Australian STONEFRUIT GROWER

incorporating the **Low Chill Stonefruit Grower**

Launch of the Australian Manufacturing & Farming Program – Page 10

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'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.

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From the LCA President – Raymond Hick

Growers are well underway with pruning and thinning and even enjoying a few weeks of sunshine and warmer days following the relentless wet. Could this be the year when we return to a "normal" season? Unfortunately incidents of blossom blight are being reported.

In June the new Summerfruit Australia Board met and with directors from Qld, NSW, Vic, Tas. and WA. **Mark Wilkinson** from WA was elected Chair. Under Mark's leadership the Board is ready to serve growers and progress the industry. Unfortunately, with limited levy funds, major issues facing the industry and high grower expectations, the task is somewhat daunting.

The management of fruit fly remains the major priority for the industry. Projects are currently underway to find alternatives but at the moment there is no "silver bullet" on the horizon. During a Market Access workshop in Melbourne in August, APVMA gave a presentation which included an update on fenthion. The review is still underway and whilst no date was provided for an announcement nor view expressed on what the decision will be, the consensus of attendees is that fenthion will be removed.

Growers should ensure they have an alternative in place should the decision to remove is made during the season. Once handed the results of the review APVMA is only allowed to decide "yes" or "no" on its continued use which is, interestingly, different to the Canadian model which allows the regulator to incorporate the finding of an alternative into their decision.

It would appear that USA stone fruit will not be in Australia for this season. DAFF have advised that the finalisation of the Spotted Wing Drosophilla PRA is still a couple of months away and when finalised DAFF will be able to finalise the import conditions. In the event that the USA fruit will be granted access, SAL has attempted to engage the USA stone fruit growers' body to discuss marketing issues and opportunities to work cooperatively in the Australian market. Whilst open to these discussions they prefer to wait until access has been granted.

The SAL AGM and industry annual levy payers meeting was held in Melbourne on 4 August. An excellent presentation on the expenditure of levy funds was given by the IAC past president **Rowan Little**. The Industry Annual Report contains information on marketing and R&D programs. I am continually amazed as to how much is being achieved with so little funds.

Thanks must go to the researchers, marketers and the IAC who put great effort and passion into delivering outcomes for us. I strongly encourage growers to read the report. If you have not received a copy then please contact the SAL office.

On behalf of low chill growers I wish to thank the outgoing board for their commitment to our industry and in particular the past Chair and Deputy Chair **Ian McAllister** and **Fred Baronio** who worked tirelessly for the industry during a very difficult period.

Best wishes for a profitable season.

Kind Regards

Ray Hick – President –

***Note:** Due to the LCA President's overseas absence, this contribution was written on his behalf by Committee Member Mark Napper.*

"This project (LCA Communications including this publication) has been funded by HAL using voluntary contributions from Low Chill Australia Inc. and matched funds from the Australian Government."

From the Summerfruit Chair …

Chairman's Address –

Atlantis Hotel, Melbourne - 4/08/2012

I would like to thank **Ian McAlister** for his leadership of Summerfruit Australia over the last 10 years and thank his family for allowing him to serve the industry for so long.

Also stepping down from your board is our long serving Treasurer, **Alfred Baronio**. I wish him well in his retirement and acknowledge his efforts in turning the Summerfruit Australia budget from deficit ten years ago, to surplus.

Andrew Smith has transferred his service from Summerfruit to Chair *Cherry Growers Australia* and I hope to have a close working relationship with Andrew and the other Peak industry Body leaders in the future.

The incoming directors are **Andrew Finlay** from Queensland, **Mark Napper** from New South Wales and **Jason Size** from South Australia. This gives the board a truly National representation and may allow us to become better at demonstrating value to our levy payers.

Our attempt to increase the levy after 16 years at 1c/kg was unsuccessful, but the levies *Roadshow* provided valued feedback on our industry and Summerfruit Australia Ltd.'s place in it. With only 289 growers registering across Australia and only 121 growers attending the 13 regional meetings to listen to the proposal, it is evident that the Summerfruit Australia Ltd has become irrelevant to many growers. The feedback collected during the levy *Roadshow* has been collated into a report that will inform your board as to how to better serve the levy payers into the future.

The Summerfruit Australia Board has been greatly occupied with Fruit Fly and the APVMA Review of the only effective chemicals for control of flies on our orchards. We have been meeting with Government, regulators and researchers to put the view that fruit fly are a problem of production first and foremost and we growers are certain that the alternative controls for fruit fly will not work.

Soon many growers will be placed into a position where they must use untried, untested and uncertain means to obtain a viable crop of Summerfruit.

The Summerfruit IAC has assigned over ½ a million $ of Research and Development funds to seek alternative controls or use patterns for older chemicals.

Summerfruit Australia is managing a project SF11004, *Industry workshop to identify alternate fruit fly control methods.* We met on the 2 August and on two previous occasions and are developing some approaches that may be useful in a few years' time.

At the same time as our Fruit Fly chemicals for infield control and post harvest disinfestation are being withdrawn, there is an unprecedented number of outbreaks of Fruit Fly in Fly free zones. As State Governments slash their Agriculture budgets, spending on Area Freedom is at immediate risk and across industry support and lobbying is essential to maintain Government financial, regulatory and enforcement support for area freedom.

The regulation of trade, market access, protocols and certification are areas that Summerfruit Australia provides much formal and informal input to Government through DAFF, HAL and PHA and our collaboration with other peak industry bodies.
Governments are constantly seeking to reform and we are ever vigilant that this is not going to permanently damage our economic viability as an unintended consequence.

The APVMA proposal to regulate spray drift by imposing a 300M buffer at the property boundary has been a concern to Summerfruit Australia. We have been putting your concerns to the National Working Party and are hoping that a real world solution can be found. This is one example of the constant pressure, with occasional messy outbreaks, for industry vigilance, dialogue and consultation. With our small and overstretched resources within Summerfruit Australia prioritizing which, where, and when of these invitations to accept is a problem for your Board and Executive officer.

The release of an import protocol for Summerfruit from the USA appears to be immanent with the expectation that there will be fruit available in Australian stores within days of an announcement.

