with Channel Ten's *My Market Kitchen*. (You can view the episodes here horticulture.com.au/growers/my-market-kitchen/, and more on australianavocados.com.au/my-market-kitchen/.)

The Australian Avocados website was updated to feature the clips and showcase the choc avocado mousse recipe. On the website to date, for the choc avocado recipe the average time on page is about a minute and a half, which means people are staying around to read the recipe, and on the *My Market Kitchen* page, readers are staying about three minutes, meaning people are staying around to watch the videos that showcase the growers as well.

Australian Avocados website

According to the latest Avocado Fund report (more on page 38), the Australian Avocado website (australianavocados.com.au) is growing in popularity with 278,217 users in 2019/20, up 62.36% from 2018/19. From a demographic point of view, 75% of users are female and 25% male. More than 494,000 pages were viewed in 2019/20, and the highest traffic was to the recipe page with 45,000 visitors and the Guacamole recipe page which attracted 42,702 visitors. There is consistent traffic to the website between 10am and 8pm, but there is a spike between 3pm and 6pm when people are looking for recipes and meal inspiration.

Acknowledgement

This activity is managed by Hort Innovation, on behalf of the industry, and is funded by the avocado marketing levy.



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The Guardian

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The Australian Avocados PR campaign has kept Aussie avos in the news across 2020.

Delroy's launch Delcado brand

West Australian avocado growers Delroy Orchards launched a new premium Hass avocado in October, which they say offers better quality because of their innovative supply chain technology and management eight years in the making.

Dubbed the 'Delcado' – a signature smash-up of Delroy and avocado – the premium grade Hass is grown at the Delroy Orchards, Pemberton.

Driven by consumer demand for improved avocado quality, the Delroy family have spent eight years finetuning each part of their avocados' journey through growing, quality checks, storage, ripening and supply chain.

"We've put a lot of energy into controlling the quality of our Delcados. This starts on the tree where we test the fruit for its oil content to make sure it has a rich flavour before it's picked," said Robbie Delroy, Delroy Orchards Business Development Manager and son of orchard founders Russell and Jenny Delroy.

"We're also now using near infrared technology, in addition to our blemish technology, to see inside the avocado to better detect any internal damage.

"The technology is already used by apple growers looking for bruises in their fruit, while it is early days for avocados, we're excited about what it could mean for quality control and the avocado category in general.

"Another key investment has been making our supply chain as efficient and controlled as possible, so we can monitor and temperature control every step of the Delcados journey from orchard to store."

The Delroys saw an opportunity to improve quality through supply chain efficiency and have invested heavily in R&D in partnership with Australian and international universities to improve best practice technology in both production and supply chain.

The Delroys have also worked with Reservoir Partners on a three-year strategic marketing program. It begins with a major integrated brand campaign launching with two commercials on television and digital channels, public relations and social media programs, out of home advertising, point of sale, and a media partnership with taste.com.au.

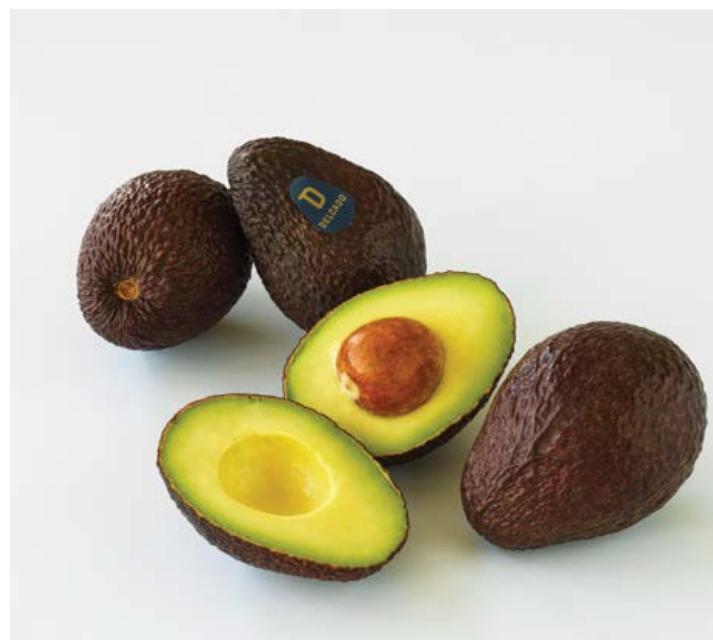
Delcados will be available from October to February at Coles, Woolworths and ALDI supermarkets, Harris Farm Markets and fresh produce retailers in New South Wales, Victoria, South Australia, Western Australia and Tasmania.

More information

Visit delcado.com.au or find Delcado on Facebook, Instagram and YouTube.



Kathryn, Suzie and Robbie Delroy in the family's Western Australian orchard. *Image: Sam Harris.*





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RESEARCH AND DEVELOPMENT

Panicle blight (flower dieback)

Elizabeth Dann, Akila Prabhakaran, Kaylene Bransgrove

Severe panicle blight, or inflorescence dieback, occurred in blocks in the Bundaberg/Childers growing region during the 2019 flowering. This dieback of inflorescences has been observed in previous years, but was apparently much more severe in 2019. There was no fruit harvested from some of the worst affected blocks, and yields in other blocks were greatly reduced.

What is it? What does it look like?

The photos show the typical symptoms of panicle blight. The flower shoot is sometimes wilted, and flowers turn brown and necrotic with the dieback clearly extending down the panicle (*Figures 1-3*). The vegetative shoots of indeterminate inflorescences also wilt and die. The dieback is often arrested at the node, but occasionally extends further down the branch.

The skeleton of the inflorescence remains in the canopy until it is pruned out (*Figures 4 and 5*).

When dieback occurs in the early stages of flowering, inflorescence elongation is prevented and a “witches broom” type symptom is observed (*Figure 6*).

Shoot blight affecting newly planted trees (*Figures 7 and 8*) was also common in the region last year.

Is it new?

No, we don't think it is due to some new or exotic pathogen that would be of biosecurity concern. It has been seen in previous years, and we also saw it in orchards in New South Wales, Western Australia and New Zealand, so there is probably some degree of panicle blight in most, maybe all, orchards across all growing regions.

What causes it?

We'd be very happy to hear your ideas on the cause, if you are familiar with it in your orchards!

Anecdotal evidence from colleagues in other countries (Israel, California, South Africa) say it is caused by “*Dothiorella*”, (the old name for fungi in the *Botryosphaeriaceae* family, which also cause stem end rot), and associated with tree stress, eg

drought. There are similar problems in other crops such as macadamia, pistachio, mango and lychee.

We collected several samples ourselves from the field, and growers and agronomists also sent us symptomatic tissues. We carefully selected tissues, surface-sterilised to remove any microbes which colonised decaying tissue (secondary colonisers), and plated small pieces of tissue onto selective media in Petri dishes.

We monitored growth of fungi and identified several genera. These included *Alternaria*, *Cladosporium*, *Colletotrichum*, *Fusarium*, *Pestalotiopsis*, *Diaporthe*, *Botryosphaeria* (eg “*Dothiorella*”). The fungi we have isolated are the “usual



Figure 1. This whole panicle was affected at later stages of inflorescence elongation and prior to flowers opening. Others nearby are not showing symptoms. This photo was taken in south-east Queensland in 2020, although anecdotal reports suggest that flower dieback has not been as severe this year as in 2019. *Image: grower/agronomist.*



Figure 2. Dieback has extended down the flowering shoot and has been arrested at the node.



Figure 3a & 3b. Flowers turn brown and necrotic pre-bloom, and vegetative shoots of indeterminate inflorescences also die (close-up).



Figure 4. The skeleton of the inflorescence remains in the canopy until it is pruned out, and is a reservoir of fungal inoculum for subsequent infections of developing fruit. *Image: grower/agronomist.*



Figure 5. Panicle blight was very severe in this young orchard in northern NSW. The challenging conditions in the lead up to the 2019 flowering may have exacerbated the problem.



Figure 6. Dieback sometimes occurs in the early stages of inflorescence elongation, representing a "witches broom" type symptom.

suspects", that is, those commonly associated with avocado fruit stem end rot, and those reported to cause similar flower dieback symptoms in macadamia, pistachio, mango and lychee.

