Australian Stonefruit Grower

Issue 2 | 16
August 2016

California – America's fruit bowl

Queen Garnet plum: health food powerhouse

Zapping insects with gamma rays

plus

All the latest research

Australian Stonefruit Grower is the official publication of Summerfruit Australia Ltd & Low Chill Australia Inc. – the industry bodies representing the interests of Australian stone fruit growers

contents

COVER: Most of the fruit picking in California has traditionally been done by Mexican migrant workers who've been paid relatively low wages giving Californian growers a competitive advantage. This may change now due to new regulations on minimum rate. Photo: Mountain View Fruit

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Fruitful opportunities

Spring has arrived and blossoms are out. A lovely time of year, following a mild winter and a welcome bit of rain in most areas.

The big news in this issue is all about exports. This season, for the first time, Australian nectarines are going to China. Thirteen years of pest assessments and inspections and what probably seemed like endless negotiations have finally paid off in access to this potentially massive new market.

> "This season, for the first time, Australian nectarines are going to China."

Australian production must seem like a drop in the ocean to the Chinese; Australia grows around 80,000 tonnes of stonefruit annually; they produce over 13.5 million. With a population over 1.357 billion, the problem could be just having enough fruit to send!

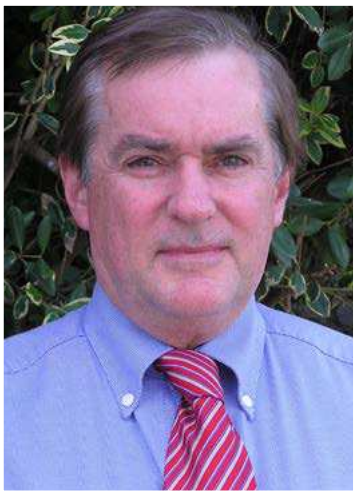
Part of the agreement with China is reciprocity – we can't expect to export if we don't accept imports (with quarantine security of course). The first shipments of Chinese nectarines are now arriving in Australia, by air and sea. Such imports compete directly with Californian stonefruit, now in its fourth season in Australia. The Chinese fruit will certainly be cheaper so it will be interesting to see how quality and sales compare.

With this in mind, our cover story this issue is on the Californian industry. USA stonefruit growers are facing many of the same challenges as here with rising labour costs, increasing environmental pressures and threats from urbanisation. However, a strong focus on quality through the whole supply chain, and continual variety development are helping to keep consumers excited about stonefruit.

Other stories include a timely reminder of the threat of brown rot – rain during flowering increases the risk of this devastating disease. Prevention is better than cure, so timely fungicide applications are essential. We also visit the Steritech irradiation facility in Brisbane, report on new research on SPLAT for managing fruit fly, interview grower Rowan Berecry about the practicalities of producing the Queen Garnet plum, and detail how to calibrate the DA meter for measuring fruit maturity.

It's a bumper issue – hope you enjoy it!

-Jenny Ekman



New season nectarines for China

After 13 years of negotiations, the Industry is gearing up (export preparedness) for Australian exports of nectarines to China.

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Three pest monitoring workshops were held during June for growers who are thinking to register for exports to China. The workshops were run by authorised entomologists / pathologists and overseen by Department of Agriculture and Water Resources (DoAWR). The Victorian DEDJTR were very helpful in preparing the Integrated Pest Management details to be viewed by attendees at these workshops. The focus was on the 11 insect pests and one fungal disease that are of concern to Chinese authorities.

The workshop in Loxton included participants who joined via Webinar from WA and Qld, with subsequent workshops in Swan Hill and Cobram. A total of 153 growers and third party contractors attended these events, confirming the high level of interest in accessing the Chinese market.

Applications for registration of orchards, packhouses and treatment facilities were issued to China Aspirants (inclusive of Thailand and Taiwan indications) and concluded on 22nd July with detailed summaries submitted to the authorities, 27th July 2016.

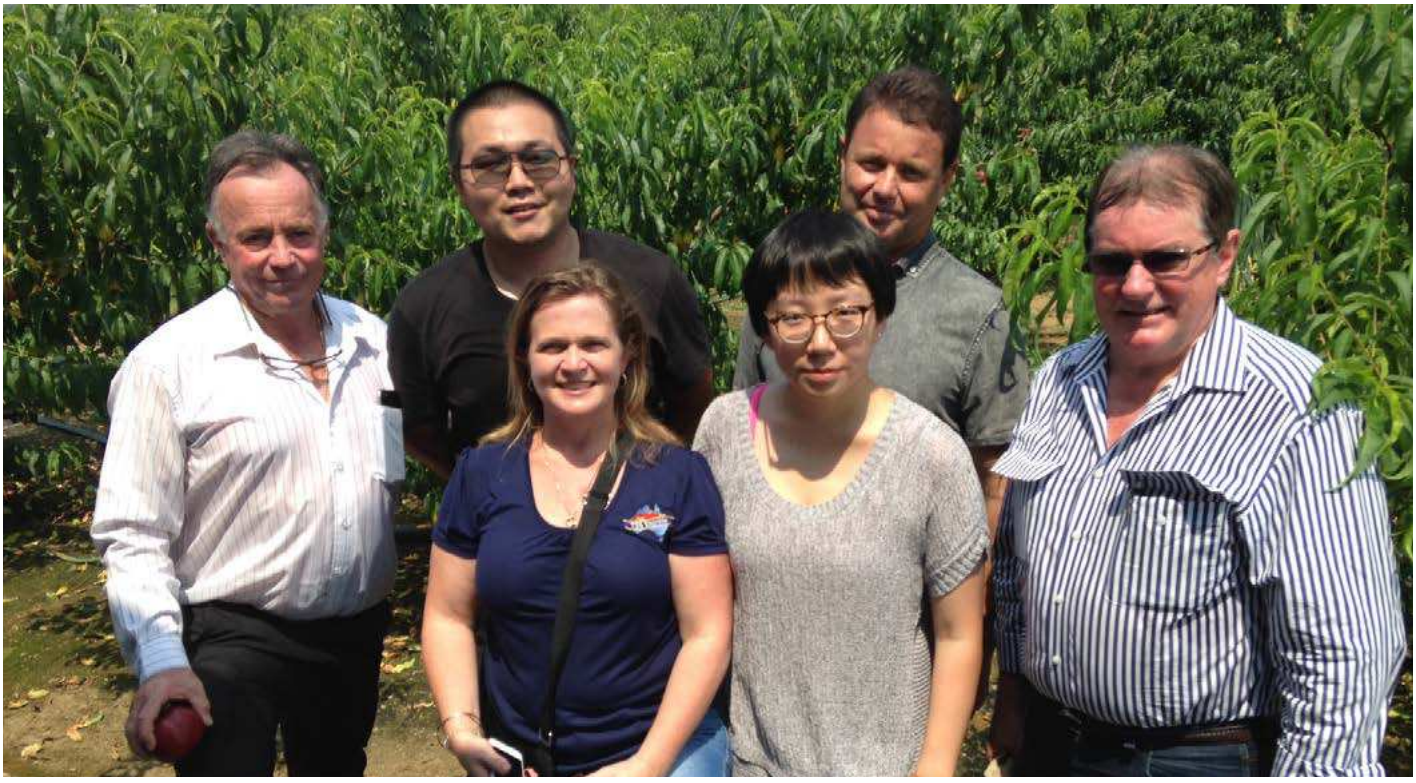
The next step is for these properties – 103 orchards, 53 packhouses and 12 facilities (to be used for fumigation and onshore cold treatment of fruit, if applicable) will be audited between 12th September – 24th September 2016 by DoAWR will be visiting these properties. Around 1.5–2 hours will be needed at each address to check that growers have transparent and traceable administrative systems in place as well as infield monitoring trapping and recording pathways that are required by the Chinese authorities.

Applicants will know whether they have been successful by the first week of October; these approved establishments will be the official list of registered properties for nectarines to China. These farms/packhouses/facilities where applicable, will be registered also for Taiwan and Thailand. (note that onshore cold treatment facilities will need a special audit for Thailand , if not already inspected by Thailand inspectors)

With the exception of current citrus exports, this effectively makes Australian stonefruit the first-cab off the rank for exports to China; 2016/17.

Exciting times indeed.

CEO's Report



The Dalian orchard. From left to right: Ian McAlister, Li Bao (orchardist, Dalian), Rob Cathals (N&A group), John Moore. Front row: Colleen Dangerfield (VFS exports), Sammy Xu (T&G Delica).

Aussie, Aussie, Aussie

To accompany the export program, To accompany the export program, industry has been preparing plans for a major promotional campaigns.

The first is at Asia Fruit Logistica, on September 7–9 in Hong Kong. A function is planned to promote Australian nectarines, alerting importers and consumers that fruit is coming this season.

> "After 13 years of negotiations, the industry is gearing up (export preparedness) for Australian exports of nectarines to China."

This will be followed with an event at the Shanghai central wholesale market on 21 September. Victorian Minister for Agriculture the Hon. Ms Jaala Pulford will attend this event. The Trade and Investment Division of the Victorian Department of Economic Development has been incredibly helpful, working collaboratively with the industry to achieve this market access. So, it is really pleasing to get this level of support from government, before and after the event. Not forgetting the great work over these last few months particularly by DoAWR- Plant exports, they have negotiated a fantastic protocol for Industry to be proud of and once again may I say it's a privilege to have and pay the utmost respect .

The official launch of Australian stonefruit in China will be at the China Fruit and Vegetable Fair in Beijing on 1 November. Sponsored by the AQSIQ, this huge, three day event is designed to showcase horticultural products and services from around the world.

Additional promotions will also be held at iFresh in Shanghai on 16-17 November and at markets in Chengdu and Guangzhou. It will be great to be finally able to bring fresh Australian nectarines to these markets, both for Chinese consumers and for the Australian industry.

CEO's Report

The yin and yang of international trade

Concurrent trade and collaboration is essential and industry has been busy.

Nectarines from Yuncheng City, Shanxi Province, China arrived in early August. Reported to be of "reasonable" eating quality, the early season fruit looks a little less coloured than that from the USA and sells for around $1 less/kg. This is likely because the Chinese protect the fruit with paper bags while they are developing, although the bags are removed two weeks before harvest to allow blush development.