Summerfruit Australia was funded to visit the USA to discover any areas of collaboration, but could not gain an invitation from a representative body in the USA. It is expected that the USA product will be largely counter-seasonal **but the possible availability of American peaches and nectarines in September and October is of concern to our Low Chill Growers**

Engagement with China has been ongoing with the view of promoting trade of horticultural products through biosecure, formal protocols. Summerfruit Australia co-hosted a Chinese AQSIQ delegation inspecting Australian orchard practices and packing sheds in Central NSW, Yarra Valley and Tasmania. This experience will allow us to progress the application for our Summerfruit exports into China in the coming year or so.

A delegation from Australia, consisting of **David Minnis**, **John Moore**, **Adrian Conti** and **myself** were invited to China to study the prospects for mutual trade and benefit of our Stonefruit industries and to meet with National, State and local officials. It was an interesting and valuable experience and part of an ongoing engagement. We will report and circulate our findings soon.

The interaction and flows of money and control between the Summerfruit Australia Ltd, the peak body of which I am the Chair; The Summerfruit Industry Advisory Committee, which is a subcommittee of Horticulture Australia Ltd; The Department of Agriculture Fisheries And Forestry and their boss, the Minister of Agriculture, is an overly complicated and evolving relationship that has been disturbed by recent events in other industries. This happened just as your board had dissolved the previous IAC under the Chair of Rowan Little in order to offer the services of the whole SAL board, with additions, as an IAC to Horticulture Australia.

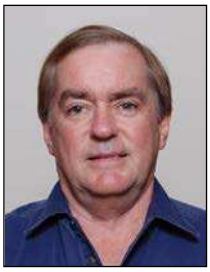
The resulting compromises to re-establish an IAC in time for the scheduled meetings do not represent the best use of the talents and time of the participants and are not going to be sustainable in the longer term.

Thank you for your attention and I hope that we all have a fruitful and profitable year ahead.

Mark Wilkinson - *Chai*

Summerfruit AUSTRALIA

From the Summerfruit CEO …



CEO Round Up …

John Moore – *CEO Summerfruit Australia Ltd*

Three Chemical project meetings/workshops have been held so far. The first was held in Melbourne on 7th March 2012, the second in Brisbane on the 29th March and the third in Melbourne on the 2nd August 2012. A wide cross section of interests has been represented at each meeting including industry leaders, research providers, research funders/managers, regulators and private consultants.

Presentations of existing fruit fly research has been presented by researchers to identify where existing capability lies and where there are substantial gaps in knowledge.

The major outcome of the meetings has been to identify research priorities to address short and longer-term issues in developing fruit fly control strategies in the absence of Fenthion and Dimethoate.

A research project on Dimethoate residues has already been commissioned and completed (SF11007) and another to provide data on Trichlorfon residues is being commissioned. A major project to identifying alternative chemicals to control fruit flies in the field has been developed and will be submitted for funding by **Dr Olivia Reynolds** from NSW DPI. Another project taking a more strategic view to developing an understanding of fruit fly behaviour and ecology is being developed by **Prof. Anthony Clarke** from Queensland University of Technology. Both projects will commence this season.

At a market access meeting held in Melbourne 3rd August, it was flagged that the APVMA review of Fenthion is shortly to be released and reading between the lines there will be no good news for stonefruit producers. Industry will contest with authorities these harmful reviews and the impost to sustainable horticulture in this country. Also, SAL will continue to examine avenues through the chemical committee to combat the pressures on production and representations to regulators and government of the spiralling costs horticulture is enduring due to chemical withdrawals as well as the impact of the carbon price with increases in electricity, fertilisers, packaging and refrigeration gases.

One review that has temporally slowed is the spray drift regulatory review. It's been put on hold.

The Vic DPI is holding a series of meetings to inform Victorian fruit producers and marketers located outside of the Sunraysia PFA, in Greater Victoria (rest of the State) to inform them of DPI's intention to deregulate QFF controls as a result of escalating number of outbreaks and associated costs. Notwithstanding, pressures on the Sunraysia PFA will be a subject of a separate meeting towards the end of August.

This is on the back of Queensland and NSW looking to declare endemic status and quite possibly we see the whole of the east coast categorised as endemic. Spare a thought for what might lay ahead if this happens.

The Annual General Meeting /Annual Levy Payers Meeting were held in Melbourne and thanks to all who attended. Two very interesting presentations from Vic DPI were heard; **Dr. Oscar Villalta** – enhancing disease prediction tools for brown rot and **Carlos Lora** for mobile phone technologies and multimedia platforms for industry – extremely beneficial. The Minutes from these meetings will be on the web site.

The SAL Chair- **Mark Wilkinson**, Deputy Chair –**Adrian Conti**, our Technical expert – **David Minnis** and myself spent two weeks in China recently as part of an Australian Chinese Agricultural Cooperation Agreement visit particularly for stonefruit where we would have to admit we looked for insects in orchards. I`d have to say that the level of pest control in China appears to be quite good.

We visited stonefruit orchards in Shanghai-Nanhui, Wuxi and Xi`an, and the peach growing areas out of Beijing. The way they grow their trees, the ability of the farmers to put on cover sprays would have to be limited. The trees are close

together and grow over in to the rows so you end up with a complete canopy over the whole orchard. No tractors are used.

We looked for Spotted Wing Drosophila, which is native to China, but the Chinese claim it is not a problem. There was plenty of Oriental Fruit Moth damage to shoot tips, but little if any damage to the fruit. This would not be the case in Australia. In Wuxi the orchards had considerable Bacterial canker infection but the trees were laden with fruit. In Australia the trees would have died. The question of inherent resistance to canker in their varieties was discussed.

Growers use light traps, water traps, pheromone traps, and seem to use minimal sprays. We only once saw someone using a knapsack.

Mites were seen and very aggressive bees on waste fruit. Brown rot was obvious on fallen fruit but the fruit on the trees that was mostly bagged was sound and free from any insect or disease damage. The government subsidises the cost of the paper bags.