There is no doubt that conditions leading into the 2019 flowering in Central Queensland were challenging, despite orchard irrigation. A couple of years of drought, poor quality irrigation water (chloride levels in excess of 80mg/L), and low rainfall totals in July (9.6mm), August (14.2mm) and September (3.8mm), most likely exacerbated the problem. (You can read more about acceptable soil chloride levels for avocados on page 17 of the Winter 2018 edition of *Talking Avocados* – avocado.org.au.)

What are we doing about it?

We have included additional research activity in *Improving avocado orchard productivity through disease management* (AV16007) to investigate the issue.

- We will continue to receive samples from 2020 flowering to build our database of distribution and associated fungi.
- Pathogenicity testing in the glasshouse involves spraying fungi onto flowers and attempting to replicate the dieback symptoms in order to demonstrate conclusively that a particular fungus causes the disease. More than one fungus may be involved.
- We have communicated with the major agrichemical companies and have screened several conventional fungicides and "biofungicides" not currently registered in



Figure 7. Shoot blight affecting newly planted trees was also common in the Central Queensland region in 2019. *Image: C. Simpson, EE Muir*

avocado, for their ability to inhibit growth of selected fungi. This was done in the laboratory, and involved some 2000+ Petri dishes.

- From these *in vitro* tests, four fungicides were selected for trialling in the field. Two trials have been established in Hass orchards at Childers and Bundaberg, and first sprays have been applied during early flowering. There will be a second spray at about mid-bloom, followed by standard copper program. The new treatments will likely be applied again later in the season when conditions have been conducive to infection of fruit (rainy periods).

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- We will be assessing the trees in the field trial for crop safety (phytotoxicity), panicle blight incidence and severity, fruit set/retention, final yield and post-harvest anthracnose and stem-end rot.

What can you do about it?

If you see it, please send some pictures in an email (e.dann@uq.edu.au), and we may ask you to send us some samples. Early infection stages, when there is still some green/ healthy tissue in the inflorescence, is best, not the later skeletal stage.

We would like to know how widely distributed it is, and do further isolations onto selective media to see what fungi or other microbes may be associated. Your information will be treated as confidential and we will not identify blocks or orchards unless you give us permission.

As for management strategy, it is safest to prune out the branches with the dieback. This removes the source of inoculum, assuming that fungi are involved. The fungi can survive on dead branches, skeletal panicles and mummified fruit within the canopy and produce spores which can then spread to flowers and developing fruit in rainy weather, initiating new infections. Maintain optimum tree health at all times by good agronomic and Phytophthora root rot management.



Figure 8. A close up of shoot blight.

Acknowledgement

The *Improving avocado orchard productivity through disease management* (AV16007) project is funded by Hort Innovation, using the avocado research and development levy, and contributions from the Australian Government.



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Biosecurity threats – avocado seed moth larvae

By Dr Louisa Parkinson and Associate Professor Andrew Geering, QAAFI, UQ

The avocado seed moth, *Stenoma catenifer* Walsingham (Lepidoptera, Elachistidae), is an important pest of avocados in Central and South America, causing significant economic losses by infesting between 80-100% of fruit in countries such as Venezuela and Brazil (Boscán de Martínez & Godoy, 1982; Nava et al., 2005a).

Stenoma catenifer is known to feed exclusively on the stems, fruits and seeds of trees in the Lauraceae family, with most of the economic damage caused by larvae feeding inside the fruit and destroying the seed and pulp. Use of contact insecticides for pest control is hindered by the burrowing habit of the larvae. In Brazil, insecticide sprays of 7-11 times per growing season still result in up to 60% of the fruit becoming infested with the larvae (Nava et al., 2005b). The avocado seed moth is rated among the highest priority biosecurity threats to the Australian avocado industry.

Where is *Stenoma catenifer* found?

The avocado seed moth is distributed in Argentina, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, the Galapagos Islands, Guatemala, Guyana, Mexico, Panama, Peru and Venezuela. The moth can disperse on its own wings and by trade of infested fruit. Despite being present in neighbouring Mexico, the avocado industry in the United States remains free of this pest and other fruit-feeding insects such as seed weevils (Hoddle, 2006). Although fruit is reportedly smuggled from neighbouring countries into the United States, a number of factors have contributed towards the invasive pests failing to establish in new territories, including the frequency and volume of smuggled fruit and unfavourable environmental conditions for colonisation to happen (Hoddle, 2006).

Nevertheless, the risk of spread remains significant as millions of avocado fruit from Latin America are imported into California. In the Galapagos Islands, this exotic pest established within one year of its introduction into Ecuador in 2001 (Hoddle, 2013). Up to 90% of avocado fruit on the Galapagos are infested and the crop is no longer considered marketable or economically viable (Hoddle, 2013), highlighting that successful establishment from an incursion can have dire consequences to an industry.

Life cycle and morphological identification

Stenoma catenifer eggs are oval in shape and approximately 0.59 ± 0.04 mm long and 0.38 ± 0.2 mm wide (Cervantes et al., 1999). When first laid, eggs are initially pale cream or white in

colour and darken towards maturity. Female moths oviposit at night, typically within four hours of darkness (Nava et al., 2005a), with a preference for rough surfaces such as necrotic sections of fruit skin (Hohmann et al., 2003). Eggs can be oviposited on fruit, the fruit stem, pedicel and branches attached to the pedicel.

Avocado seed moth larvae have five instar stages prior to pupation (Cervantes et al., 1999; Hoddle, 2013). First instar larvae are pale cream to light purple in colour which increases in intensity as the larvae progress through each instar phase. Fifth instar larvae are 22mm in length, and appear brown or red-brown on the upperside but are violet and turquoise-blue on the underside (Figure 1). After 3-4 weeks, when ready to pupate, *S. catenifer* larvae will abandon the fruit and 'walk or climb' for approximately 12 hours (Hoddle, 2013) to find a protective spot in the soil (typically 5-20mm deep) (Boscán de Martínez & Godoy, 1984), where it enters a quiescent period to spin a loose silk chrysalis, which takes a further 12 hours.

Although uncommon, *S. catenifer* larvae can remain in the seed to pupate (Hoddle, 2013). Young pupae are turquoise-blue in colour and will change to red-brown within 4-8 hours of initial pupation (Figure 2). The adult moth develops after 10 days of pupation. Adult moths are light tan in colour and have a characteristic 'C' shape of black dots around the edges of the forewings (Figure 3). Adult females are 15mm in length in a resting position (wings folded and length measured from the tip of the head to the tip of the wings); while the forewing span is 28-30mm in breadth (Hoddle, 2013). Males are slightly shorter in length than females by 2-3mm (Cervantes et al. 1999).

Symptoms of seed moth infestation

As its name suggests, the avocado seed moth typically lays eggs on the skin of fruit but a seemingly unlikely but more frequent place for oviposition is on the branch attached to the fruit pedicel. In studies, up to 68% of eggs can be found on the branch compared to just 12% on the fruit (Hoddle, 2013), although the avocado fruit is typically required as stimulus for inducing egg laying (Nava et al. 2005a). When doing quarantine inspections, it is important to check the inside of any plant material attached to the fruit, including nearby branches, as the larvae are known to bore into branches as well as fruit (Figure 4).



Figure 1. *Stenoma catenifer* fifth instar larvae are red-brown (left) and turquoise-blue underneath (right). *Image: Prof Mark Hoddle, University of California, Riverside*



Figure 2. Young pupae are turquoise-blue in colour (left) and will change to red-brown within 4–8 hours of initial pupation. *Image: Prof Mark Hoddle, University of California, Riverside*



Figure 3. Adult seed moths have characteristic 'C' shape of black dots around the edges of the forewings. *Image: Prof Mark Hoddle, University of California, Riverside*



Figure 4. Avocado seed moth larvae are known to bore into branches as well as fruit. *Image: Prof Mark Hoddle, University of California, Riverside*

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Some key symptoms of seed moth infestation include persitol (sugary exudates) running down the side of fruit (Figure 5); frass ‘kick-outs’ by the pest at the end of feeding galleries; and holes on the side of the fruit (Figure 6) (Hoddle, 2017). The majority of larval attacks can be observed on the lower part of the fruit. Typically, infested fruit have 1-2 larvae in the seed but sometimes several larvae can be found in the seed (Hoddle, 2013). Seeds are often completely destroyed when more than one larvae persists in the fruit (Figure 7). Young fruit with seed moth drop prematurely and the larvae continue feeding prior to emerging from the fruit to pupate in the soil.