A 40' container of nectarines was scheduled to leave Dalian for Australia in August, the result of a partnership between three Australian importers who volunteered their time and efforts to demonstrate goodwill and further collaboration with Chinese authorities. The importers, along with SEDA (Summerfruit Export Development Alliance) chair Ian McAllister and yours truly visited China to inspect the registered Dalian orchard and facilities before deciding to purchase the fruit.

Unfortunately, the shipment has not gone ahead – the result of bad weather that delayed harvest and reduced fruit quality. Interestingly, the Chinese industry has a standard pressure test of 9kgs, which is rigidly controlled by CIQ (equivalent to our ASIQ) for export shipments. Should we learn a lesson?

> "With more than 5 million Australians of Chinese ancestry, the future is surely bright for trade between our countries."

Not only are imports about encouraging and growing two-way trade between Australia and China, this is about the future development of consumer markets in both countries. Developing such collaboration is also a sign of good faith. With more than 5 million Australians of Chinese ancestry, the future is surely bright for trade between our countries.

Finally , I wish to advise that our Annual General Meeting will be held this year at the Horticulture Centre of Excellence, Ferguson Road Tatura from 1pm -4.30pm on Wednesday 28 September.

The AGM has been delayed to ensure there was no conflict with the China export audits by DoAWR. The program will include presentations by researchers, inspection of the stonefruit demonstration orchard and a an important guest presentation by Chris Williams, Executive Director – Plant Programs – National Residue Survey – DoAWR. Please park the date.

Wishing everyone every success for the approaching season.

– John Moore

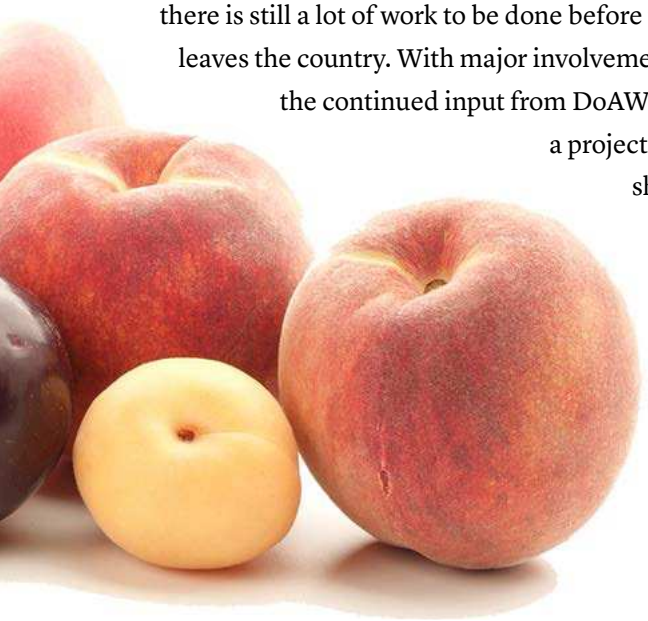
Towards a dynamic export environment

The recently announced protocols for market access for nectarines between China and Australia is the most significant event for Australian Summerfruit growers for many years.

The joint protocols, which allow two-way trade of nectarines between Australia and China are the culmination of many years of hard work between the Australian DoAWR and AQSIQ in China, with major involvement from Summerfruit Australia and China Entry & Exit Inspection and Quarantine Association (CIQA) throughout the process

It is appropriate in this column to recognise the outstanding efforts and commitment of the market access team from DoAWR in Canberra. They have actively engaged with industry and negotiated to achieve a protocol that includes both air and sea freight protocols and recognises area freedoms from fruitflies. The work that DoAWR has done has helped enormously to create an environment that can lead to a healthy two way flow of fruit between Australia and China.

This protocol presents a fantastic opportunity for Australian growers, although there is still a lot of work to be done before the first shipment of nectarines leaves the country. With major involvement from Horticulture Innovation and the continued input from DoAWR, SAL has been able implement a project to work with growers and packing sheds which focuses on ensuring that the industry is export ready for China and is able to meet the requirements of the protocol for a successful first season of nectarine export to China. Although not all growers have registered to export to China this season the benefits resulting



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Chairman's Report

from being able to better match supply to demand on the domestic market, through having a major new export destination, will invariably flow through to all growers.

There are times when farming can be a tough gig, but there are times, like now, when groups and organisations are pulling in the same direction that things start to come together and you realise a difference can be made and outcomes can be much better. A quick snapshot of what has been happening shows DoAWR working closely with industry on market access; Horticulture Innovation, as the Horticulture RDC, combining growers levies with matching funding from the Commonwealth through the Agricultural Levies Program and working with growers and industry to help set up and manage projects that have been and are continuing to contribute towards building successful export programs; state governments having significant input – such as Victoria leading the "In Season Now" campaign, and Queensland, NSW and SA having major input into fruit fly disinfestation and control; National Farmers Federation actively supporting Summerfruit's application for market access to China; and growers themselves working together as the Summerfruit Export Development Alliance (SEDA) doing everything that they can to promote a dynamic export environment. To see so many people channelling so much effort and energy into Australia's Summerfruit industry is very exciting, and although there is a long way to go and a lot of work still to be done we are on the right road heading in the right direction.

> "There are times when farming can be a tough gig, but there are times, like now, when groups and organisations are pulling in the same direction that things start to come together and you realise a difference can be made and outcomes can be much better."

The recently appointed Summerfruit Industry Advisory Panel (SIAP) met for the first time in Melbourne earlier this month. The role of this panel is to provide advice to Horticulture Innovation Australia on investment priorities for the Summerfruit industry. Part of that advice also includes a review of the Summerfruit Strategic Investment Plan which is used to set the strategic direction, expected outcomes and performance indicators for the investment of the matched levies for Summerfruit R & D for the next five years.

Consistent with the constructive relationship that has developed between SAL and HIA, members of the Summerfruit SIAP and HIA engaged in forthright and open discussions with the outcomes of that meeting being an accurate reflection of industries priorities. It has been almost two years since the horticulture RDC transitioned from HAL to HIA, following that transition there was considerable uncertainty about how our industry levy funds were going to be managed and what the future would hold in that space.

I am confident, especially after the last few months, that we are on the right track where SAL, growers and HIA are able to work as a team to get the best possible R&D outcomes for Summerfruit growers while meeting the expectations of the federal government for their matching R&D contribution.

To those growers who are about to undertake their initial audits for China I wish you well. China has presented us with an amazing opportunity. It is now up to us to demonstrate to them that their trust is well placed.

I look forward to seeing those of you who are able to attend the Summerfruit AGM at the end of September in Tatura. It will also be an opportunity to see some of your levy funds at work.

– Andrew Finlay

Quality is our business

The trees on the north coast are now well and truly flowering, some a bit early compared to the usual given the generally mild winter we have just enjoyed. With no frost and a dry July, conditions were ideal for the trees.

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Unfortunately this was followed by a large dump of 110ml of rain at the start of August. Not great timing, and it does raise the prospect of potential brown rot issues later in the season (for advice on management of brown rot see page 20 of this magazine).

The low chill executive had a very productive meeting at Rocklea Markets on 18 July.

Bruce Topp provided a briefing on his latest results with dwarfing rootstocks. He is getting some good initial results with these reduced-vigour trees, which could provide significant labour savings in the future.

> "Consumers are always looking for the novel and the new. So far, we have had good retail feedback on many of our new varieties, including doughnut peaches."

Work on novel varieties is also continuing. In Europe, stonefruit consumption is declining, largely due to competition from fruit such as cherries and berries. The exception to this is the doughnut peach, this being the only stonefruit which is actually increasing production.

Consumers are always looking for the novel and the new. So far, we have had good retail feedback on many of our new varieties, including doughnut peaches. The main thing holding them back is the volume available – if more growers adopt these categories we can provide reliable supply for longer periods. It's a bit of a chicken-and-egg situation really, hard to grow the market without supply.

President's Report

The meeting was also an excellent opportunity to walk the markets and talk to the agents. Partly to get their perspective on the season just gone, but also to check out the quality of incoming USA stonefruit.

It seems that the USA is now really starting to refine their supply chain, and quality is more consistent. While the fruit seems to me to lack flavour by the time it reaches us on the mid-north coast of NSW, this may be due to the long travel time between here and California.

Challenge from China

The potential overlap between the end of USA season and the start of our local production is now even more under pressure given the potential for Chinese imports. The low chill industry has always supported efforts to gain market access to China – we recognise that moving fruit out of the domestic market benefits all growers. However, the corresponding entry of Chinese nectarines into Australia will undoubtedly create extra challenges for low chill producers. It now seems likely that fruit will be arriving from China in September, just as our season starts.

In an increasingly competitive market, quality is essential. Managing brown rot, not picking immature fruit, and targeted promotion are all ways that we can ensure that Australian stonefruit stays in the shopping basket from the time we start picking in September, right up until the end of March.

– Mark Napper

New wrist bands to help at harvest

A simple, coloured, silicone wrist band has been developed by Summerfruit New Zealand to help fruit pickers during the upcoming 2016–17 season.

NZ market coordinator Trisha Aitken said the wrist bands will help pickers decide which fruit to pick and which fruit to leave on the tree to grow and ripen further.

"The bands are great for new or inexperienced pickers as they are a constant reminder of the colour fruit they should be looking to pick," Ms Aitken said.

"Growers also found they are really helpful for first or second picks, when there is still a lot of immature fruit on the trees."

The wrist bands are the result of a three-year AGMARDT/Summerfruit NZ-funded project Harvest Assurance Tools and follow trialling the bands with apricot, nectarine and peach growers in Hawkes Bay and Central Otago.

"Fruit colour is a major trigger for deciding fruit maturity and therefore deciding when and what to pick," Ms Aitken said.

"The colours for the wrist bands were chosen following trials which closely matched colours with certain varieties. But that doesn't mean they can't be used for other varieties too."

The trials found that the wrist bands helped with training new staff and also reduced the amount of time needed to supervise pickers.

Ms Aitken said the hard-wearing bands are used by advertisers, charities and event organisers as they are comfortable to wear and won't split, tear or fade. Available in packs of 10, order forms can be downloaded from the Summerfruit NZ website www.summerfruitnz.co.nz

Summerfruit NZ has also produced a set of 13 maturity guides for selected apricot, nectarine, peach and plum varieties. These are ready for trial with pickers and packers. Each guide features images of five maturity stages, indicating colour changes from immature through ripe and to overmature.

"Both the wristbands and the guides focus on apricot, nectarine and peach varieties, but cherry and plum colour wrist bands are being trialled for release this time next year," Ms Aitken said.