In Beijing we met with the head of AQSIQ Plant Biosecurity and we raised the possibility that Chinese peaches could have a market in Australia, just as Australian peaches could have a market in China. However we pointed out that for each country to trade we would need an airfreight protocol which would involve the use of Me Br for various pests.

China does use Me Br as a fumigation treatment for imported fruit.

China will not accept irradiation, as they cannot be sure the live insects that have been sterilised are not capable of reproduction. This dose rate is around 150 gray. Australian exporter's may not want to use a lethal dose to kill say Fruit Fly maggots as the disruption of the fruit ripening process as well as physical damage to the fruit would be too great a risk.

Photo - L to R – **John Moore** – *SAL CEO*, **Adrian Conti** – *SAL Deputy Chair*, **Mr Cheng** – *General Secretary CIQA*, **Mark Wilkinson** – *SAL Chair*, **Mr Wang** – *Director Biosecurity AQSIQ*, **David Minnis** – *SAL Technical Adviser*, **Ms Song** –*Ministry of Agriculture Interpreter*, AQSIQ Staff Member, **Li Tianxiu** – *AQSIQ*

China might come round to our idea of mutual use of Me Br to allow airfreight trade (which most Australian mainland areas will need particularly for Peaches and Apricots. Nectarines and Plums could also utilize sea freight), if the Australian negotiators approach the discussions in the right way. Interestingly the Chinese have imposed extraneous conditions on Canadian airfreight of Cherries, a mandatory 15 day period of cold treatment which is disappointing as this negates the idea of fresh fruit, particularly as the USA has the same pests.

We raised the issue of Sharka (Plum Pox Virus) which supposedly was found in Hunnan province in about 2006. AQSIQ said they did a 3-year survey in Hunnan and have presented the results at an international conference in Canada in late 2011. They claim they do not have Sharka in China.

We did ask the $64,000 question – when will Australia be granted access for exports of stonefruit to China

Negotiations are continuing and it is not unforeseeable for 2012 but more likely 2013. We were pleased to get this response as Mr. Wang Yiyu, the Director of Biosecurity, was genuinely sincere throughout our lengthy meeting. A summary of the recent IAC meeting will be circulated shortly.

For any further assistance, please contact
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Industry Information …

Foodbank
An Australia Without Hunger

Foodbank hates food being wasted when we know people (including children) within our community are going hungry. We would like primary producers to know that food not-fit-for-market doesn't have to be wasted. Donating this produce to a worthy cause is an alternative with many benefits.

Foodbank collects unsalable, surplus and donated food and grocery products from farmers, manufacturers, wholesalers, retailers and the public and distributes them to over 2,500 charities and community groups around Australia. The food goes to hostels, shelters, drop-in centres, school breakfast programs, home hampers and emergency relief packages for people in need.

Foodbank sources food for charities such as ***Meals On Wheels***, ***The Salvation Army***, ***Canteen*** and ***Ronald McDonald House*** just to name a few. Foodbank Queensland alone provides food to more than 300 charities/community welfare groups every week. That's more than 80,000+ needy people per week who depend on us for a meal. Sadly, about half are kids!

Emergency Food Relief …

In addition, **Foodbank** distributes food to disaster affected areas throughout Queensland and Australia as required. In the last few years demand for food at the frontline has been huge. And the need for ongoing support equally so. **We just can't keep up with the demand!**

Foodbank is constantly sourcing food from wherever we can get it. Typically, the food we source is second grade or not-fit-for-market produce which is often wasted! In reality there is nothing wrong with the product nutritionally or from a safety point of view. As a general rule *'if you or I can eat it, we will gladly accept it'* and redistribute it to where it's needed. Sadly though, a lot of this type of produce gets dumped and we would like to change that.

In the event that a grower wishes to participate in this worthy cause and make a donation, here are some of the benefits.

- **The value of any donation made to Foodbank is 100% tax deductible.**
- **Foodbank can provide bins, boxes or even pallets at no cost to the grower.**
- **Foodbank can arrange transport at no cost to the grower.**
- **Making a difference to someone in need.**
- **We make sure the donor knows where their produce is going and the difference it will make.**

FOR MORE INFORMATION –

If you have time and would like to know more about us, visit our website at www.foodbank.com.au. If you have any questions about what we do or making a donation, call us on 07 3395 8422 and ask to speak to Ken McMillan the General Manager at **Foodbank Queensland**. We would love to hear from you.

Industry Information …

Photo - L-R – Senator The Hon. John Madigan – *Democratic Labor Party Senator for Victoria*, **Senator The Hon. Nigel Scullion** – *Country Liberals Senator for Northern Territory*, **John Moore** – *SAL*, **Senator The Hon. Nick Xenophon** – *Independent Senator for South Australia* and **The Hon. Bob Katter MP**.

Launch of the *Australian Manufacturing & Farming Program*

Canberra 16th August 2012

Summerfruit Australia Limited participated in launch of the Australian Manufacturing & Farming Program which involved Members of both House selecting an Industry to champion and spend time on a selected farming enterprise to experience first-hand the daily plight of Australian farmers.

The Australian Manufacturing and Farming Program was championed by **Senators Madigan** and **Xenophon** and **The Hon. Bob Katter MP** inviting **Mr Dick Smith** to give the official opening address in support of Australian business entities. A showcase of 100% wholly owned Australian Industries and Businesses was held on the lawns of Parliament House.

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An Australia Without Hunger

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TO MAKE A DONATION.

Consumer Research …

Australian Consumer Stonefruit Preferences

In recent years the Australian stonefruit industry has experienced static domestic sales coupled with long periods of over-supply, which leads to low prices. Variable fruit quality, particularly in taste and texture, and general consumer dissatisfaction have been identified in anecdotal reports as the major impediments to increased sales on both domestic and export markets. Recent market surveys and polls conducted by Summerfruit Australia have highlighted the need for a better understanding of what consumers want with respect stonefruit firmness, sugar and acid content.