Is there a difference in susceptibility of avocado cultivars?

Surveys of orchards in South America and laboratory oviposition studies suggest that cv. Hass is more susceptible to seed moth than other cultivars (Hoddle, 2013). It is thought that fruit skin texture and nutritional content have a role in host selection for breeding (Nava et al., 2005a).

What are some pest-control methods?

- Parasitoids can provide some natural biocontrol but the available species is limited to its endemic distribution (Nava et al., 2005b). Moreover, parasitoids cannot provide commercial-scale biocontrol (Hohmann et al., 2003).
- Broad-spectrum insecticides can reduce rates of infestation but not provide eradication.
- Strict biosecurity practices for import of plant material are currently the only methods to prevent an incursion.

What we can do to be on the lookout?

Although Australia has strict biosecurity regulations in place to prevent incursions by invasive species, being aware and knowing what to look for is still an important practice in protecting our industry.

- Be aware of what the moth and larvae look like (and at different stages in the larval life cycle)
- Purchase plant material only from accredited nurseries or orchards
- Inspect new plant material
- If you notice signs and symptoms of seed moth activity, report it and get the plant material inspected and tested.

We are proposing to develop a rapid molecular test for identifying seed moth larvae in avocado fruit. Trapping larvae and observing its life cycle for weeks followed by confirmation of its identity with a morphological key of an adult moth takes considerable time to wait for a diagnosis. There is a need for on-the-spot molecular identification of invasive pests at the larval stage to complement our industry’s biosecurity arsenal of rapid identification tools.

More information

If you have any queries, concerns or suggestions about high priority pest and disease threats to industry, please contact the

Avocado Biosecurity Team at QAAFI (Dr Louisa Parkinson, lparkinson@uq.edu.au). If you find any suspicious insects in your orchard or nursery please report it to the exotic plant pest hotline (1800 084 881).

Acknowledgement

We wish to thank Prof Mark Hoddle, University of California Riverside, for his expertise on the topic and the images used in this article.

The *Avocado industry biosecurity capacity building* project (AV16010) project has been funded by Hort Innovation, using the avocado research and development levy, and contributions from the Australian Government.

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Figure 5. Symptoms of seed moth infestation: persitol (sugary exudates) running down the side of fruit. *Image: Prof Mark Hoddle, University of California, Riverside*



Figure 6. Symptoms of seed moth infestation: holes on the side of the fruit (left); frass 'kick-out' from active larvae (right). *Image: Prof Mark Hoddle, University of California, Riverside*



Figure 7. Avocado fruit with destroyed seed filled with frass of *Stenoma catenifer* (left). Damaged avocado seed with *S. catenifer* pupa and frass (right). *Image: Prof Mark Hoddle, University of California, Riverside*

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National Tree Crop Mapping – Queensland updated!

Craig Shephard, UNE Applied Agricultural Remote Sensing Centre

To better understand the annual growth of the avocado industry and to be better prepared for biosecurity outbreaks and natural disaster response, Avocados Australia and Hort Innovation are supporting the continued development of the National Tree Crop Map.

Researchers at the Applied Agricultural Remote Sensing Centre (AARSC) have now completed the update for all growing regions in Queensland, which shows 9,337 hectares of commercial avocado orchards mapped across the state. We are sharing the updated mapping from a variety of theme-based web applications, all available at une.edu.au/webapps.

The new ‘Dashboard’ interactively summarises the extent (area) of horticulture tree crops, by growing region. Panning and zooming around the map will also update statistics, on-the-fly (Figure 1).

Users can also use the Australian Tree Crop Map to filter the data to show a specific tree crop of interest (Figure 2).

In response to industry feedback, the dashboard app now includes the functionality to return demographics by state and territory and local government area, via a “pop-up”. At national scale, clicking the map will return the area of each tree crop by

state and territory, while zooming in to the map will show Local Government Areas. Note that the metrics in the pop-ups are populated from tabular data. Navigating the map with the “zoom to growing region” tool, type an address or place name into the search box and/or simply pan and zoom will update the statistics for each tree crop (at bottom) on-the-fly, based on the map extent.

Stakeholders are encouraged to contribute to the mapping update by completing a ‘Land Use Survey’ or reviewing the draft mapping in the ‘Industry Engagement Web App’. Input from industry experts is extremely valuable, especially for mapping new



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crops which are not yet visible in satellite imagery.

Importantly, no personal or commercial information is acquired or presented within this map, and the map adheres to the national standards of the Australian Collaborative Land Use and Management Program.

Spatial data supporting insights for industry

With the mapping updated across all growing regions in Queensland, the spatial data can be applied to informing industry demographics. The dashboard can be used to show production area of tree crops by growing region. Additionally, we can now derive change metrics based on the presence/absence of orchards between the Phase 1 (2017) and the updated Phase 2 map (2020).

By growing region, the avocado orchards in Bundaberg increased by 768 hectares and the Tablelands (Figure 3) increased by 1,569 hectares. These metrics are essential for the avocado industry to better understand future supply and demand, manage logistics including labour, processing and transport, as well as resource inputs such as water, root stock production and land availability. The Australian Tree Crop Map provides this essential information.

Up next

Our national mapping program is now focused on updating the growing regions in South Australia, including Renmark.

More information

Contact: Craig Shephard via cshepha2@une.edu.au or visit une.edu.au/aarsc.

Acknowledgement

The *Multi-scale monitoring tools for managing Australian tree crops initiative* is led by the University of New England, and supported by Hort Innovation under the Australian Government's Rural Research and Development for Profit program.

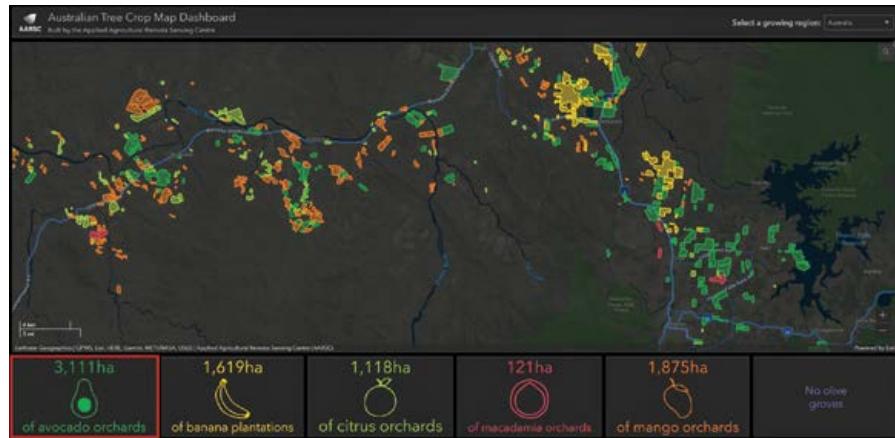


Figure 1. The new “dashboard” of the National Tree Crop Map summarises the extent of horticultural tree crops.

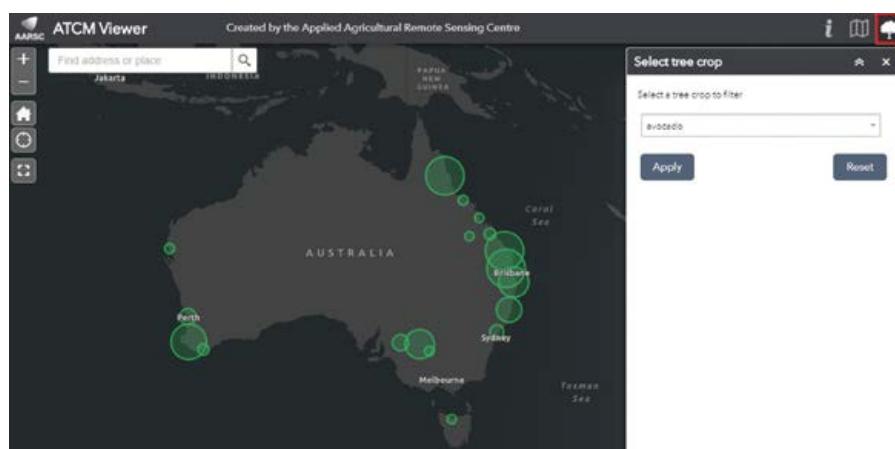


Figure 2. The Australian Tree Crop Map can be filtered to show a specific tree crop.