For inquiries contact Trisha Aitken by email: trisha@summerfruitnz.co.nz

Exports up

By Wayne Prowse, Fresh Intelligence Consulting

Australian summerfruit exports have increased 15% in the season to March 2016 (97.5% of 2015/16 season) achieving 14,144 tonnes worth $47.5m. Overall unit values were 10% higher at $3.36 per kg compared to the same period last year.

share of season 97.5%

March 2016 export results were 30% higher than March last year.

Table 1 : Summerfruit Key Measures

EXPORTS	YTD	Chg LY
Volume (tonnes)	14,144	14%
Value (M AUD)	47.47	26%
$ per kg	$3.36	10%

Source: World Trade Atlas; Fresh Intelligence analysis

Trade to Hong Kong accounted for 45 per cent of the trade to date (table 3) and Middle East markets accounted for 31% of trade to date. Significant increases off low bases are seen in other markets such as Malaysia, Indonesia and India.

Table 2. Summerfruit export by type (Jul to Mar)

EXPORTS	Tonnes	Share	Change
Peach & Nectarine	9.940	70%	17%
Plums	3,604	25%	8%
Apricots	600	4%	21%
TOTAL	14,144	100%	15%

Source: World Trade Atlas; Fresh Intelligence analysis

Peaches and nectarines accounted for 70% of the trade and increased 17%. Apricots increased 21% for their season mostly to Middle East markets. Plums are now 8% higher to date.

Table 3. Summerfruit Exports by Market (Jul to Mar)

MARKET	Tonnes	Chg LY	Share
Hong Kong	6,362	7%	45%
UAE	2,728	13%	19.3%
Singapore	1,886	10%	13.3%
Saudi Arabia	878	93%	6.2%
Malaysia	698	30%	4.9%
Kuwait	416	57%	2.9%
Qatar	220	78%	1.6%
Indonesia	191	99%	1.4%
Thailand	115	13%	0.8%
New Caldonia	113	0%	0.8%
Bahrain	97	28%	0.7%
India	84	1114%	0.6%
Taiwan	61	-54%	0.4%
Canada	59	-3%	0.4%
Oman	48	++	0.3%
all other	356		2.5%
TOTAL	14,144	15%	100%

Source: World Trade Atlas; Fresh Intelligence analysis

Rays of hope

By Jack Rozycki

How gamma irradiation of produce may help in the constant battle against insects now that chemicals are being progressively restricted.

Ben Reilly, Steritech Businesss Development Manager. Photo: Jack Rozycki

The use of chemical insecticides and fumigants such as Dimethoate, Fenthion and methyl bromide to provide quarantine security is increasingly restricted around the world. Further complicating matters are the different requirements of each export market. Complicating matters further are the different requirements of various export markets.

Indeed, the European Union has banned the use of methyl bromide, a hitherto commonly used fumigant. In Australia, methyl bromide is no longer used as a soil fumigant, Fenthion has received a cease notice in November last year, while Dimethoate is being phased out in the medium term following a review by Australian Pesticides and Veterinary medicines Authority just a few months ago **http://apvma.gov.au/sites/default/files/docs/dimethoate-residues-report-updated-june-2016.pdf**

With regulatory screws being tightened for chemicals, exporters may increasingly have to rely on cold, hot water, vapour heat and controlled atmospheres to kill pests, none of which are as cheap, fast and effective as chemicals. Except, perhaps, irradiation.

With irradiation, the produce is briefly exposed to ionising energy which can come from a variety of sources including cobalt-60, e-beam or X-ray machines. This treatment is very effective in killing and or sterilising insects both internally and externally on fruit, while leaving no harmful residue that could be ingested by the consumer/end-user. Importantly, it does not noticeably alter the colour nor the taste of the produce. Ionising irradiation can also reduce and control moulds and bacteria, enhancing shelf life and quality as has been observed in cherry and blueberry trials treated within the FSANZ food irradiation limit of 1000 grays (units of radiation) in Queensland. .

An Australian firm Steritech provides just such an irradiation service for growers. The bulk of its work includes sterilisation of medical equipment and devices. It also irradiates as a quarantine treatment for imported items – especially wood and organic products that contain plants and/or soil. With the stricter regulations pertaining to chemicals it now sees irradiating fruit and vegetable produce even more firmly in its future.

Australian Stonefruit Grower visited Steritech in the

northern suburbs of Brisbane and spoke to its Business Development Manager Ben Reilly, and Seth Hamilton who is responsible for implementing the specialist quality management system that operates the cobalt-60 gamma irradiation facility at Narangba, Queensland.

Mr Hamilton says that his task of quality management system is, understandably, quite site-specific, considering that there is myriad of strict policies, regulations and procedures to ensure regulatory compliance and high standards for the services which Steritech offers.

Mr Hamilton is also responsible for handling audit and inspection requests from customers and numerous regulatory bodies, training staff, advising customers on product validations.

He confirmed that Steritech already conducts phytosanitary (relating to the health of plants, especially with respect to the requirements of international trade of fresh produce) treatment, particularly that which is earmarked for export. In 2015, Steritech treated more than 3000 tonnes of fresh produce.

Since January last year, the Queensland Steritech facility has been approved by the US Department of Agriculture for irradiating produce, such as Australian grown mangoes and lychees for export to the USA, Mr Reilly said.

In addition, such food irradiation has been approved in 40 other countries including Japan, France and the Netherlands and is backed by the World Health Organisation and the Food and Agriculture Organisation.

Australian Stonefruit Grower saw the treatment room, which did not look much different to a standard cold room, into which pallets of produce arrive on a conveyor belt. The process is rather rapid – it sterilises insects in pallets of produce with hourly through-put of approximately 20 tonnes. Most importantly, the cold chain can be maintained as products do not need to be warmed up to meat treatment requirements.

"Irradiation is the only air freight suitable alternative to methyl bromide fumigation," Mr Reilly said.

"Methyl bromide has a major downside as it is a recognised ozone-depleting chemical. It has now been phased out by most countries and, for export, the use of methyl bromide may not be allowed in many instances. Methyl bromide of course, is highly toxic. Moreover, fruit has to be warmed up before fumigation, then cooled down again afterwards.

"Using irradiation instead of chemicals has clear benefits for stonefruit and summerfruit. It is fast, effective and efficient. It is approved for export to the US and other countries where many chemicals are banned and it maintains the integrity of the cold chain during treatment. During the current North American season, US grown peaches were exported using phytosanitary irradiation to Mexico for the first time," Mr Reilly told Australian Stonefruit Grower.

"In export to the US we have not had one single complaint. The irradiation is entirely chemical-free."

The Steritech Queensland facility that we visited received its approval from the US Department of Agriculture for irradiating Australian mangoes and lychees for export into the USA early last year and Indonesia has given its approval for grapes and citrus irradiation.

The Steritech Queensland facility we visited received its approval from the US Department of Agriculture for irradiating Australian mangoes and lychees for export into the USA early last year and Indonesia has given its approval for grapes and citrus irradiation. New Zealand, Malaysia and Vietnam also have existing Australian irradiation protocols.

Food irradiation is used around the world and after some 50 years of research the scientific consensus is that when it is carried out within specified standards it produces food that is safe to eat.

Before food can be irradiated it must first go through a strict safety assessment by Food Standards Australia New Zealand (FSANZ) and, if approved, must be labelled as having been treated by radiation.

Such labelling has not hurt exports. A savvy "green" market such as New Zealand is no problem, for example. Australian mangoes, papayas and lychees which have been treated with irradiation and labelled as such are sold widely in New Zealand.

New Zealand has very strict quarantine requirements (as has Australia) to protect its pest-free status in relation to many insects, especially fruit fly.

Commercial post harvest options for managing insect infestation*

	Cost (per unit)	Fruit quality (sub tropical and soft fruits)	Operational reliability and simplicity	Range of insects treatable	Toxic chemical residues	Quarantine approval process
Chemicals (e.g. Dimethoate, Fenthion, Methyl Bromide)						
This is a commonly used treatment option but there are some regulatory, supply, safety and environmental risks associated with the chemicals.	Cost competitive.	Fumigation can damage several fruit types.	Some post treatment handling required.	Some insects are either resistent or become resistent.	A risk of chemical residues.	Regulatory restrictions and consumer resistance increasing.
Irradiation						
The product is exposed to high-energy gamma or x-rays which is highly effective in killing or sterilising insects.	Resonably cost competitive.	Generally minimal impact on fruit quality.	A simple process that can be applied to fruit that is already packed.	Effective against a broad range of insects.	No risk of chemical residues from treatment.	Limited but growing acceptance in Australia and internationally.
Refrigeration						
Cooling the fruit kills insects of tropical or sub-tropical origin over several days. Commonly used.	Resonably cost competitive if energy use not considered.	Exposure to cold temperatures can damage fruit quality.	Some issues with reliability and quality assurance of the process	Not effective against some insects.	No risk of chemical residues from treatment.	Widely recognised and accepted.
Hot water						
Fruit is exposed to heated water for a specific period to kill pests. A rapid method suitable for pre-packed product although with some issues relating to product quality.	Cost competitive.	Adverse impact on quality and self life.	A simple process but fruit shape and size can be an issue	Effective against a broad range of insects.	No risk of chemical residues from treatment.	Widely recognised and accepted.
Vapour heat						
Fruit is exposed to heated air in a staged process. Used for special markets.	Relatively expensive.	Adverse impact on quality and self life.	Fruit requires significant post treatment handling.	Effective against a broad range of insects.	No risk of chemical residues from treatment.	Limited acceptance.
Controlled atmosphere						
Fruit is placed in sealed containers with low oxygen/high CO2 levels. Conditions in containers need to be monitored and fruit needs to have a long-shelf. Commercial use is rare.	Relatively expensive.	Minimal impact on quality for fruits with long shelf life.	Simple process but lengthy and some issues with assurance.	Effective only on a limited range of insects.	No risk of chemical residues from treatment.	Limited approvals.

* This table is Steritech's opinion only and is intended to provide a high-level overview of the different treatment options available. It should not be considered a complete review of all the treatment options and all the possible measures of performance. Industry participants are advised to explore options further in order to find the alternatives that best suit their alternative needs.

In the past, Australian fruit has been rejected for that very reason. Now irradiated fruit has boosted trade in tropical fruits in a major way.