This study, conducted in January 2012, aimed to establish more precisely what Australian consumers prefer with regards to sweetness, acidity and firmness in selected stonefruit varieties, with an emphasis on nectarines and peaches. Because of their extensive experience in consumer research in fruit, Plant & Food Research (NZ) were contracted to design and assist in the implementation of this study. As the project methodology was finalised it became clear that to gain useful results with the limited resources available, the study needed to concentrate on the two most popular crops: peaches and nectarines but gather some information on the other types, plums and apricots.

This approach was presented to, and discussed with the Summerfruit Industry Advisory Committee for comment and feedback. In total eight stonefruit cultivars representing the main stonefruit crops were sourced and tested (Table 1).

Table 1. *Stonefruit varieties used for sensory testing showing flesh colour, acidity, harvest date and growing location.*

Fruit type	Cultivar	Flesh colour	Acidity	Harvest date	Location
Peach	'Summer Flame 29'	Yellow	High	19/01/2012	Bunbartha, VIC
	'Snow Fire'	White	Sub-acid	27/01/2012	Bunbartha, VIC
	'Tatura 204'	Yellow	N/A	19/01/2012	Bunbartha, VIC
Nectarine	'August Fire'	Yellow	High	10/01/2012	Moulamein, N.S.W
	'Fire Sweet'	Yellow	Sub-acid	18/01/2012	Yarroweyah, VIC
	'Fire Pearl'	White	Sub-acid	10/01/2012	Ardmona, VIC
Plum	'Prime Time'	Red	N/A	07/01/2012	Moulamein, N.S.W
Apricot	'Rival'	N/A	N/A	09/01/2012	Sidmouth, TAS

Two target peaches and nectarines (high and low acid varieties) and four other fruits representing the main stonefruit crops were included. Nectarines and peaches were stored and ripened at DPI Knoxfield to provide two firmness categories (firm and soft) based on hand pressure, whilst the four other fruits were sorted into one medium firmness category. Fruit were then sorted into sweetness categories based on total soluble solids content, (TSS).

Target peach and nectarine cultivars were sorted into high and low TSS groups with medium TSS fruit discarded while the remaining four fruits were grouped on medium TSS content with the highest and lowest TSS fruit discarded. This was achieved using non-destructive near infrared spectroscopy (NIR). The non-destructive grading was completed over two days prior to the consumer testing and resulted in four categories of fruit being created for each target peach and nectarine cultivar: firm/high SSC, firm/low SSC, soft/high SSC, and soft/low SSC.

To prepare fruit for the consumer panels, the 'blush' cheek was cut from the stone and cut into three wedges. Two wedges were placed in plastic cups labelled with 3-digit numbers for presentation to consumers. The third wedge was divided into three pieces; one for accurate measurement of SSC (%) using a refractometer and assessment of juiciness (using a 4-point scale ranging from not at all juicy to extremely juicy), and the other two pieces retained for titratable

acidity measurements on bulked samples. During panels, fruit firmness was also measured by penetrometer on a sub-sample of 30 fruit within each treatment category.

Melbourne consumers (n=150) were recruited at a major shopping centre by Colmar Brunton P/L (an experienced market research company) and directed to a state of the art sensory testing facility on site at the shopping centre where they were asked to taste three sets of four fruit samples. Consumers rated each sample for liking (using a 9-point scale ranging from 1 = dislike extremely to 9 = like extremely), acceptability (yes/no) and purchase intent (using a 6-point scale ranging from definitely will not buy to definitely will buy). Consumers also completed questionnaires about their current satisfaction with the stonefruit category and their preference for flesh colour of peaches and nectarines.

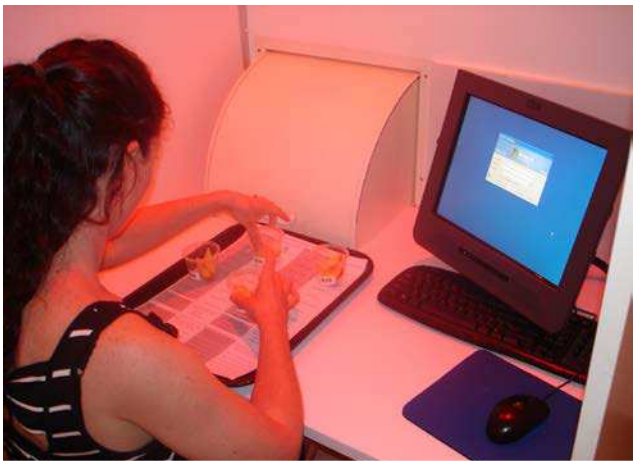


Figure 1. *Consumer tasting fruit samples in the sensory testing facility. Note red lighting to disguise colour of fruit flesh.*

Results …

Before they started tasting fruit, a brief questionnaire was presented to consumers to assess the health of the stonefruit product category. That is, how consumers view their stonefruit experience overall. Key findings were:

- Having fresh stonefruit available is extremely important to consumers.
- Current satisfaction with fresh stone fruit is moderate, with room for improvement. Specifically consumers were disappointed with variability in quality and taste from week to week.
- Over one third of consumers intend to consume more stonefruit than they normally do.
- Interest in new cultivars is high.

Taste Preferences …

The main driver of consumer liking, acceptance and purchase intent for the target peach and nectarine cultivars was fruit firmness, with consumers providing significantly higher scores for soft fruit (<2 kgf), irrespective of acid content or sweetness. Acidity in peaches had little effect on consumer scores if the fruit were soft. However, low-acid, firm nectarines achieved significantly higher consumer scores than high-acid, firm nectarines with the same sweetness.

Consumers scored sweet fruit higher than fruit from the low sweetness band and the effect of high sweetness was more evident in firm fruit.