Figure 3. The tree crop map allows for spatial data insights.

Where are all the missing trees?

John Tyas, Avocados Australia

Avocados Australia is currently undertaking the annual tree census and in this time of significant growth, now, more than ever, we need everyone to review and update their orchard records.

If you need assistance, please contact the office and we can help you out. A link to your individualised census was emailed out on 25 September (from infocado@avocado.org.au). If you cannot find the email, contact Daniel Martins (0458 004 198 or data@avocado.org.au) or Amanda Madden (0472 501 301 or admin2@avocado.org.au) and they will be happy to assist you.

Thousands of missing hectares

A few years ago, we were part of a project to develop a map of all known avocado plantings in Australia. The area of avocado plantings that were mapped aligned closely with our *OrchardInfo* records from our annual tree census at the time. While the map is a very useful tool to know exactly where orchards are located, it cannot capture information about the variety, age of tree or planting density. This essential information is only collected via our annual tree census.

However, the mapping team is currently updating the map (more on this project on page 56) and recently completed a review of all of Queensland. We were alarmed to learn that the area of avocado plantings in Queensland is now 9,337 hectares compared with the area of plantings that we have recorded from our latest census in 2019 when we recorded 6,796 hectares.

There is no doubt that there have been a lot of new plantings over the past few years, but this additional area is astonishing and will significantly increase our estimates for production volumes in the coming years. This production estimate underpins everything including research & development, domestic marketing, and our export development efforts.

Future viability relies on good planning

Our industry is growing rapidly and this presents a lot of challenges and opportunities. Unless we have a good understanding of what is in the ground, we are only guessing about what production might look like in two, five or 10 years from now.

We want to be able to provide the best support for you, the growers, to ensure the industry remains profitable and sustainable over the longer term. We want to establish appropriate market development programs and invest in leading edge R&D projects that ensure the industry is globally competitive. This future planning requires good data about the number of avocado trees: by variety, by age, by region.

Your next steps

The 2020 annual tree census is continuing and I strongly encourage all growers to review and update their records, and we thank those who have already contributed.

- Fill out your annual census. A link to your census was emailed out on 25 September (from infocado@avocado.org.au). The survey is quick and easy to fill in, and all data is confidential. We aggregate to the regional level, and this is the basis for the report you will receive by the end of the year.
- If you cannot find the email with your individualised survey link, contact Daniel Martins (0458 004 198 or data@avocado.org.au) or Amanda Madden (0472 501 301 or admin2@avocado.org.au) and they will be happy to assist you.
- Have you updated who completes the *OrchardInfo* in your business? Please let us know.
- If you know of any new growers in your area, ask them if they contribute their data, and if not, please ask them to contact us (or, if they agree, send us their contact details).

I cannot overstate how important having this information available is for your future.

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New rootstock released for use by the Australian avocado industry

Dr Anthony Whiley and Dr Elizabeth Dann

The first commercial planting of 600 Hass trees grafted to a new rootstock selected and evaluated in Australia, occurred near Childers in the Central Queensland growing region in July 2020.

The rootstock was recovered and clonally propagated from a surviving Hass tree in an avocado orchard at South Kolan, Queensland. Surrounding trees had succumbed to Phytophthora root rot. Identified as 'SHSR-04' for evaluation purposes, it proved to have a high level of resistance to Phytophthora root rot, in repeated trials conducted between 2006 and 2015 under high disease pressure (Smith et al, 2011).

At Childers, the trees on SHSR-04 have been planted alongside rows of Hass grafted to Dusa, Velvick and other rootstocks, and the owner has generously agreed to provide access and assistance with the collection of comparative performance data. Tree health and growth rates across the block will be monitored along with the collection of yield and fruit size data. The site is a replant block in a commercial orchard, where 30-year-old trees had significantly declined from Phytophthora root rot. The site will also test the tolerance of the new rootstock to high chloride concentrations in irrigation water. To retain Phytophthora resistance, SHSR-04 is produced as a cloned rootstock since its seedlings were shown to have no significant resistance when grafted to Hass. The new rootstock does not have complete resistance to *Phytophthora cinnamomi*, but will be a key component to establishing and maintaining healthy, productive orchards. Remember the Pegg Wheel for integrated management of Phytophthora root rot! (You can find the Pegg Wheel on the *Manage Phytophthora root rot* poster in the Education Materials area of the BPR Library.)

The Intellectual Property owners of SHSR-04 (George H. Green, Horticulture Innovation Australia Ltd and Sunshine Horticultural Services Pty Ltd) have secured protection under Plant Breeders Rights and are progressing the commercialisation of SHSR-04 to provide broad access for Australian avocado growers. Propagation licenses have been signed with two ANVAS nurseries, Anderson Horticulture Pty Ltd at Duranbah, New South Wales and Turkinje Nursery at Walkamin, North Queensland. Licensing negotiations are continuing with other ANVAS nurseries.

The IP owners have also applied for a US Patent for the rootstock and are considering other opportunities for international licensing. The latter is believed necessary since past experiences have shown that unauthorised transfer of elite plant material across international borders will occur if IP protection has not been taken out. A Trade Mark (rootstock name) has had preliminary approval, with final approval expected to be granted in November 2020 and the name announced in a subsequent publication.

More information

Dr Anthony Whiley and Dr Elizabeth Dann are preparing a detailed article about the new rootstock for the Summer edition of *Talking Avocados* (out in early 2021). Watch this space!

You can also find the final reports for AV07000, AV08000 and AV10001 in the R&D Reports area of the BPR Library.



Rootstock trial at Duranbah, New South Wales, demonstrating healthy Hass on the SHSR-04 rootstock (LHS) among declining trees on other rootstocks. The site had a very high *Phytophthora cinnamomi* disease pressure, and was known by the research teams as the "Killing Fields" since most rootstocks had succumbed to Phytophthora within two years.

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Acknowledgement

The research leading to this result was funded by the Horticulture Australia Limited (HAL) project *Rootstock improvement for the Australian avocado industry - phase 3* (AV08000), that recovered and clonally propagated the rootstock in collaboration with George Green and Sunshine Horticultural Services. (As IP owners, George Green and Sunshine Horticultural Services provided resources supporting the development of the rootstock, including recovering the original rootstock and subsequent propagation of the rootstock allowing it to be field tested.) The HAL/Hort Innovation funded projects *Improving yield and quality in avocado through disease management* (AV07000 and AV10001) carried out field evaluations of Phytophthora root rot resistance.

The *Avocado rootstock SHSR-04 commercialisation* (AV15005) project was funded by Hort Innovation, using the avocado research and development levy, and contributions from the Australian Government. Its main role was to assist with securing the Intellectual Property vested in the rootstock and negotiating commercialisation agreements with nurseries in collaboration with the other parties with IP ownership.



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Cryo-biotechnology to safeguard avocado germplasm

Chris O'Brien, Mitter Lab

Germplasm conservation of horticulturally valuable plant species is vital for future plant selection and breeding programs.

Avocado is one such crop highly valued in horticulture with very rich, diverse, and versatile germplasm due to two main reasons. Firstly, avocado comes from three land races: Mexican, Guatemalan and West Indian. Secondly, they are a cross pollinated species. Conservation of avocado through conventional seed banking is impossible due to heterozygous and recalcitrant nature of the seeds.