With all those advantages, a number of other issues remain. One is simply the location of the plant in Brisbane; with no Melbourne-based operation, Victorian fruit needs to be transported several thousand km for treatment before export. However, Steritech has medical treatment plants in Sydney and Melbourne and Mr Reilly said the company is looking to expand access to horticultural treatment facilities for southern growing regions.

Another issue is that although irradiated insects cannot grow and reproduce, they are not immediately killed. Researchers at Macquarie University have been working on ways to test the viability of any live larvae found by quarantine officials. However, until such tests are recognised and accepted, a live larvae is likely to be unacceptable to inspectors.

Finally, it is important to test the effects of irradiation by variety. The colour and aroma of Kensington Pride mangoes can be negatively affected by irradiation, especially if the fruit is still green. In contrast, Honey Gold mangoes are completely unaffected.

Despite these issues, food irradiation is an attractive option for industry as it is non-invasive, effective against a broad spectrum of insects, does not heat or wet the fruit, and is a relatively quick and cost-competitive option – so long as transport costs are not excessive.

*For more information and questions contact Steritech on **07 3385 8400** or contact Ben Reilly, Export Business Development Manager for Fresh Produce directly by email at **breilly@steritech.com.au***

SPLAT-tering fruit flies

The never-ending struggle against the fruit fly menace continues. **Jennifer Ekman** explains.

A male fruit fly investigates a dollop of SPLAT CL.
Photo: ISCA Technologies.

Male Annihilation Technique

Many growers are no doubt already familiar with the Male Annihilation Technique (MAT) as one of the tools for managing fruit flies in the orchard.

MAT units have three components –

1. The substrate, usually a wick or other absorbent material.
2. A dose of male attractant (cue-lure if the target is Queensland fruit fly, or medlure for Mediterranean fruit fly).
3. Insecticide, such as fipronil or malathion, to kill the fly on contact.

MAT units therefore work much like standard traps; it is just that the dead flies are not retained.

While MAT units are fairly cheap, they need to be put out at a high density in order to attract and kill a significant percentage of the male population. The units should be distributed every 20–25m within the orchard, as well as in surrounding non-host vegetation. This means at least 25 units/ha need to be nailed to posts or attached to branches.

MAT units therefore involve significant labour to put out, retrieve, and replace each season.

SPLAT goes the fly

The aptly named SPLAT (Specialised Pheromone and Lure Application Technology) is designed to make application quicker and easier. Male attractant and insecticide are applied in a flowable, waxy matrix. This matrix controls release of the volatiles and protects them from environmental degradation.

SPLAT is applied in small dollops using a caulking gun, modified sprayer or even by a robot or an airplane. Application is quicker so more can be applied. This means ~25 MAT units can be replaced with a couple of hundred globs of SPLAT per hectare of orchard.

The potential downside of this is that more insecticide is being placed in the environment. To overcome this, some practitioners have proposed using spinosad as the toxicant. Spinosad is considered to pose less risk to mammals, birds and fish than organophosphate insecticides, making it more environmentally sustainable when applied around the orchard.

Research in Florida and Hawaii has found that SPLAT, combined with spinosad insecticide and the appropriate male attractant (methyl eugenol or cue-lure), can successfully attract and kill male Oriental and melon flies.

"Spinosad is considered to pose less risk to mammals, birds and fish than organophosphate insecticides, making it more environmentally sustainable"

Australian SPLATs

New research from Peter Crisp (SARDI) and Olivia Reynolds (NSW DPI) has tested whether SPLAT can also work for Queensland fruit fly (Qfly). Initial trials were conducted using large, mesh cages containing adult male Qflies. A mixture of SPLAT + cue-lure + spinosad was compared to cue-lure + maldison (malathion), with both lure types weathered outside for up to eight weeks before testing.

The formulations were then taken out into the orchard. In this case, traps baited with SPLAT + cue-lure + spinosad were compared to traps baited with a caneite block or wick, both loaded with cue-lure + malathion. The traps were distributed in a mixed fruit orchard (pome and stone fruit) in southwest Sydney. Traps were checked weekly, with the trial repeated six times.

The results indicated that spinosad is slower acting on Qfly than malathion, and is more likely to lose efficacy over time. However, the combination of SPLAT + spinosad attracted and killed more flies than the wick system, although not as many as the caneite block.

"The results show that SPLAT + cue-lure + spinosad is a promising alternative system for management of Qfly under Australian conditions", according to Dr Crisp, and "it could also prove useful for other fruit fly species, including the invasive melon fly".

However, MAT remains just one part of an overall strategy.

"Male annihilation can be combined very effectively with other management strategies, such as protein bait sprays, field hygiene, and biological controls," Dr Crisp said.

"Combinations of these techniques have successfully defeated Qfly outbreaks in SA, WA and parts of the old fruit fly exclusion zone. SPLAT has the advantage of reducing labour costs, as well as allowing the use of a less toxic, more environmentally sustainable insecticide than malathion in baiting programs."

ACKNOWLEDGEMENT: This project has been funded by Horticulture Innovation Australia Ltd using multiple industry levies and funds from the Australian Government (MT12001).

Male flies are more likely to be attracted by many small dollops of SPLAT CL + cue-lure + insecticide around an orchard than to fewer, though larger, MAT bait stations. Photo: ISCA Technologies

The threat of brown rot

It may be a wet spring...

By Oscar Villalta

According to the Bureau of Meteorology, there is a 65–70% chance that many of Australia's stonefruit growing areas will get above average rainfall in the next two months.

While rain during spring is ideal for growers of other crops, such as vegetables or grain, it is bad news indeed for stonefruit growers.

Brown rot, caused by the Monilinia sp. fungus, can infect fruit at any time. However, infection is increased if plant tissues remain wet for more than a few hours, and is most likely at flowering (if blossom blight is not controlled properly) and when fruit is very young. Injured, immature fruit is also very susceptible to infection. Although fruit is resistant to brown rot infection during pit hardening, susceptibility increases as harvest approaches.

This season, for the first time, we are exporting nectarines to China. Brown rot is a key issue for China, making control of this disease absolutely essential. At this time we still do not have clear information about Chinese MRLs for fungicides used legally here, particularly

OSCAR VILLALTA is a plant pathologist at the Department of Economic Development, Jobs, Transport and Resources, Victoria

in terms of postharvest application (e.g. Scholar). Negotiations are continuing but, again, this emphasises the need for good control during flowering and early fruit set.

Infection by brown rot can stay dormant and undetectable right until harvest. However, decay can develop within a few days as fruit starts to ripen. Timely harvest, handling fruit carefully to avoid injuries, using clean containers to hold fruit and cooling promptly after harvest can all help reduce postharvest brown rot problems.

Effective sanitisers are essential to destroy spores of Monilinia, as well as other decay fungi, in water flumes and during postharvest washing. Sanitisers can kill spores in water and on fruit surfaces. However, they cannot control latent infections, and often do not protect wounded tissues if spores have lodged inside.

CONTROLLING BROWN ROT
Prevention is better than cure

The best way to prevent brown rot problems is to use a multi-layered management approach that includes:

1. Effective pre-harvest control of blossom blight and fruit brown rot (orchard sanitation to destroy "mummies" from the last season; fungicide sprays from 5% bloom to shuck fall, as well as during immature fruit stages if disease pressure is high and when fruit is ripening, at a frequency suitable to infection risk).
2. Identifying dormant fruit infection shortly before harvest so as to develop a postharvest management and marketing strategy.
3. Use of effective harvest and postharvest handling practices to reduce incidence of infection and spread.

ACKNOWLEDGEMENT:
This project has been funded by Horticulture Innovation Australia Ltd using the summerfruit levy and funds from the Australian Government (SF12004). It has been supported by the Victorian Department of Economic Development, Jobs, Transport and Resources.

For more information, please refer to a brochure published last year on management of brown rot. This summarises the outcomes of project SF12004, describing a Monilinia infection model which can be used to improve the timing of fungicide applications for blossom blight and brown rot of fruit. It also includes a best practice guide for managing this disease, and describes a method for identifying latent infections in fruit shortly before harvest. This brochure is available on the ***Summerfruit Australia website****. An article in this magazine in August 2015 (pp. 29–33) described the efficacy of fungicides used to control Monilinia infection.*

All the way from the USA

California is a fruit-growing behemoth. **Jennifer Ekman** reports how on they do it and the competition it represents to Aussie growers.

> "The USA now produces around 1 million tonnes of stonefruit annually. Less than 10% of this is exported, with the vast majority grown for domestic consumption."

Central Valley deep

According to the USDA, by the middle of the 18th Century peaches were so plentiful in the USA that they were commonly mistaken for a native fruit!

Most stonefruit are grown in the deep soils of the Central Valley, in the region reaching from Visalia in the south, to Fresno in the north. This area produces 75% of the peaches and virtually all the nectarines grown in the USA.

Perhaps, surprisingly, many farms are still family-owned operations – just really large ones. There are also a number of co-operative marketing groups. For example, Mountain View Fruit Sales brings together 11 farming families under the "Summeripe" branding. Many families are multigenerational orchardists who can trace their history in the region back 100 years or more.

Until relatively recently, many of the orchards in the Central Valley were furrow irrigated. This was possible due to the flatness of the landscape, as well as an abundant supply of irrigation water supplied by snow melt in the nearby Sierra Mountains. It is this, combined with a vast network of irrigation pipes and channels, which has turned what is essentially a desert into one of the worlds great food bowls.

However, concern about sustainability is finally resulting in major changes. Recent years of drought have seen growers switch to more efficient irrigation practices. Although the 2015–2016 season provided a return to more normal snowfall and welcome flows into rivers and aquifers, most growers now use sub-surface irrigation systems. They also use recycled water in packing operations.

Solar panels are also a common sight. For example, the huge Wawona packing operation is 75% solar powered, using 5 acres (2ha) of sun-tracking solar panels to reduce the company's carbon footprint and reliance on the grid for power.

Despite these efficiencies, other practices remain traditional. Trees are usually pruned to open vase shapes; growers have not shifted to more intensive, mechanised trellising. Labour costs are lower in California than Australia, which allows the Californian industry to employ a very large, mostly Latino, workforce.

Plum jobs

One of the key differences between the Australian and Californian industries is the larger portion of the industry that produces plums. Plums represent around 30% of the Californian stonefruit industry, compared to around 15-20% of that in Australia.

There is a huge range of plum varieties grown, many the result of private breeding programs. This is another key difference between the Australian and Californian industries, with the large producers almost all having their own breeding and development programs, as well as trial orchards for promising new cultivars.