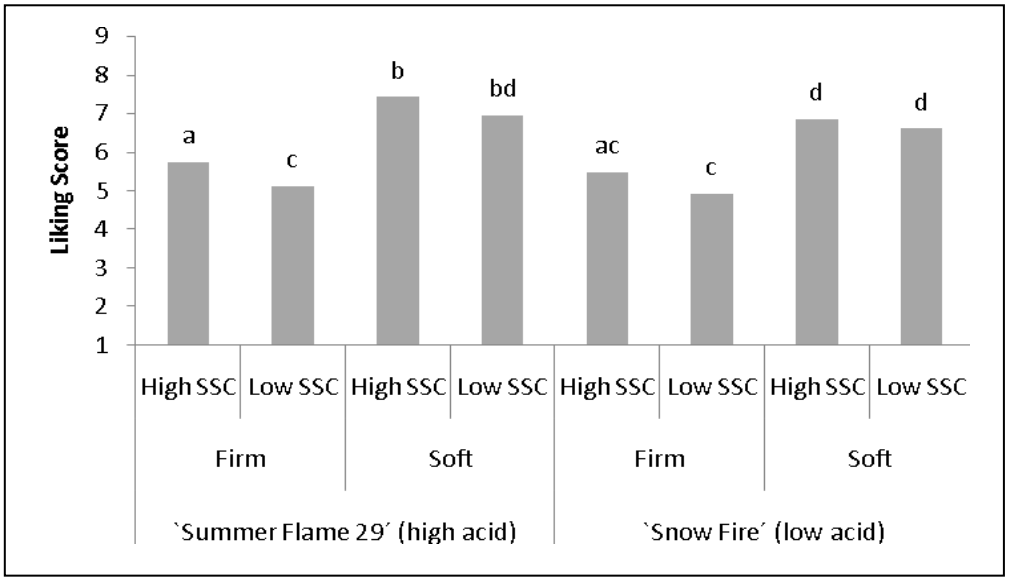


Figure 2. *Consumer liking scores for peaches (1= Dislike extremely, 9= Like extremely). Consumers tasted both high acid (Summer Flame 29) and low acid (Snow Fire) peaches, each divided into soft and firm categories. Each firmness category was again divided into high or low sweetness groups based on TSS. A score over 6 indicates the fruit was liked and would likely be purchased again. Different letters above bars indicate values are significantly different at the 5% level of probability (P=0.05).*

Consumers clearly preferred soft peaches irrespective of their acid content. However, sweetness was only considered important if fruit were high acid and firm (Fig 2).

Consumer liking scores showed a similar pattern for nectarines (Figure 3). Soft fruit were preferred over firm but there was a significant preference for high sweetness in both low and high acid soft fruit. This preference for high TSS was not seen in firm nectarines, although firm low acid fruit were better liked than firm high acid fruit.

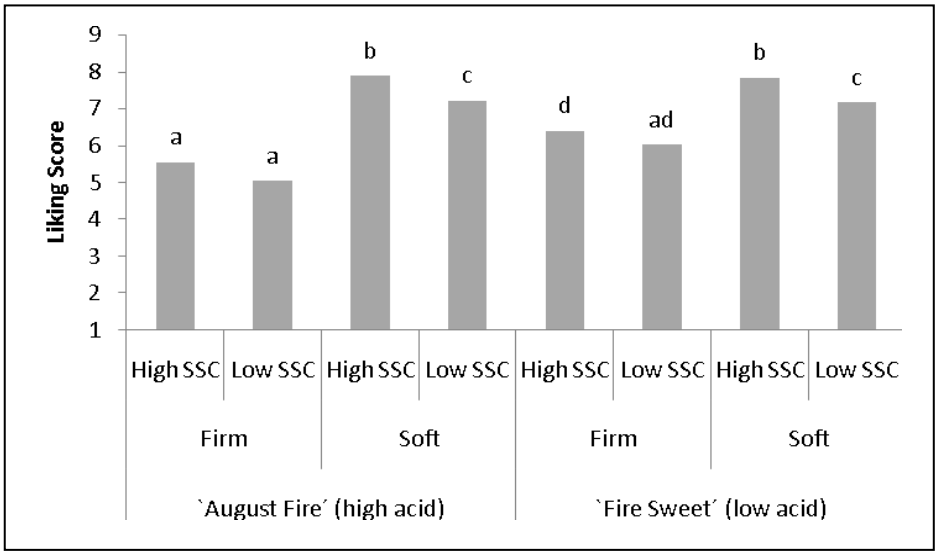


Figure 3. *Consumer liking scores for nectarines (1= Dislike extremely, 9= Like extremely). Consumers tasted both high acid (August Fire) and low acid (Fire Sweet) nectarines, each divided into soft and firm categories. Each firmness category was again divided into high or low sweetness categories based on TSS. A score over 6 indicates the fruit was liked and would likely be purchased again. Different letters above bars indicate values are significantly different at the 5% level of probability (P=0.05).*

All consumers also assessed the four additional fruit cultivars for liking (Figure 4), acceptance and purchase intent. These fruit were selected based on having average firmness and TSS. Fruit with the highest and lowest values were discarded.

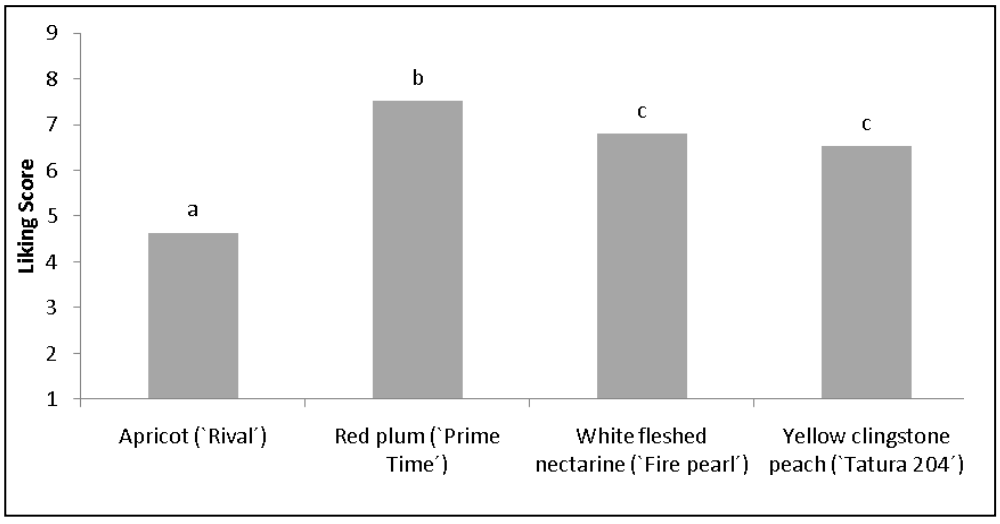


Figure 4*. Consumer liking scores for apricot cv 'Rival', plum cv 'Prime Time' white nectarine cv 'Fire Pearl' and clingstone peach cv 'Tatura 204'. Fruit were of medium firmness and sweetness. A score over 6 indicates the fruit was liked and would likely be purchased again. Different letters above bars indicate values are significantly different at the 5% level of probability (P=0.05). Apricot ('Rival') fruit were scored particularly poorly by consumers (Fig. 4).*

During the sorting process, researchers found the apricots to be mealy and dry, which was also reflected in a low juice index score (data not shown). These fruit were collected at the end of the season (Table 1) and stored for over two weeks before assessment by consumers, which in part explains the poor fruit quality.