This means avocado germplasm around the world is conserved as field repositories (Figure 1). Field repositories are advantageous as the trees can be evaluated periodically, however, there are several limitations:

- high maintenance cost
- intensive labour and land requirements



Figure 1. One of the many avocado accessions being maintained in The Huntington Botanical Gardens (in San Marino, California USA) living germplasm collection.

- pressure of natural calamities
- pandemics
- risk of biotic and abiotic stresses
- funding sources and economic decisions limiting the level of accession replication to maintain genetic diversity.

There is no insurance when germplasm is stored only in field repositories.

The threat of ambrosia beetle species and its symbiont fungus laurel wilt disease to the avocado field gene banks and commercial industry in Florida, California, Israel and Mexico is a glaring example of an abiotic stress that could destroy the industry.

Here, in Australia, during the bushfires in 2019/2020 natural forests, bushlands and genetic diversity was lost. It has been estimated that we have already lost around 40% of the forest cover in developing countries of the world through deforestation; which includes the genetic origins of avocado and this has led to a loss of the genetic footprint of *Persea* spp. that has eroded potential useful genes for future breeding programs.



Figure 2. Chris O'Brien (PhD student, Mitter lab) and Professor Neena Mitter observing avocado plants in the growth room (left) and Chris O'Brien receiving training on cryopreservation techniques from world expert Dr Raquel Folgado during a visit to The Huntington Botanical Gardens in 2019 (right).

Useful genetics

Each of the three recognised races of *P. americana* (Mexican, Guatemalan and West Indian) have distinctive characteristics, for example, plant habit, leaf chemistry, peel texture, fruit colour, disease and salinity tolerance. These attributes can serve as a resource in crop improvement programs.

An example of a wild *Persea* spp. that can be taken advantage of is *Persea steyermarkii*, which grows adventitious roots (essential for clonal propagation) from the main trunk when it is damaged (Barrientos-Priego, 1999), making it a dominant species in a forest in Chiapas and Mexico (Barrientos-Priego and López-López, 2000). In Spain, a fungus called *Rosellina necatrix* is problematic, however, and seedlings from the germplasm bank of the Fundación Slavador Sanchez Colin have shown a tolerance to this disease (Feng et al, 2013, Lorea Hernández, 2002) with potential to select accessions to combat the fungus.

Germplasm banks in Australia

Living collections maintained at Maroochy Research Station, Walkamin Research Station, and private farms on the Atherton Tablelands (plus many others in Western Australia and Northern New South Wales) serve as a great resource for genetics for the Australian avocado industry. With current biosecurity issues surrounding importing material from overseas and pandemics such as COVID-19 impacting all supply chains, it is becoming extremely challenging to source this valuable material in a cost-efficient and timely-manner, if at all, from interstate or international areas.

Collections of avocado germplasm containing useful genes have already been lost in Australia, for example, at the old CSIRO Merbein Station plants were removed for a caravan park development and all material was removed from the Frank Wise Institute, Ord Valley for a sugar mill.

Currently we are in correspondence with Mark Hoult from Coastal Plains Research Station outside of Darwin regarding a small collection of avocado accessions of West Indian race, which are set to be destroyed. We need to take advantage of opportunities to save this germplasm for future generations and breeding. These collections urgently need a complementary back-up such as cryopreservation which offers a safe and cost-efficient method to conserve this important germplasm.

Cryopreservation is part of the solution

Cryo-biotechnology, or cryopreservation, is where regenerable plant tissues (eg, seed, embryos, shoot tips) are stored indefinitely in liquid nitrogen at -196°C until they are rewarmed to recover them into plants from preserved germplasm. Unlike field repositories, cryopreservation is secure, space-efficient (can store 1000s of trees in a 10m² space) and protected from climate change, extreme weather events and disease. It also allows material to be stored at very low cost compared to other conservation methods

KEY POINTS

- Avocado seed cannot be seed banked.
- This is the first time avocado shoot tips from mature trees have successfully been cryogenically frozen and revived, conserving genetics of the mother tree.
- Securing diverse germplasm is key to breeding of future-proof food crops.
- Until now, preserving avocado genetics has meant maintaining different varieties as trees in the field, at significant risk of global change.
- Cryopreservation saves space and potentially could be a way to transport clean, disease-free avocado plant material globally.

such as slow growth tissue culture maintenance, which requires on-going sub-culturing (Kaczmarczyk et al, 2011). Cryopreservation is considered an optimal strategy supporting conservation of recalcitrant or vegetatively propagated plant species, including crops and species at risk of extinction (Funnekotter et al, 2017).

The Mitter team have developed the world's first protocol to successfully cryopreserve (storage in liquid nitrogen at -196 °C) and regenerate plants from shoot tips of avocado. We have 80% regrowth for Reed and 60% regrowth for Velvick after liquid nitrogen storage.

The technology was developed using a technique called droplet vitrification, which has been successfully applied to many sub-tropical and tropical crops. For avocado, our research reveals that careful optimisation and know-how is needed for different cultivars. Shoots are cultured in specific pre-culture conditions before dissection of 1mm² shoot tips, followed by treatment with cryoprotectant solutions before placing shoot tips on alfoil strips in a cryo tube and plunging into liquid nitrogen (Figure 3). After storage, shoots tips can be recovered using a rewarming step followed by culturing to regenerate shoots and root induction to obtain rooted plantlets according to the protocol developed in our lab by Hiti-Bandaralage et al (2019).

We have now successfully regenerated avocado shoot tips into full plants after storage in liquid nitrogen and these are ready to be transferred to the nursery and eventually into the field for evaluation.

For the first time in history we can now preserve true-to-type genetic material of avocado (mature material) to safeguard the industry of the future. A solution sought for over 40 years has been developed opening the door to translate the technology and know-how to more accessions and establish the world's first germplasm bank for avocado. Our vision is an Australian-led, Global Avocado Conservation Program to conserve core avocado germplasm to preserve against worldwide disease pandemics, natural disasters and climate change.

A cryo-based conservation program for avocado germplasm could provide the following advantages:

1. collections that can no longer be stored in the field can be stored as in vitro collections
2. plants cryopreserved are clonal (true-to-type) and disease free for purity and quality
3. strategic expansion and improved access of current avocado collections through global exchanges
4. conserve avocado genetics for future breeding to develop new cultivars for this horticulturally important crop.



Figure 4. Cultivar Reed plants that have been through the cryopreservation protocol and revived - growing in the glasshouse at The University of Queensland.

More information

You can read more about this innovation from the ABC (abc.net.au/news/rural/2020-09-10/avocados-preservation-science-cryopreservation/12643822) and check out QAAFI's video as well, qaafi.uq.edu.au/article/2020/09/putting-future-avocado-apocalypse-ice. You can read Mr O'Brien's journal articles via qaafi.uq.edu.au/profile/408/chris-obrien.