Quality control officers sampling fruit on arrival at the packing shed.
Photo: J. Ekman

Producing the best fruit possible

Many Californian growers have foliar spray programs to improve plant health. As well as producing sweeter fruit, it is believed such programs improve shelf life.

Thinning is done by hand, and can be quite severe in order to maximise harvests of large fruit. Other practices aimed at improving fruit quality include;

- Summer pruning to remove excess vegetative growth 10–14 days before harvest
- Reflective mulch placed over the orchard floor to increase colouring
- Leaves around the fruit removed 3–4 days before harvest
- Multiple picks; industry standard is 3 to 4 picks over each orchard, but some operators do up to 8 picks.

Fruit used to be harvested into half-tonne bins. However, many firms are now using buckets or plastic crates to reduce compression and bruising damage. Plastic crates are disinfected between uses, with company policies stating they should never be placed directly on the ground.

New fumigation chambers under construction, outside and inside. These units have been installed specifically to meet Australian quarantine requirements. Photo: J. Ekman

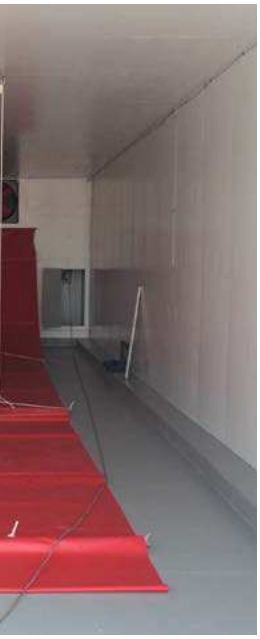
County inspector conducting a 600 piece USDA inspection of outbound fruit following fumigation with MeBr. Photo: J. Ekman

While a few of the large firms have their own packing sheds, most service a number of growers. This makes it important that information on the quality of each batch of fruit is recorded as soon as it reaches the central packing shed. Growers may be paid according to fruit quality attributes as well as pack-out.

A subsample, typically 50 fruit from different lugs, is used for measurement of firmness, brix and size. To measure firmness, sections of fruit skin are removed from both cheeks, the shoulder and the tip of each fruit, and a bench mounted penetrometer used to measure rupture force. In Australia we usually measure only the cheeks, but the results are likely similar.

Advanced fruit may be used for domestic markets, while the less advanced fruit is more likely to be exported. However, this is not always the case. It seems that much of the information gathered is used mainly to reflect on orchard management practices after the season, rather than to inform marketing decisions.

Temperatures of 37–40°C are common during summer



Initial field examination of peaches harvested into white lugs.
Photo: Mountain View Fruit

months, so minimising the time between harvest and cooling is essential to maintaining fruit quality. Hydrocooling is the dominant cooling method used. Fruit are then graded and packed similarly to large Australian operations.

Exports to Australia

Californian stonefruit first gained entry to the Australian market on 19 July, 2013. As with Australian nectarines finally getting access to China, this was the culmination of many years of negotiations, pest risk assessments and quarantine protocol negotiation.

Importers who had already been waiting for years pounced on the opportunity, and the first USA peaches and nectarines arrived in the markets within a fortnight.

Access would have occurred sooner had it not been for Drosophila suzukii, or spotted wing drosophila (SWD). This tiny, but extremely damaging, pest was first found in California in 2008. Although peaches and nectarines are not a preferred host, it can infest them if populations are high and/or other hosts are not available. Although the Import Risk Assessment for USA stonefruit was finalised in 2010, Australia had already introduced emergency quarantine measures in response to the risks associated with any import of SWD hosts, including stonefruit. Access was put on hold until a quarantine treatment was developed and proven effective against SWD – this proved to be fumigation with methyl bromide (MB).

Plums gained access in early 2015, with apricots finally gaining access in July this year. However, don't expect to see Californian apricots on shelves any time soon – apricots are generally considered too fragile to tolerate quarantine treatment and shipping. However, there is interest in plumcots; these plum + apricot hybrids can now be imported, as both parents have been shown to be disinfested by the same treatment.

The complexity of quarantine

Peaches and nectarines can be imported into Australia from California, Oregon, Washington and Idaho. Plums can only be imported from certain Californian counties. Access is based on area freedom from fruit flies (except cherry fruit fly) as well as a two-hour fumigation with 48g/m3 MB at pulp temperatures >13.9°C and chamber loading not more than 38%. This treatment is more severe than that conducted for other export markets, reflecting Australia's intense concern about this pest.

Fumigation can severely damage some varieties, causing a characteristic skin browning known as "fumo-burn". In addition, fruit has to be warmed for fumigation and then re-cooled afterwards, a process that can increases ripening and can result in less even quality on arrival.

Initial exports into the Australian market were somewhat hit-and-miss, as some fruit – white peaches, for example – were in poor

Fumigation damage (fume-burn) on a white peach.
Photo: J. Ekman

Fruit testing laboratory at Mountain View Fruit, Reedley CA. Photo: Mountain View Fruit

shape by the time they reached retail shelves. However, considerable effort has now been put into selecting varieties for Australia that eat well, but also cope with the quarantine treatment and extended storage time required.

Productivity through pre-clearance

Largely because of concern about SWD, the Californian stonefruit industry decided to reduce the risks of rejection or delays by instigating a pre-clearance program. Australian quarantine officials were contracted to provide this service. As the product is inspected before it leaves the USA, fruit not meeting Australian biosecurity standards can be diverted into other markets rather than rejected on arrival.

This program will cease by 2020, and in the meantime is being scaled back due to lack of available inspectors. According to Produce Marketing Australia's Mark Baker, the loss of the pre-clearance program is the issue of most concern to the Californian industry. "Although inspectors are still there, they are already thinner on the ground and will cost many Australian importers more per inspection," Mr Baker said.

> "Californian stonefruit is exported to Australia by airfreight. This is expensive, adding around $4/kg to the price of fruit."

"Clearance will increasingly have to occur on arrival, which is riskier for importers.

"If the product doesn't pass, then it will have to be re-fumigated or re-exported, both of which will significantly reduce fruit quality. There aren't enough facilities in Australia to cope with the volume of USA imports, or enough people authorised to do the inspections. This means delays in the supply chain, which is bad for business".

It is planned that the pre-clearance system will be replaced using "authorised officers", Australian citizens trained by AQIS and employed directly by importers to conduct the inspections.

The tyranny of distance

Stonefruit is exported from the USA to Australia by airfreight. This is expensive, adding around $4/kg to the price of fruit.

Using sea-freight in refrigerated containers would at least halve this cost. However, shipping times are at least three weeks, which makes this difficult to achieve. A number of importers have trialled sea-freight, with mixed results.

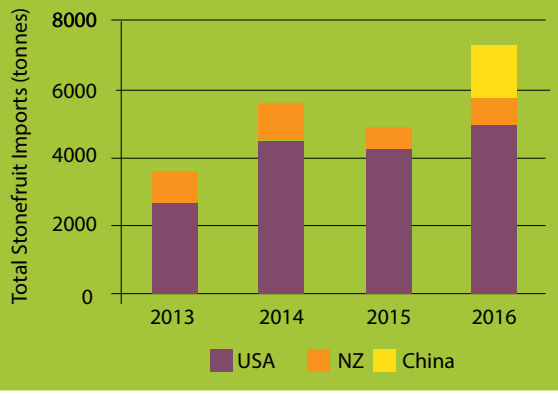
Bins of fruit being hydro-cooled on arrival at the packing shed. Photo: J. Ekman

USA vs China

While exports from California into Australia increased in 2014, poor environmental conditions and reduced consumer demand resulted in a decline in 2015. As shown in the graph below, imports have been forecast to increase again this season, potentially rising to 8,000 tonnes.

However, the USA product is now facing competition from another source – China. In terms of world production, the USA is tiny compared to China. Around 13.6million tonnes, or two thirds of world production, of peaches and nectarines are now grown in China.

Nectarines from China are now entering the Australian market. Initial trials have been by air-freight. However, as John Moore noted in this magazine, sea-freighted nectarines are now arriving. These are likely to be priced significantly lower than the Californian fruit. How they compare on quality has yet to be seen. Moreover, there may be consumer reluctance to purchase Chinese stonefruit; after several years access Chinese apples remain under 1% of the total Australian market.



One of the major issues is that fruit is likely to need regrading on arrival, as firmness is liable to vary through the load. Soft fruit is difficult to handle, and does not meet the specifications of the major retailers.

However, new technologies such as modified atmosphere shipping containers, ethylene blockers / absorbers and selection of longer storing varieties, could make sea freight more attractive in the future.

Apricot cv. Diamond Cot. Photo: Mountain View Fruit

Pluot cv. Flavor Grenade. Photo: Mountain View Fruit

Pluot cv. Apple Dandy. Photo: Mountain View Fruit

Plum cv. Black Beauty. Photo: Mountain View Fruit

Plum benefits

The royal flush: How Queen Garnet burst onto the Australian fruit scene

By Jack Rozycki

The unprecedented consumer demand for Queen Garnet, a plum variety developed by two Queensland Government agricultural scientists, has its genesis in recent scientific research into ageing and wellbeing, which suggests that this group of flavonoids called polyphenol phytochemicals may help in dealing with cardiovascular disease, decline in brain function and various cancers.

Anthocyanins are thought to play a role in the prevention of such diseases with their antioxidant properties.