The red plum 'Prime Time' was liked by consumers with a mean liking score greater than 7 as were the peach and nectarine with scores above 6. This indicates that peaches and nectarines with medium firmness and sweetness scores are acceptable to consumers.

In addition to taste preferences, consumers were also asked their preference for flesh colour in nectarines and peaches (Table 2). Consumers were presented with a sheet containing photographs of different flesh colours and were asked to rate these based on their past experiences. Results clearly show that Australian consumers greatly prefer yellow fleshed nectarines and peaches (Table 2), with over twice as many preferring yellow flesh in either fruit type.

It is worth noting that all fruit samples were tested by consumers under red light that prevented them from discerning flesh colour, so the results presented above were not influenced by the fruit tasted.

Table 2. *Consumer preferences for flesh colour in peaches and nectarines. Values represent the proportion of consumers (%) tested.*

Fruit type	Flesh preference	Proportion of consumer group (%)
Peach	No preference	18.0
	Yellow flesh	64.0
	White flesh	18.0
Nectarine	No preference	14.2
	Yellow flesh	58.1
	White flesh	27.7

Conclusions …

This is an important study for the Australian stonefruit industry, because it is the first of its kind to demonstrate such strong interactions between fruit firmness and consumer preferences in a properly designed scientific study. It shows that domestic consumers prefer soft yellow flesh, low-acid nectarines and soft, yellow flesh, high-acid peaches with high TSS.

However, further studies are required to confirm these findings using detailed testing of both high and low acid white and yellow flesh cultivars and to further investigate consumer preferences for plums and apricots. The preference for soft fruit with a penetrometer firmness of approximately 2 kgf or less, presents a major challenge for industry.

A comprehensive review of harvest maturity standards and cool chain management and supply chain practices through marketing and into the retail environment is warranted to identify existing practices and important gaps in our knowledge, and is being planned by DPI Victoria. This is required to ensure consumers can consistently be presented with fruit in the optimum firmness range.

It is also recommended that these preferred quality characteristics are taken into account when evaluating the suitability of new cultivars for the domestic market. In the long term, work to evaluate orchard management techniques that improve SSC content and reduce fruit variability at harvest would complement these initiatives and is now being planned by DPI Victoria at a new trial orchard at Tatura.

Figure 5. *Questionnaire presented to the consumers in the sensory laboratory when they tasted fruit.*

Part 1: How much do you like the fruit?

- Please taste the samples in the order that appears at the top of your scoring sheet (checking that the 3 digit codes on the samples match the 3 digit codes on the scoring sheet). Place each container of fruit in the position that represents how much you like its taste. After that, you can go back and re-taste each fruit. You can change the position of the containers as you progressively taste and re-taste all the fruit. Only when you are certain of your decisions, and the relative liking for all the fruit, should you mark the boxes with a tick. Please ask if you have any questions or are unsure what to do.
- Only when you have completed this first question should you proceed to answer the questions about acceptability and purchase intentions.

Part 2a: Acceptability and purchase intent

- Please go back and taste another piece of fruit from each container. Taste the samples in the order that appears at the top of your scoring sheet. After tasting each sample answer the questions on acceptability and purchase intention at the bottom of the page by ticking the appropriate boxes. Please ask if you have any questions or are unsure what to do.

1. Is the quality of the fruit acceptable or unacceptable? (Yes/No, coded 0/1).
2. Peaches/nectarines/stonefruits currently vary in price between $2.00/kg and $6.00/kg (NB: these values varied for fruit set). Would you buy a peach/nectarine/fruit again if it tasted like the fruit above and had a price of $3.00/kg (price varied for fruit set)?

The consumers responded by ticking a multiple choice answer:

- Definitely will buy (90 to 100% chance) (6)
- Probably will buy (70 to 89% chance) (5)
- Possibly will buy (50 to 69% chance) (4)
- Possibly will not buy (30 to 49% chance) (3)
- Probably will not buy (10 to 29% chance) (2)
- Definitely will not buy (0 to 9% chance) (1)

DA Meter – *a revolution in monitoring fruit quality*

By – Dario Stefanelli, Bruce Tomkins & Rod Jones

Supply of consistent quality fruit to consumers is one of the major challenges facing the Australian fresh fruit industry. An important factor affecting fruit quality is maturity and it is essential to maintain optimum maturity at every step in the chain from harvest to consumption. Despite being a major driver of fruit quality it is not easy to measure and maintain maturity at optimum levels from farm to consumer.

Fruit maturity is directly linked to most of the variables that comprise fruit quality such as total soluble solids, total acidity, flesh firmness, fruit colour and starch content. These are normally determined destructively on a sample of fruit which is not always representative of the variability of fruit batches.

There are currently only a few instruments that allow non-destructive measurements of specific fruit quality attributes such as soluble solids and flesh firmness.

Equipment that is commercially available commonly uses visible (vis) and near infrared (NIR) spectroscopy and acoustic technologies respectively. These devices can be used in the field or on packing lines, but can be expensive, relatively slow and generally require frequent, complex calibration on a large number of fruit to be useful (AFG, 2011).