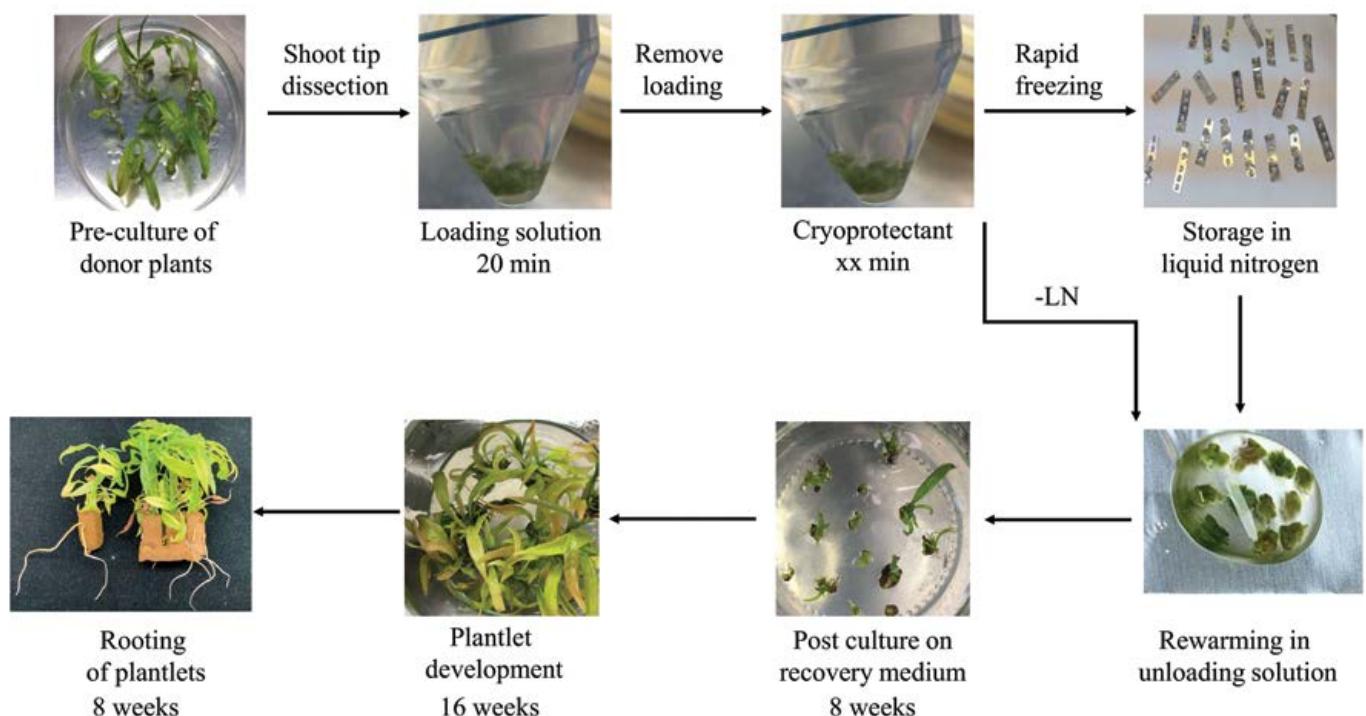


Figure 3. Flow-diagram of the avocado droplet vitrification protocol developed by O'Brien et al (2020b).

Acknowledgement

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Avocado smash made more secure by native flies

Native flies are showing potential as a supplementary pollinator to bees in avocado trees grown in Western Australia's South West.

The Department of Primary Industries and Regional Development (DPIRD) is leading the national research project, funded by Hort Innovation with partners from across Australia.

The third year of trials was expanded this year from an orchard in Busselton to include another new orchard at Pemberton, which all grow the Hass variety of avocados.

Each site hosts three purpose-built enclosures, containing 21 trees each at Busselton and 25 at Pemberton, which has a higher tree density.

On each property, one enclosure was populated with about 5000 western golden-haired flies (*Calliphora albifrons*), one with the western blue-bodied fly (*Calliphora dubia*) and – for the first time – a managed honey bee hive (*Apis mellifera*).

DPIRD research scientist David Cook said this year's research sought to verify previous results from the first two years of the trial.

Dr Cook said the results showed pollination exclusively by native flies produced yields two-thirds of that achieved via open pollinated trees, where flowers could be pollinated by either bees and other insects in the orchard.

"Results from the past field trials showed the blue-bodied fly to be the most effective pollinator, visiting flowers three times more often than the western golden-haired fly and producing three times as much fruit as western golden-haired flies," he said.

"If something were to happen to the bee populations sourced by orchardists, like a new pest or if a disease of bees and hives was introduced into Australia, then at least growers would have a viable other insect species they could use for pollination."

The scientists discovered that native flies in enclosures were particularly useful in pollinating Hass avocado flowers, which open as female one day, then male flowers the next.

"Flies that visit a male flower and pick up pollen while feeding can then transfer the pollen to a female flower nearby," Dr Cook said.



Adult flies ready for release into one of the fly enclosures in the Pemberton avocado orchard for the native flies pollination trial. (©2020 DPRID)



A western golden-haired native fly rests on an avocado fruit from a Type B Ettinger polliniser tree, grown to increase the chance of pollination occurring, during DPRID research to assess the potential of native flies as supplementary pollinators in Hass avocados. (©2020 DPRID)

"As there are no other sources of sugar available to the flies in the enclosures, they feed on the flowers regularly throughout the day.

"This means there is an increased chance of the male and female flowers being open for pollination, optimising the potential for fruit to be set."

While researchers will not know the results from the trial until the avocados are harvested in June, an examination of fruitlets about two centimetres in diameter or bigger on the trees will provide a good indication of the future yield potential.

"In previous years the fruitlet count of marble-sized fruit in the fly enclosures gave a good indication of future yield, as they did not have a typical fruit drop event that often occurs with trees out in the open," Dr Cook said.

"Clearly the native flies were doing a good job of pollinating."

The WA component of the project is also examining the performance of native flies as pollinators in blueberry crops, which has already produced encouraging results from trials at Busselton and the department's South Perth glasshouse.

While the western golden haired fly performed well in 2018, in 2019 the western blue-bodied fly performed even better, increasing total yields by 36% and berry size by 5%.

"In this year's blueberry trials we were looking to verify those results, as well as assess how long the flies remain in the enclosures and examine measures to encourage them to linger in the cropping area, such as protein lures," Dr Cook said.

"The warmer than average winter meant that chilling temperatures below seven degrees centigrade were rarely experienced and the level of flowering was significantly less than normal, producing inconsistent trial results compared with previous years."

The other project partners Western Sydney University, The University of New England, The University of WA, SeedPurity Pty Ltd and Biological Services are examining the performance of native flies in avocados, mangoes, seed crops and strawberries.

Stage two of the project in years four and five will develop rearing techniques for mass production of each species so they can be applied commercially in the horticulture sector.

This work will involve determining the x-ray radiation dose required to render native flies unable to reproduce to ensure there is no increase in the natural population of flies or displacement of other insect species, such as hover flies.

Acknowledgement

The *Managing Flies for Crop Pollination* project is funded by the Hort Frontiers Pollination Fund, part of the Hort Frontiers strategic partnership initiative developed by Hort Innovation, with co-investment from the Department of Primary Industries and Regional Development, Western Australia, The University of WA, Western Sydney University, University of New England, Seed Purity Pty Ltd and Biological Services and contributions from the Australian Government. It has also been funded by Hort Innovation, using the avocado research and development levy and contributions from the Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.



Three netted enclosures cover 25 avocado trees each to test the pollination performance of two species of native flies and a bee species. (©2020 DPIRD)



Snapshots – International Avocado Research Update

This series of research snapshots is compiled from abstracts of published scientific papers accessed through CAB Direct as well as Google Scholar searches. Dates provided reflect the date research was published.

TECHNOLOGY

Suitability of airborne and Terrestrial Laser Scanning for mapping tree crop structural metrics for improved orchard management

Australia (2020): Airborne Laser Scanning (ALS) and Terrestrial Laser Scanning (TLS) systems are useful tools for deriving horticultural tree structure estimates. However, there are limited studies to guide growers and agronomists on different applications of the two technologies for horticultural tree crops, despite the importance of measuring tree structure for pruning practices, yield forecasting, tree condition assessment, irrigation and fertilisation optimisation. ALS

data is evaluated against near coincident TLS data in avocado, macadamia and mango orchards, to demonstrate and assess the accuracy and potential application for mapping crown area, fractional cover, maximum crown height, and crown volume. ALS and TLS measurements were similar for crown area, fractional cover and maximum crown height (coefficient of determination (R^2) ≥ 0.94 , relative root mean square error ($rRMSE$) $\leq 4.47\%$). Due to the limited ability of ALS data to measure lower branches and within crown structure, crown volume estimates from ALS and TLS data were less correlated ($R^2 = 0.81$, $rRMSE = 42.66\%$) with the ALS data found to consistently underestimate crown volume. To illustrate the effects of different spatial resolution, capacity and coverage of ALS and TLS data, calculations of leaf area, leaf area density and vertical leaf area profile from the TLS data, while canopy height, tree row dimensions and tree counts at the orchard level were calculated from ALS data. The results have shown that ALS data have the ability to accurately measure horticultural crown structural parameters, and measurements of hedgerow width, length and tree counts at the orchard

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scale is also achievable. While the use of TLS data to map crown structure can only cover a limited number of trees, the assessment of all crown strata is achievable, allowing measurements of crown volume, leaf area density and vertical leaf area profile to be derived for individual trees. This study provides information for growers and horticultural industries on the capacities and achievable mapping accuracies of standard ALS data for calculating crown structural attributes of horticultural tree crops. Read the paper here: bit.ly/3lenOhC.