Every day, the human body's cells are assailed by oxidation due to various environmental factors such as pollution, ageing and the effects of smoking tobacco, among many others. Oxidation involves a loss of electrons by the body's compounds, weakening them and making them reactive – prone to attracting unwanted electrons from elsewhere. Such unbalanced and highly reactive molecules are called free radicals. This has serious ramifications for health. For example, in cardiovascular disease the sides of coronary arteries become clogged with plaque because blood platelets affected by free radicals become "sticky" and begin to adhere to the walls of the arteries. This narrows the arteries to the point of being blocked, eventually causing a heart attack, where parts of the heart muscle die because they are denied oxygen carried in the blood flow.

continued on page 14

The Good Rich Fruit Co orchard - the fine detail

- Located between Inglewood and Stanthorpe in SE Qld
- First substantial Queen Garnet planting in Australia
- 75,000 trees planted 2010/2011
- Queen Garnet bred at Stanthorpe by Qld DPI
- Grown in Traprock country as diversification from fine wool
- The trees were originally planted with the processed nutraceutical market in mind
- The trees are grown on a trellised cordon system
- The consumer response to the QG as a fresh product has been so great that the fresh market will remain the dominant outlet for time being
- Queen Garnet grown under a biological regime: feeding the soil biology which in turn feeds the tree. This in turn produces a healthier tree and fruit
- There are no artificial fertilisers used, and no insecticide cover sprays; the only fungicide is copper at budswell
- The soil is balanced, and bulk nutrient added using compost made on farm; soil testing is used to determine the inputs required in the compost; extra nutritional requirement is gained through adding products such as gypsum, lime, soft rock phosphate, palagonite to the manure/carbon base
- The soil is then boosted with trace elements through fertigation, plus fish, kelp, humates, fulvic, compost extract and nitrogen fixing biology
- Currently the orchard's own biological/nutrient brews used for both foliar and fertigation
- Spray program revolves around calcium, kelp, sea minerals
- This nutrition program delivers a nutrient dense tree/product with inbuilt resistance to fungal, bacterial and insect attack
- Using tree health as the first defence against these pests
- Huge number and variation of insect predators as a result of no insecticide cover sprays; there's a population of mites and thrip but yet to see damage
- Had some damage from San Jose scale, but predators seem to have that under control
- Queensland Fruit Fly: about to start fifth season of sterile fruit fly release; last three years of this will have been as part of an HIA research project run by Dr Olivia Reynolds – NSW DPI
- The sterile flies have been run in conjunction with MATs, baiting, and trap monitoring of both orchard and surrounding bush/gardens; this has been an ongoing learning process with continual alterations being made to the program as they learn; it has been the only on-ground work happening in Australia
- Other orchards in the region have been brought into the program in the last two years; the aim is to obtain an area wide freedom from Qfly
- The results have been promising with the localised population of Qfly reducing each year The last two years probably only had 2–4 wild flies in the orchard giving trouble; the trapping has let the orchard know where the wild flies are breeding, so they know where they need to be wiping them out
- The aim of the project has been to work out models that the rest of eastern Australia can use to control Qfly without having to resort to harsh cover sprays; the orchard has made great gains, but unfortunately there is only one season left with the project; as it is the only on-ground SIT Area Wide Freedom work happening, Rowan Berecry is sure it would have beneficial for the industry as a whole to have been able to continue with the research
- Weed Control: The orchard was using a restricted herbicide program up until 12 months ago; they were seeing too many nutrient tie-ups with the herbicide, so have gone to a permanent sward under the trees; the nutrient lock-outs were starting to affect tree health
- Mulch was also being used for weed control / moisture retention; the orchard managers have backed off on this for the time being as legumes are starting to dominate along the tree rows; they do not want to restrict its ability to spread and survive
- Water is a major issue: Main water source reliant on run-off, supplemented with bores; however, salt content in bores is starting to cause a few problems; installed a magnet to supplement biology/ nutrition as a control for the salt
- Harvest: The fruit matures mid-January; the managers have two weeks in which to get the crop off; almost totally reliant on backpacker / uni student labour. This year aiming to harvest 100 tonnes/day
- The fruit is currently hand-picked; it is hoped to mechanise this in future years
- Postharvest: The fruit is fast cooled then packed or stored; the fruit stores well for at least 6–8 weeks; cooling will be done on-farm for the first time this year; local coolrooms are used for the long-term storage, and local packing sheds used for packing
- Daily packing requirement is controlled by Harrowsmiths International in Brisbane

Factbox supplied by Rowan Berecry, Good Rich Fruit Company

Anthocyanins have been found to offer a defence against oxidation and are thus regarded as "antioxidants". Moreover, they are also now seen as being able to regulate tissue inflammation – a major causative factor in rheumatoid arthritis, the aforementioned coronary artery disease and myriad other diseases such as Parkinson's, amyotrophic lateral sclerosis (Lou Gehrig's disease) and allergic disorders.

Anthocyanins are also being cited for helping to arrest declining brain function. Ageing causes brain cells to degenerate with the loss of a protein called the "brain-derived neurotrophic factor" (BDNF). BDNF is essential in making new brain connections. Research (on rats) has shown that supplementation with anthocyanins raises the levels of BDNF in the hippocampus region of the brain, the area responsible for memory function.

"Anthocyanins are also being cited for helping to arrest declining brain function. Ageing causes brain cells to degenerate with the loss of a protein called the "brain-derived neurotrophic factor" (BDNF). BDNF is essential in making new brain connections."

But what has evidently given anthocyanins – and the foods which contain them in significant amounts – a huge boost in demand is their role in fighting obesity. Recent evidence suggests that anthocyanins enhance the ability of the body to absorb and utilise sugar for energy production instead of storing it as fat deposits.

The Queen Garnet plum was bred by Dr Bruce Topp and Dougal Russel of Queensland Department of Primary Industries (now Queensland Department of Agriculture and Fisheries) in the early 2000s. Its high anthocyanin levels, said to be 150–280mg per 100g, makes it extremely competitive in the now rampant anthocyanin market against other plums, where the range is 3–30mg per 100g; and various other sources of anthocyanins such as berries – blueberries in particular – as well as açai, bilberry, cranberry and blackcurrant; plus sour cherry.

The Queensland Government has licensed the Queen Garnet to Nutrafruit Pty Ltd, a consortium of businessmen of which Bim and Rick Goodrich are shareholders and directors.

According to Rowan Berecry, orchard manager at Good Rich Fruit Co's Warroo Station near Inglewood, on the southern Darling Downs in Queensland, the Queen Garnet has a very dark flesh and skin, which are outward indicators of high anthocyanin content.

The Warroo Station orchard was planted in 2010–2011 and currently has 75,000 Queen Garnet trees, plus polliniser plum trees, Mr Berecry said.

"While this orchard was originally planted with processing in mind and there are umpteen options there, we thought we would give (this new plum) a profile in the fresh fruit market first.

"However, there's been such a huge response (for fresh fruit) that we will keep it going (as fruit) at this stage.

"It all snowballed after we asked the media and also invited Queensland Agriculture Minister.

"First up, we found ourselves on the front of Queensland Country Life, then we were on (ABC's) Landline (program), so the whole thing started exploding.

"Last year I think we've had five film crews all through the packing shed; then it just fed on itself, you couldn't pay for the publicity that we got."

The demand for the plum has grown and grown, fuelled by recent publicity about an "obesity epidemic" and a spike in general interest in nutrition.

The plan for next season?

"The majority will be fresh market," Mr Berecry said. "We'll start probably in mid-January.

"The Queen Garnet stores really well, it looks like we can store it probably for eight weeks."

With other orchards coming on stream further south, Mr Berecry reckons the market expectations for Queen Garnet fresh fruit can be met from January to the end of April.

The future seems almost unlimited.

Nutrafruit purchased the plant breeder rights from the Queensland Government, whose scientists developed the variety.

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Progress in the SITplus program

The SITPlus facility under construction in Port Augusta, SA. Photo: D. Ryan

In a refreshing change to addressing major issues in horticulture, a group of research organisations and the government have teamed up with Horticulture Innovation Australia in a combined effort to develop the Sterile Insect Technique (SIT) for Queensland fruit fly (Qfly), potentially transforming the way this pest is managed in Australia.

ACKNOWLEDGEMENT: This project has been funded by Horticulture Innovation Australia Ltd multiple industry levies and funds from the Australian Government (MT13059)

By Dan Ryan, SITplus Program director

The organisations have come together as SITplus. The group will coordinate a five-year, $45 million research and development program on Qfly through a strategic, coordinated and national approach. In good news for growers, that unprecedented level of investment has been leveraged off less than $2 million in grower levies or co-contributions.

As a summerfruit grower or supply chain member, you will fully appreciate Qfly's status as a major, endemic pest in the Australian horticultural sector. Fruit flies damage produce in the field, leading to yield losses, as well as impacting the health status of crops for international market access.

A recent study by the Plant Biosecurity Cooperative Research Centre estimated that Qfly costs Australia's horticulture sector $300 per annum in control lost markets. The SITplus partnership aims to develop SIT as a cornerstone to how Qfly is managed in Australia, helping to address those significant industry losses.

So, what is SIT?

SIT involves the strategic release into the wild of large numbers of male fruit flies that have been sterilised. Enough sterile male flies are released to greatly

outnumber the wild male population. As a result, wild females have limited opportunity to mate with wild males. The outcome of this disruption to mating is the suppression, or eradication, of subsequent generations of the wild flies.

For SITplus, male flies will be reared in a factory in Port Augusta, South Australia, then sterilised and released from the air.

The "plus" in SITplus emphasises that the aim of the partnership is about more than just raising and releasing sterile Qfly. The objective of SITplus is about innovative science to cost-effectively produce effective male only flies for release. It also aims to provide a framework of integrated ecological and behavioural science, maximising the impact of those flies when released as part of an area-wide management program.

SIT with Qfly can protect current pest-free areas such as South Australia, help growers work towards resumption of recently lost pest-free area status such as in the Sunraysia, and assist growers management plans in areas of low pressure such as the Murray/Goulburn region.

SIT is a well-established technique with a history of development dating back to the 1930s. The first implementation of SIT took place in 1954 against New World screwworm. That program successfully eradicated the pest from the island of Curaçao, off the coast of Venezuela, in just seven weeks. It then led to a broad-scale successful program in the USA in the 1960s and 1970s.

The technique is now used worldwide on a range of insects, including multiple fruit flies, tsetse fly, mosquitoes, screwworm, codling moth and painted apple moth. A review of a medfly SIT program in Mexico stated that their SIT program protects a fruit and vegetable export market of over $3 billion/year through an annual investment of around $25 million. Medfly-free status, achieved with SIT, has been estimated to have opened markets for Chile's fruit exports worth up to $500 million.

"The technique is now used worldwide on a range of insects, including multiple fruit flies, tsetse fly, mosquitoes, screwworm, codling moth and painted apple moth."

Progress so far

Since kicking off in November 2014, the SITplus partnership has managed some significant early achievements. At the time of writing, construction of a factory to produce sterile male flies by Primary Industries and Regions South Australia (PIRSA) was nearing completion, on time and on budget. The factory is located in Port Augusta and will have a minimum capacity of 50 million flies per week. PIRSA is currently advertising for a factory manager to develop operations of the factory. The factory is expected to officially open before the end of 2016.

Macquarie University research supporting fly production has developed a new feed strategy for fly larvae that can significantly increase production capability and reduce factory staff levels by up to a third. This efficiency gain will mean cheaper and more flies.