Recently, a new non-destructive fruit maturity meter was developed in Italy and is being tested by DPI Victoria. The DA Meter (TR-Turoni snc, Forli, Italy; Figure 1) is an innovative instrument for non-destructively determining fruit maturity by measuring the decline in chlorophyll content immediately below the skin during ripening.

Developed and patented by **Professor Costa** and his team at the University of Bologna, Italy, the DA Meter is a portable spectrometer which can accurately monitor fruit maturity. A maturity index is developed for each fruit variety by calculating the difference in absorbance (DA) between two wavelengths (670 and 720 nm) close to the absorbance peak of chlorophyll-a (Ziosi et al. 2008, Noferini et al, 2008a) and comparing this with fruit ethylene production. The DA value is strongly correlated with ethylene production of fruit, which is an indicator that ripening has started. The DA decreases in value during ripening of the fruit, until it reaches a minimum value when fruit ripening is complete.

***Figure 1**: Image of the DA-Meter (TR-Turoni snc, Forli, Italy). Dimensions of the instrument are 16.5 x 8.0 x 5.0 cm and weights approximate 320 g.*

Each fruit species and cultivar has specific DA values according to the different phases of maturation. Consequently a set of reference indices are required for each cultivar, but once established they can be used year after year as DA values are not affected by agronomic or postharvest practices. This is a major advantage over other non-destructive technologies which require at least annual recalibration.

Pioneering research by the University of Bologna team indicated that the DA Meter exhibited great potential in the peach production chain.

In the field, it was used to establish the optimum time to harvest and in the pack house the DA value was used successfully to accurately sort fruit according to maturity (Noferini et al., 2008b). It can also be used during the cold chain to establish maturity changes over time (Costa et al., 2009, Noferini et al., 2009).

In another study, the potential of the DA Meter was assessed for segregating peaches and nectarines into consistent quality classes based on shelf life and consumer preference attributes (Gottardi et al., 2009). The DA easily separated fully red peach varieties into consistent classes which had a high correlation with ethylene production rate, postharvest ripening behaviour and consumer acceptance. Other research has shown that the DA Meter is a reliable tool for monitoring on-tree apple ripening to establish the optimum harvest time to maximise fruit storage life and quality (Noferini et al., 2008c).

A great deal of additional research is necessary to fully utilise the enormous potential of this instrument. Assigning DA values to each stage of the chain is one step required for adoption of the DA technology by the horticultural industry. Further research is required to identify the correct DA value ranges for each step.

To optimise maturity and quality during the entire fruit chain the DA Meter can be used as a tool to:

- optimise crop load and other agronomic practices to obtain a consistent, high quality crop;
- reduce the number of picks and reduce fruit variability;
- identify the optimal picking window;
- monitor and quantify maturity of stored fruit and at any specific time the shelf-life potential of the fruit;
- sort fruit according to maturity, thus guaranteeing optimal, predictable and consistent storage quality whether using normal air, CA or 1-MCP;
- increase market flexibility by being able to measure and predict suitability of fruit for supplying local, national or export markets and minimising variability in shelf life and market performance;
- enable retailers to rapidly and accurately measure fruit maturity to manage inventory thus presenting produce consistently at the required consumer preference.

Fruit maturity could become the quality parameter that allows full integration of information between practitioners at each step in the chain based on an exact reference value provided by the DA Meter. Monitoring fruit maturity using DA values along the value chain will allow the identification of best management practices at each step which will reduce losses due to variable quality and will increase efficiency and profitability.

Knowing the ideal DA value that correlates with quality preferred by consumers will permit real time correlation at each step of the chain allowing fast decisions on the future of each fruit regarding the remaining shelf life and consequently the preferred market. This will increase consumer satisfaction and return sales. Consistent, simple value chain protocols can be created and whole system models implemented to provide a high level of agility for the Australian industry and the ability to respond rapidly and strategically to market contingencies and outside pressures both locally and internationally.

The Department of Primary Industries Victoria based at Knoxfield has recently acquired a DA Meter and is testing its efficacy on stone and pome fruit varieties under Australian conditions. Close collaboration with the University of Bologna team has allowed data exchange and frequent discussion to further develop this revolutionary instrument. Currently, DA value ranges at each step of the chain for key varieties are unknown and DPI is planning research projects which will help identify them.

As a start, the DA Meter has been integrated as a standard measurement at harvest time in current and future DPI pome and stone fruit projects. Future research projects cover all steps in the value chain including fruit production, harvest, handling, storage, fruit composition and quality and consumer preferences. However, considerable industry investment and collaborative effort will be required to cover the broad range of possible fruit species and variety.

Preliminary results in Australia indicate that the DA Meter is very effective for monitoring and quantifying the effects of irrigation on 'Royal Gala' maturity at harvest (Stefanelli et al., 2012; Figure 2) as well as measuring fruit maturity at harvest to predict storage life and susceptibility to chilling injury of mid-season peach and nectarine varieties (data not published).

Full adoption of the DA-Meter will help project the current Australian horticulture supply chain into the 21st century, transforming it into a powerful value chain leading the world wide horticultural market in term of volume and quality.