FROST TOLERANCE

Comparative study of leaf antioxidant activity as a possible mechanism for frost tolerance in Hass and Ettinger avocado cultivars

Israel (2019): A major drawback of avocado is susceptibility to frosts, which reduces yields and limits its geographic distribution and market growth. Whereas the frost-susceptible cultivar Hass leads the global avocado market, cv. Ettinger, although commercially less important, is considered frost-tolerant. The mechanism behind the greater frost tolerance of Ettinger has not yet been explained; therefore, the aim of the current study was to evaluate the differences

between the frost responses of the two cultivars. The results showed that detached Ettinger branches had greater tolerance than Hass to controlled frost stress. Tissue browning caused by methyl viologen oxidative cell damage, superoxide accumulation in leaf discs following wounding and browning of cut surfaces in branches were much lower in Ettinger than in Hass, suggesting greater antioxidant activity (AA) in the former. In leaf extracts, AA was significantly higher in Ettinger than in Hass, but osmolarity was similar in the two cultivars. Total phenolics content was significantly higher in Ettinger but addition of a protein mask did not significantly reduce AA in either cultivar. Interestingly, following the freezing treatment, AA increased in Ettinger and remained almost unchanged in Hass, while osmolarity was unaffected in either cultivar. These results suggest that the greater frost-tolerance of Ettinger than Hass is due largely to its greater AA, which springs mainly from a non-enzymatic source, ie, accumulation of phenolic compounds. Based on the current study, future applications may be developed to minimise frost damage in avocado orchards. Read the paper here: bit.ly/3iwB9A5.

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BIOLOGICAL CONTROL

***Bacillus mycoides* A1 and *Bacillus tequilensis* A3 inhibit the growth of a member of the phytopathogen *Colletotrichum gloeosporioides* species complex in avocado**

Mexico (2020): Avocado is affected by *Colletotrichum gloeosporioides* causing anthracnose. Antagonistic microorganisms against *C. gloeosporioides* represent an alternative for biological control. Accordingly, in the present study, we focused on the isolation and characterisation of potential antagonist bacteria against a member of the *C. gloeosporioides* species complex with respect to their possible future application. Samples of avocado rhizospheric soil were acquired from an orchard located in Ocuituco, Morelos, Mexico, aiming to obtain bacterial isolates with potential antifungal activity. From the soil samples, 136 bacteria were isolated and they were then challenged against a member of the *C. gloeosporioides* species complex; only three bacterial isolates A1, A2 and A3 significantly diminished mycelial fungal growth by 75%, 70% and 60%, respectively. Two of these isolates were identified by 16S rRNA as *Bacillus mycoides* (A1 and A2) and the third was identified as *Bacillus tequilensis* (A3). *Bacillus mycoides* bacterial cell-free supernatant reduced the mycelial growth of a member of the *C. gloeosporioides* species complex isolated from avocado by 65%, whereas *Bacillus tequilensis* A3 supernatant did so by 25% after three days post inoculation. *Bacillus tequilensis mycoides* A1 was a producer of proteases, indolacetic acid and siderophores. Preventive treatment using a cell-free supernatant of *B. mycoides* A1 diminished the severity of anthracnose disease (41.9%) on avocado fruit. These results reveal the possibility of using *B. mycoides* A1 as a potential biological control agent. Read the paper here: bit.ly/2GG2djj.

LAUREL WILT

Finite difference analysis and bivariate correlation of hyperspectral data for detecting Laurel wilt disease and nutritional deficiency in avocado

USA (2019): Laurel wilt (Lw) is a very destructive disease and poses a serious threat to the commercial production of avocado in Florida, USA. External symptoms of Lw are similar to those that are caused by other diseases and disorders. A rapid technique to distinguish Lw infected avocado from healthy trees and trees with other abiotic stressors is presented in this paper. A novel method was developed to analyse data from hyperspectral data using finite difference approximation (FDA) and bivariate correlation (BC) to discriminate Lw, Nitrogen (N), and Iron (Fe) deficiencies from healthy avocado plants and was achieved with an overall accuracy of 100%. Read the paper here: bit.ly/3nop3wv.

Evaluation of semiochemical based push-pull strategy for population suppression of ambrosia beetle vectors of Laurel wilt disease in avocado

USA (2020): Ambrosia beetles (Coleoptera: Curculionidae: Scolytinae and Platypodinae) bore into tree xylem to complete their life cycle, feeding on symbiotic fungi. Ambrosia beetles are a threat to avocado where they have been found to vector a symbiotic fungus, *Raffaelea lauricola*, the causal agent of the laurel wilt disease. A laboratory assessment of the repellency of methyl salicylate and verbenone to two putative laurel wilt vectors in avocado, *Xyleborus volvulus* (*Fabricius*) and *Xyleborus bispinatus* (*Eichhoff*) was conducted. The same two chemicals were released from SPLAT flowable matrix with and without low-dose ethanol dispensers for manipulation of ambrosia beetle populations occurring in commercial avocado. The potential active space of repellents was assessed by quantifying beetle catch on traps placed 'close' (~5-10 cm) and 'far' (~1-1.5 m) away from repellent dispensers. Ambrosia beetles collected on traps associated with all in-field treatments were identified to species to assess beetle diversity and community variation. *Xyleborus volvulus* was not repelled by methyl salicylate (MeSA) or verbenone in laboratory assays, while *X. bispinatus* was repelled by MeSA but not verbenone. Ambrosia beetle trap catches were reduced in the field more when plots were treated with verbenone dispensers (SPLAT) co-deployed with low-dose ethanol dispensers than when treated with verbenone alone. Beetle diversity was highest on traps deployed with low-dose ethanol lures. The repellent treatments and ethanol lures significantly altered the species composition of beetles captured in experiment plots. Our results indicate that verbenone co-deployed with ethanol lures holds potential for manipulating ambrosia beetle vectors via push-pull management in avocado. This tactic could discourage immigration and/or population establishment of ambrosia beetles in commercial avocado and function as an additional tool for management programs of laurel wilt. Read the paper here: go.nature.com/33ySBj9.

POST-HARVEST

Hormonal interplay in the regulation of fruit ripening and cold acclimation in avocados

Spain (2020): Avocados are climacteric fruits, the ripening of which during post-harvest at room temperature is strongly ethylene dependent. However, the role of other phytohormones in the modulation of postharvest ripening of avocados is still poorly understood. The optimal ripening state of avocados is attained a few days after harvest depending on the genotype, growing region and initial maturity stage of the fruit, and cold temperature storage is commonly used to delay this process. In this study, it was hypothesised that the ripening of avocados at room temperature may be governed not only by ethylene, but also by other phytohormones. With this aim, the hormonal profiling of avocados was

analysed and subjected to either 4°C and 25°C during 10 days of postharvest. A biphasic response was observed during postharvest ripening of avocados at room temperature. While ethylene alone appeared to govern fruit ripening during the first transfer from cold to room temperature, a complex hormonal interplay occurred during ripening of avocados leading to a progressive fruit softening at room temperatures. Aside from ethylene, auxin, gibberellins, jasmonates and ABA appeared to be involved in avocado fruit ripening during postharvest at room temperature. Cold storage for a period of 10 days inhibited this hormonal response related to ripening. Furthermore, avocados stored at cold temperatures underwent a quick response in order to tolerate cold stress leading to changes in endogenous ABA and jasmonates. We conclude that a complex hormonal interplay, rather than ethylene alone, modulates postharvest ripening of avocados and that cold storage can effectively be employed as a technique to prevent avocados from a rapid ripening thanks to the cold stress tolerance mechanisms deployed by fruits through multiple hormonal regulation. Read the paper here: bit.ly/3d2aUAI.