An economic analysis of the costs of fly management, market loss and willingness to pay for fly management is well advanced. Modelling of the fly in the environment is also well progressed and will help ensure the most effective targeting of sterile flies. Community engagement has seen significant interaction with grower groups in the Riverland, Sunraysia and Goulburn/Murray Valley regions.

At this stage, plans for the factory involve a period of developing fly production and documenting processes, followed by test releases of a bi-sex strain. It is expected that a male-only strain of the fly will introduced into the factory in 2018 and the first releases of fit male-only sterile flies should commence in the summer of 2018/19.

During that development period, SITplus will continue to engage with industry to develop how the fly will be released, where it will be released and how the scheme will be paid for.

SITplus partnership members are Agriculture Victoria, CSIRO, Macquarie University, NSW Department of Primary Industries, Plant and Food Research, Primary Industries and Regions South Australia, South Australian Research and Development Institute and Hort Innovation.

The distinctive rings of Sharka infection on a peach. Photo: EMPPO, Bugwood.org

Preventing a sharka attack

By Jenny Ekman

Researchers have, for the first time, developed a sharka resistant plum.

Sharka, aka. plum pox virus, is the world's most devastating disease of stonefruit. It is widespread in most of Europe and parts of central Asia, Africa, the USA and Canada.

It is estimated that more than 100 million trees have been infected.

Australia has so far stayed free of sharka, a status we certainly want to keep.

Although symptoms are slow to develop they eventually cause major drops in yield. Fruit that is produced is deformed and unattractive, with poor flavour. There is no cure once trees are infected; infected plants must simply be destroyed.

> "There is no cure once trees are infected; infected plants must simply be destroyed."

Now, scientists have developed a genetically modified plum that resists sharka infection.

Plum cells were transformed by inserting a gene coding for the plum pox virus coat protein. This effectively makes the cells completely resistant to sharka. As the virus has no effect on humans, there will be no effect whatsoever to those consuming the fruit.

The transgenic material has been grown and tested in both the greenhouse and in a high disease pressure environment in Europe.

So far, it has proved completely resistant to the devastating disease.

Patented as HoneySweet, this material has been extensively reviewed by the USDA and registered by the US EPA. A limited amount of transgenic plum budwood material is now being made available to growers in the USA.

Genetic modification

Pretty much everything we eat and drink has been genetically modified. By this, we mean that it has been transformed from the original wild species into a plant (or animal) which is more productive, sweeter, tastier, bigger, redder and/or healthier than its wild ancestor.

All of the horticultural crops grown in Australia have been modified over time using selective breeding techniques.

However, this is somewhat hit and miss and, in the case of orchard trees, can take a long time to achieve the desired outcome.

Gene technology is a way to speed up the process by inserting exactly the gene you want into the plant that is to be improved. This may be a gene that is already there in the plant, but not well expressed. For example, adding a second copy of a gene that synthesises anthocyanin could increase red colour development.

It might also be a gene which is already there but which is turned around – "antisensed" – so that the two genes neutralise each other and are not expressed. Using the above example, adding an "antisense" gene for anthocyanin synthesis could reduce or prevent red colour development, resulting in a white fruit.

Sharka resistant plums.
Photo: S. Bauer, USDA Agricultural Service

Genes can also be inserted from different species. This where we hear about luminous pigs and antifreeze tomatoes, genetically modified organisms (GMOs) that would be difficult or impossible to achieve through conventional breeding.

Discussion of these types of GMOs is often emotional and highly political. From a scientific point of view, there is usually no reason to believe that consuming these foods is any riskier than consuming the same products modified through conventional breeding. In fact, if the modification reduces the need for chemical pesticides, then these products may be safer for both humans, and the environment.

However, debate on this issue continues. Interbreeding of GMOs with wild relatives is certainly a concern, as is the potential for introducing unknown allergens or producing other unforseen effects.

It will be interesting to see how well consumers accept HoneySweet plums. We think USA consumers are used to GMO's, yet major stonefruit supplier Mountain View Farm includes "GMO Free" as a key part of its marketing. The arguments about the rights and wrongs of GMOs matter little if consumers don't buy the product. It may depend, in part, on whether (and how) they are required to be labelled for sale.

But it is just as likely to depend on whether they are a good to eat.

A RECENT WORKSHOP FOCUSED ON FRUIT FLIES' OF FLIGHT DISTANCE, HOST PREFERENCE AND OVERWINTERING ABILITY. DR PENNY MEASHAM EXPLAINS

Where does a fruit fly fly?

By Penny Measham

The Adaptive Area Wide Management project includes a component matching our knowledge of fly biology to its physical environment. This involves looking at the landscape, and matching it with current knowledge of Queensland fruit fly ecology. This can help us predict where and when Qfly will occur.

Not only will this aid targeting of Area Wide Management efforts, but also inform the future use of SIT.

A Flight of Entomologists

A huge amount of time, money and resources have been spent studying Australia's pest fruit flies. The Australian researchers who have worked on the ecology and management of these pests have several hundred years of experience between them.

A two-day event was held to bring together that experience, with the aim of producing a comprehensive model of what we know about fruit fly ecology. In particular the workshop focused on current understanding of flight distance, host preference and overwintering ability.

The workshop was facilitated by Justine Murray and Rieks van Klinken (CSIRO), who have previously applied this approach to other pests.

Twelve fruit fly entomologists from around Australia attended the Brisbane workshop. They included researchers with expertise in regions stretching from tropical Queensland to Sunraysia, the Goulburn Valley in Victoria and the Riverland in South Australia.

The effects of climate stress, host availability and roosting site availability on fly behaviour were discussed. The group also considered the likelihood of a commodity

being attacked by fruit fly, and the probability that larvae will successfully develop inside.

Model behaviour

The model now taking shape brings together information on habitat suitability, long distance dispersal pressure, management effectiveness, seasonal fly abundance, host quality, climate, fly activity and a host of other behavioral characteristics. The model will be linked to relevant spatial (landscape) data to produce regional maps of areas at risk.

Later this year the modellers will visit different regions to see how well the predictions fit with regional knowledge and experience. Adjustments can be made and/or field tests conducted to verify where and when flies are most likely to occur in the landscape. Risk maps will then be generated to identify potential hot spots.

> "It will help regional communities conduct effective area wide management programs, make informed decisions, and stay one step ahead of the flies."

The first regions that maps will be generated for will be in southern Australia.

Developing such habitat suitability and risk models for Qfly in different regions will help us understand where the flies are most likely hiding in the landscape and, therefore, where to focus control measures.

It will help regional communities conduct effective area wide management programs, make informed decisions, and stay one step ahead of the flies.

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The DA-Meter, from theory to practice

By Christine Frisina and Dario Stefanelli

DA-Meter technology will increase consumer satisfaction as a result of consistent fruit maturity.

The DA-Meter is a new technology that provides a rapid non-destructive method for assessing fruit maturity from orchard to market. Being non-destructive, the DA-Meter can monitor fruit maturity as it develops in the orchard to predict the optimum harvest date. Different maturity classes can be identified to optimize harvest timing to supply local and export markets of choice. In the packhouse, it will be possible to grade fruit according to its shelf life potential. Overall, the DA-Meter technology creates increased consumer satisfaction resulting from the supply of fruit with consistent maturity.

The DA-Meter uses spectroscopy to measure chlorophyll 'a' in the mesocarp (just below the skin) of the fruit through the difference in absorbance between 670 and 720 nm (index of absorbance difference, IAD). The best way to determine the physiological maturity of the fruit is to correlate IAD values with the fruit ethylene production rate. The correlation between the IAD and ethylene is cultivar dependent, but once the correlation is performed correctly, the resulting maturity classes should be independent of factors such as location, agronomical practices and growing season. These factors will influence the date in the growing season at which the fruit will reach a certain value but the relative ethylene production at the specific IAD value will not change.

DR DARIO STEFANELLI is is Team Leader at Fruit Physiology, Agriculture Research Division, Victorian Department of Environment and Primary Industries. He can be contacted on 03 9032 7373 or via email: dario.stefanelli@depi.vic.gov.au

Calibrating the DA-Meter for optimal maturity determination

The main challenge in determining fruit maturity classes is the correlation between IAD value and ethylene production as it requires sophisticated instrumentation, such as a gas chromatograph (GC) to measure ethylene. In general, this equipment is only available in fruit research laboratories. However, the correlation with ethylene production and the identification of the maturity classes is fundamental to the use of the DA-Meter and if not done will reduce the accuracy and effectiveness of the DA-Meter.

To enable owners of DA-Meters access to ethylene analyses, DEDJTR scientists developed a procedure for the collection of ethylene produced by the fruit that can then be sent to a central laboratory for measurement with GC (**see video: Introduction to Ethylene Sampling for Optimal Ripening Prediction with DA Meter and the ethylene sampling protocol below**). The procedure uses pre-evacuated vials for the easy and rapid collection of ethylene samples from fruit. Growers and other handling chain participants can collect the ethylene and ship it to a DEDJTR laboratory for analysis. Central processing of the ethylene samples

ETHYLENE SAMPLING PROTOCOL

The following equipment is required to sample fruit ethylene:

- Fruit pre-measured and labelled for IAD and grouped into 0.1 IAD value increments.
- Respiration chambers: Sealable air tight jars or containers between 500 mL and 1 L capacity depending on availability (see Appendix A)
- Evacuated vials: supplied by DEDJTR Horticultural Production Sciences team.
- 25 cc syringe: with 25G needle.
- Timer/clock.
- Scale to record fruit weight.
- Recording sheets

ABOVE: Equipment needed to perform the procedure of sampling fruit ethylene. A example of a glass chamber of approximately 1L volume. LEFT: Example of plastic chamber of approximately 1L volume.

Download
Ethylene collection recording sheet

See Video
How to sample ethylene from stonefruit

makes the process less costly and allows for systematic identification of maturity classes for each cultivar. Measurements of IAD with the DA-Meter must be taken immediately prior to the collection of ethylene samples so that IAD can then be used to identify maturity classes.

For each cultivar tested, ethylene measurement should be conducted at IAD values between 0.2 and 1.7 for stone fruit and between 0.2 and 1.9 for pome fruit. Best results are achieved if ethylene is measured at IAD increments of 0.1. At least 5 individual fruit are required for each ethylene production measurement. This procedure will allow the creation of cultivar specific graphs correlating IAD and ethylene production from which it will be possible to accurately identify maturity classes (Fig. 1).