Effects of treatment with electrolysed oxidising water on postharvest diseases of avocado

Australia (2019): The present study comprised five trials to investigate the efficacy of postharvest treatment with electrolysed oxidising (EO) water on post-harvest disease development in avocado. Mature (dry matter 24-34%), hard green fruit cv. Hass (four trials), and cv. Wurtz (one trial) from orchards receiving minimal fungicide sprays were sourced, and subsequently dipped for 30 s in treatment solutions. Fruit were ripened at 23°C and 65% relative humidity to encourage postharvest disease development, and assessed when ripe for anthracnose and stem end rot (SER), arising from natural field infections and/or the size of lesions resulting from post-treatment inoculation with *Colletotrichum siamense*. In the case of natural infection, EO water treatment reduced severity of SER disease by 30-75% compared with water treated control fruit in all four trials where it was assessed. Reduction in severity of SER after Graduate A+ fungicide or hypochlorite (NaOCl) bleach treatment ranged from 60-88% or 25-50%, respectively, compared with water controls. Under extremely high anthracnose disease pressure, 20% v/v EO water, NaOCl, as well as Graduate A+ fungicide treatments were mostly ineffective. Treatments in the final trial were applied as overhead sprays in an experimental-scale packing line to simulate commercial conditions. This was the only trial where anthracnose (as well as SER) was significantly reduced in fruit by 20% v/v EO water (12-35%) and Graduate A+ (34%) compared with water control. In two trials with *C. siamense*-inoculated fruit, anthracnose lesion size was reduced by 68-85%, and 90-100% by 20% v/v EO water and Graduate A+, respectively, compared with water-treated fruit. Fruit firmness and the number of days to ripen were mostly not affected by the treatments. This study demonstrates the potential for electrolysed oxidising water to be incorporated into integrated management programs for postharvest diseases of avocado,

and possibly other fresh produce. Read the paper here: bit.ly/3lg2ok5.

Phenylalanine: a promising inducer of fruit resistance to postharvest pathogens

Israel (2020): More than 40% of harvested fruit is lost, largely due to decay. In parallel, restrictions on postharvest fungicides call for eco-friendly alternatives. Fruit's natural resistance depends mainly on flavonoids and anthocyanins – which have antioxidant and antifungal activity – synthesised from the phenylpropanoid pathway with phenylalanine as a precursor. We hypothesised that phenylalanine could induce fruit's natural defence response and tolerance to fungal pathogens. The postharvest application of phenylalanine to mango and avocado fruit reduced anthracnose and stem-end rot caused by *Colletotrichum gloeosporioides* and *Lasiodiplodia theobromae*, respectively. The post-harvest application of phenylalanine to citrus fruit reduced green mould caused by *Penicillium digitatum*. The optimal phenylalanine concentrations for postharvest application were 6mM for citrus fruits and 8mM for mangoes and avocados. The pre-harvest application of phenylalanine to strawberries, mangoes, and citrus fruits also reduced post-harvest decay. Interestingly, citrus fruit resistance to *P. digitatum* inoculated immediately after phenylalanine application was not improved, whereas inoculation performed two days after phenylalanine treatment induced the defence response. Five hours after the treatment, no phenylalanine residue was detected on/in the fruit, probably due to rapid phenylalanine metabolism. Additionally, in vitro testing showed no inhibitory effect of phenylalanine on conidial germination. Altogether, we characterised a new inducer of the fruit defence response – phenylalanine. Pre-harvest or post-harvest application to fruit led to the inhibition of fungal pathogen-induced postharvest decay, suggesting that the application of phenylalanine could become an eco-friendly and healthy alternative to fungicides. Read the paper here: bit.ly/3jDdFLc.

More information

If you would like more details on any of the snapshots, please contact Avocados Australia on 07 3846 6566.

Acknowledgement

The *Avocado industry development and extension* (AV17005) project has been funded by Hort Innovation, using the avocado research and development levy, co-investment from the Queensland Department of Agriculture and Fisheries, and contributions from the Australian Government.



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INTERNATIONAL NEWS

Peru closing in on access to Taiwan

Access to Taiwan for Peruvian Hass is one of four market access agreements delayed by COVID-19,

the executive director of the Association of Agricultural Producers Guilds of Peru (AGAP), Gabriel Amaro told Gestión.pe.

Also delayed are access for pomegranates to China, grapes to Japan, and blueberries to South Korea.

“These four markets are the closest to be opened but the terms in which this is achieved will depend on the health authorities in these countries, because we are in a complex situation throughout the world,” Mr Amaro told Gestión.pe.

The global pandemic has delayed negotiations, postponing technical visits and face-to-face meetings.

Currently, the main destinations for Peruvian fresh fruits and vegetables are the United States and Europe, which account for 45% and 39% of Peruvian shipments in this category, respectively, while 10% reaches Asia.

“The market that we are just beginning to enter, not now but for a few years, is Asia, which is impressive as a destination and has a lot of potential,” Mr Amaro said.

The National Agrarian Health Service of Peru (Senasa) is also progressing access for avocados to Vietnam, the Philippines and New Zealand.

Read more bit.ly/311peru.

South Korea open to Chilean avocados

Chile's access to the Korean fresh avocado market is now complete, with the publication of the phytosanitary requirements by South Korea's Animal and Plant Quarantine Agency (APQA).

However, Chilean Minister for Agriculture Antonio Walker said on 23 September 2020 that there were still a number of steps to take.

“Such as, for example, sending a list of participants interested in exporting avocados to Korea, in addition to waiting 30 days for the start of shipments, but by the end of October it would already be fit to start,” he said.

Chile began negotiations with APQA in 2017, and a Korean delegation was in Chile at the beginning of 2020, just before the COVID-19 travel restrictions began.

South Korea is a country of more than 50 million, and Chile believes it is an important market as they work to expand export options.

“Diversifying the destination markets for Chilean fruit exports is key to continuing to grow and develop our industry,

for which we very much welcome the opening of South Korea for Chilean avocados, which joins the recent opening of Australia,” ASOEX president Ronald Bown said.

“This announcement also comes at a very opportune moment for the national avocado sector, since it coincides with the beginning of the harvest and export season of these fruits. There was a lot of interest in achieving the opening of the Korean market, since it is a market where there is consumption of avocados, therefore, we have positive expectations for exports.”

During the 2019/20 fruit season, Chile exported 118,981 tons of avocados to different markets around the world. The main destination was Europe (72% of total exports), followed by Latin America with 11.6% of total shipments.

Asia ranks third with a 8.6% share of total exports. Within Asia, Chile currently exports avocados to China, Hong Kong, Japan and India.

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CORPORATE STRUCTURE

How would you describe the nature of your operations (please tick)?

- | | | |
|---|--------------------------------------|--------------------------------------|
| <input type="checkbox"/> Individual | <input type="checkbox"/> Partnership | <input type="checkbox"/> Company |
| <input type="checkbox"/> Trust | <input type="checkbox"/> Lessee | <input type="checkbox"/> Cooperative |
| <input type="checkbox"/> Other (please specify) _____ | | |

Please indicate the area of property that you crop for avocados (please tick)

- | | | |
|---------------------------------------|---------------------------------------|---------------------------------------|
| <input type="checkbox"/> 0.5 - 5 ha | <input type="checkbox"/> 6 - 19 ha | <input type="checkbox"/> 20 - 49 ha |
| <input type="checkbox"/> 50 - 99 ha | <input type="checkbox"/> 100 - 149 ha | <input type="checkbox"/> 150 - 199 ha |
| <input type="checkbox"/> 200 - 499 ha | <input type="checkbox"/> 500 ha+ | |

PAYMENT OPTIONS

Grower Membership of Avocados Australia is **\$250 pa** (+ GST).

You can pay your membership by cheque or credit card. To pay your membership fee, please choose one of the following options:

Cheque
 Please find enclosed a cheque for \$275.00 made payable to Avocados Australia Ltd.

Credit Card
 Please charge \$250 (+GST) to my credit card:
 Mastercard Visa

Credit card number: _____

Name on credit card: _____

Expiry date: _____

Signature: _____

Once you have completed this form please tear off and place it in an envelope addressed to:

**Avocados Australia
 Reply Paid 87929
 Brisbane Market Qld 4106**

(no stamp required within Australia)

Or email admin@avocado.org.au

For more information or assistance please go to: www.avocado.org.au or call on 07 3846 6566

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