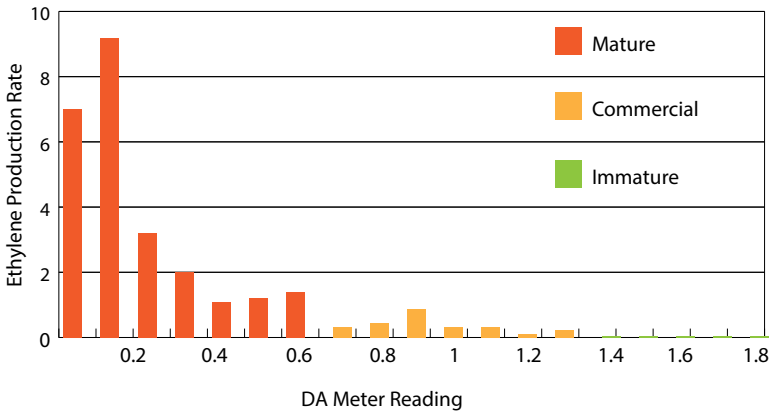

Figure 1. Nectarine Autumn Bright ethylene production and segregation in maturity classes of similar ethylene behaviour correlated to DA values. Maturity classes were: Mature = ripe (climacteric fruit), Commercial = usual maturity at commercial harvest (On-set of climacteric) and Immature = unripe (pre-climacteric fruit).

Fruit selection

IAD monitoring for harvest prediction date should start at least 4 – 5 weeks prior to harvest and be performed at least weekly. It is important to find the IAD values corresponding to pre-climacteric, on-set of climacteric and post-climacteric fruit development. This will ensure the identification of fruit at high IAD values, corresponding to fruit not producing ethylene (Pre-climacteric). Fruit selection should continue as the IAD values decrease with at least 5 fruit for each 0.1 IAD increment (i.e. 0.80 and 0.89 would be placed in the 0.8 group) until fruit between IAD values of 1.7 to 0.2 are measured for ethylene production. This should result in a minimum of 75 fruit sampled for ethylene. It is important that fruit are free from any blemish, wounds, disease, pest damage or bruise as it will affect ethylene production rate. The 5 fruit for each 0.1 IAD increment do not have to be collected on the same day but can be spread across sampling times. It is most important that a minimum of 5 fruit are collected for each 0.1 IAD increment.

It is possible to sample more than one cultivar at the same time but the samples must be correctly labelled for each cultivar and IAD value. Sampling more than one cultivar at a time does not increase the overall time commitment by much but it increases the number of chambers to be used at each single time or it requires multiple samplings with a fixed number of chambers to be able to collect from 5 fruit in each 0.1 IAD group.

> "It is possible to sample more than one cultivar at the same time but the samples must be correctly labelled for each cultivar and IAD value."

Fruit selection can be performed in two ways:

- Harvest minimum of 100 fruit at random into cardboard trays with single fruit liners to separate fruit and minimise bruising; fruit should be collected at shoulder height and from multiple trees, usually no more that 8 – 10 fruit/tree. Measure and write the IAD value on each fruit with a permanent marker. Segregate the fruit in groups within the same 0.1 of IAD increments with a minimum of 5 fruit for each increment from 1.7 to 0.
- Measure fruit with the DA-Meter on the tree. Write the IAD value on the fruit with a permanent marker. Select a minimum of 100 random fruit at shoulder height and from multiple trees, usually no more that 8 – 10 fruit/tree. Harvest the fruit that will be needed to segregate the fruit in groups within the same 0.1 of IAD increments with a minimum of 5 fruit in each group (from 1.7 to 0.2) and place them in cardboard trays with single fruit liners to separate fruit and minimise bruising.

> "The DA meter is an innovative instrument for non-destructively determining a fruit maturity index by measuring the decline in chlorophyll content immediately below the skin during ripening."

Ethylene sampling steps

1. Print or have sample record sheet on computer/tablet open and ready to edit.
2. Label the fruit numerically (e.g. 1 – 20).
3. Record the IAD, the weight of each fruit and the volume of the chamber in which the fruit goes.
4. Place each fruit into its allocated chamber. Seal all the chambers at once and record the time, in hours and minutes. A chamber with no fruit in it should also be sealed at this time to determine if there are any background ethylene contaminations that will affect the results.
5. The chambers should be left for 3 to 4 h in the shade

or inside to allow the accumulation of any ethylene production. It is important that chambers are never exposed to direct sunlight.

6. While this time elapses, label the evacuated vials that match the fruit in the chambers.
7. Include grower/orchard identification, sample type (cultivar), fruit number, chamber label and collection date.
8. After the time has elapsed, sample the chamber using a 25 cc syringe fitted with a 25G needle.
9. Insert the needle through the silicon seal into the chamber as far as it can go.
10. Slowly pump the syringe 3 – 5 times to create air movement inside the chamber stirring the contents.
11. Draw 20 cc into the syringe and remove the syringe from the chamber. Insert the needle into the correspondingly labelled vial. The syringe should release most of its contents automatically as the vial is evacuated.
12. When the syringe plunger stops moving gently push down the plunger forcing the remaining contents into the vial. While holding the plunger down, remove the needle from the vial.
13. Store the vials at room temperature in the dark.
14. Send the vials with a copy of the relevant sample recording sheet to DEDJTR for ethylene analysis.

Example of recording sheet

Fruit	Jar #	Jar Volume (ml)	DA Meter Reading	Fruit Weight (g)	Jar Closing Time (hh:mm)	Ethylene Collection Time (hh:mm)
1	45	1156	0.87	136	1.00pm	4:05 pm
2	12	1150	0.82	141	1.02 pm	4.08 pm

HOW TO BUILD RESPIRATION CHAMBERS

- Size preference is 1L capacity, glass or gas tight plastic; depending on availability chamber volume could be between 500 mL to 1L. Most important is that the chamber opening is large enough to insert and remove large fruit easily.
- Exact volume must be determined (see below).
- Each container must contain at least one hole filled with regular glass, all purpose silicone sealant, neutral cure (see picture 2). Note: Sealant will require a minimum of 24 – 48 h curing time. Do not use any other type of silicon sealant as they contain compounds that will be detected by the instrumentation (GC) used to determine ethylene presence and concentration, and therefore will interfere with the analysis of the samples.
- Label each chamber and the corresponding lid, numerically or other, for ease of recording and re-using the volume information against the individual chamber.

Example of silicone to be used.

DETERMINING THE SAMPLING JAR VOLUME

This is done by weighing the total amount of water required to fill both base and lid of the chamber. This should only need to be done once for each chamber. While the totals will be similar for most of the chosen chambers sometimes there are differences large enough to alter the results so it is important to do this for every chamber used.

EQUIPMENT:

1. a balance or set of scales, accurate to 0.1 g is preferred
2. worksheet

Download
Jar volume recording sheets

See Video:
How to determine the volume of the sampling jar

STEPS:

1. Record the chamber and lid labels.
2. Separate lid from base of chamber.
3. Place base and lid on the balance and record the weight.
4. Remove the lid, pour water into the base until is completely full (to the brim); try to avoid any spillage onto the scales as this will add to weight. Replace the lid upside down on top of the base (still containing water) and fill the lid with water.
5. Record the total weight (base and lid).
6. Repeat from step 1 for all remaining chambers.
7. Record this value for the specific chamber and keep this information for reporting with the sample information each time the chambers are used.

Acknowledgement

The procedure was developed as part of the project SF15001 "Comparing Stonefruit ripening, quality and volatile composition" which is funded by Horticulture Innovation Australia Limited using the summerfruit levy and funds from the Australian Government with co-investment from the Department of Economic Development, Jobs, Transport and Resources.

Additional information

At the time of writing, the cost of the ethylene analysis per cultivar is estimated at $1,250 including supply of syringe, needles and pre-evacuated vials but not the chambers.

The DA-Meter can be sourced through **Summerfruit Australia Limited.**

Growers or organisations interested in the identification of maturity classes should contact Dr Dario Stefanelli (**dario.stefanelli@ecodev.vic.gov.au**) or Mrs Christine Frisina (**christine.frisina@ecodev.vic.gov.au**) at AgriBio building, 5 Ring Road, Bundoora, VIC 3083.

The full downloadable protocol with explanatory videos can be also found on the Horticulture Industry Network website **http://www.hin.com.au/projects/stonefruit-field-laboratory/da-meter/ethylene-sampling-protocols/_nocache**

Net Gain

A win-win situation for growers

Every grower needs to consider netting sometime in the life of the orchard.

Netting is mainly put up as a defence against bird attack on ripe fruit, but it also has side benefits of protecting sensitive fruit from wind damage and loss of crop due to hail and severe storms. There is some evidence that it can guard against insect pests, which can't see through fine mesh nets. Nets can also be effective defence against bats and possums if erected correctly.

If the only problems come from medium sized birds such as parrots and starlings, and fruit bats, then a medium sized 40mm net will do the job. But if the orchard is liable to attack from smaller silvereyes you will need a smaller sized mesh.

If you need to keep out insects or other small pests you will need a double or quad crossover net. But if your crop needs pollination you can't use crossover net because the bees can't, or won't, fly through it. Some growers even put hives inside the permanent canopy structure with varying success.

Every grower knows what the current problem predators are, but few can predict what they will be over the life of the orchard. Species are replaced by others in response to the available food chain which can vary permanently as well as seasonally.

The next choice is between seasonal throw-over netting (sometimes called a floating cover) or a permanent structure. Vineyards, and other crops that need to be protected from birds and insects, use throw-over for the six or so weeks they are vulnerable. However, stonefruit growers must protect against hail damage for the whole time the crop is on the tree. The difference in cost is considerable; throwover costs about $3 to $4000 a hectare, an effective hail cover can cost up to $45,000.

Hail net needs to be about 9mm with a crossover but fish farm net can be effective at 75mm. Clearly a hail net structure needs to be very much stronger than that used for bird protection. To work out how strong the structure should be a structural engineer should be consulted, they can calculate the porosity of the net and the likely wind speeds the structure will need to survive.

For more information on netting and personal expert advice on how to use it under specific conditions and for specific problems, contact OTCO Agricultural netting by email: **web@otcobirdnet.com.au**

Visit the website for available net specification: **www.otcobirdnet.com.au**

To see a slide presentation on the sequence of erecting canopy go to **www.otcobirdnet.com.au/PermanentCanopy.htm**

FOR PRICING AND DELIVERY INQUIRIES CALL 0428 611 559.

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