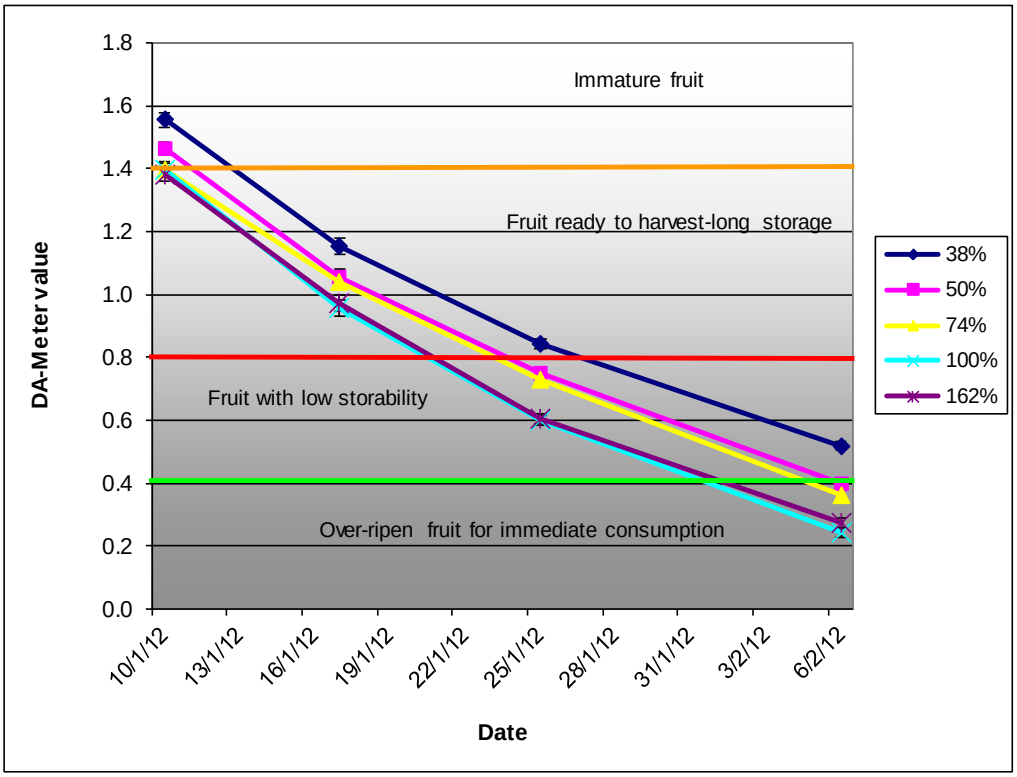


***Figure 2**. Fruit maturity (DA-Meter value) as affected by deficit irrigation (38, 50, 74, 100 and 162 % of standard grower application) for 'Royal Gala' in Goulburn Valley during 2011-12 season. Horizontal lines link DA-Meter values (obtained by correlation with fruit ethylene emission) with the corresponding fruit maturity and storability.*

Selected references for additional readings.

AFG, 2011. Fruit quality headed for Nirvana. Australian Stonefruit Grower, No 2/11 - August 2011, p.25-28

Noferini, M., Fiori, G., Ziosi, V. and Costa, G. (2008b). Indice DA, nuovo parametro non distruttivo per stabilire epoche di raccoltae qualità dei frutti. Rivista di Frutticoltura – No. 7/8

Noferini, M., Fiori, G., Cious, V., Gottardi, F., Brasina, M., Mazzini, C. and Costa, G. (2009). DA-Meter. easier control of fruit quality from farm to distribution. Journal of Fruit and Horticulture. Vol 71 (4): 74-80

Stefanelli, D., Brady, S. Cornwall, D. Goodwin, I. and Jones, R. (2012). Effect of irrigation on yield, fruit sweetness and maturity of Gala apples. Tree Fruit May 2012: 8-14.

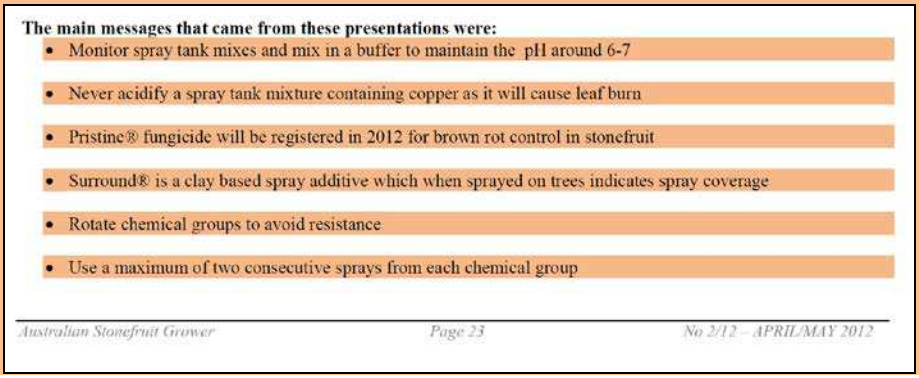
T.R. Turoni s.n.c., Via Copernico 26, 47122 Forli, Italy. http://www.trsnc.com

Ziosi, V., Noferini, M., Fiori, G., Tadiello, A., Trainotti, L., Casadoro, G. and Costa, G. (2008). A new index based on vis spectroscopy to characterise the progression of ripening in peach fruit. Postharvest Biology and Technology 49: 319-329

Blossom Blight Field Day Report - CORRECTION

In the April/May 2012 edition of the Australian Stonefruit Grower it was quoted that "Pristine would be registered in Stone fruit in 2012." (Page 23 – see below) This statement is **INCORRECT**.

***Nufarm* is currently not pursuing the registration of Pristine in Stone fruit.**



The main messages that came from these presentations were:

- Monitor spray tank mixes and mix in a buffer to maintain the pH around 6-7
- Never acidify a spray tank mixture containing copper as it will cause leaf burn
- Pristine® fungicide will be registered in 2012 for brown rot control in stonefruit
- Surround® is a clay based spray additive which when sprayed on trees indicates spray coverage
- Rotate chemical groups to avoid resistance
- Use a maximum of two consecutive sprays from each chemical group

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Phillip Wilk's Low Chill Stonefruit Seasonal Update …

August 2012 …

In southern Queensland, the mid north and north coast of NSW we have been experiencing some of the wettest conditions seen for many years. Many orchard trees in a number of different industries including macadamias, blueberry, citrus and avocado are showing signs of the disease *Phytophthora* root rot from poor soil drainage and waterlogging.

The very low sunlight hours over the last six months due to the high number of overcast days has resulted in low fruit sugar levels (Brix) in some fruit industries. The Bureau of Meteorology has been predicting that we are due for an El Nino event in the second part of this year.

On the positive side, the water table is full to capacity and stone fruit trees are now flowering and beginning to set fruit with ample soil moisture for the coming season.

Chill Accumulation …

There have been a number of cool nights this season and quite cool days which is sufficient for most low chill stone fruit varieties to flower and set fruit. Flowering in all regions of northern NSW looks even and full.

There are temperature data loggers at Bangalow just above the creek, an extremely cold spot; at Coopers Shoot orchards which is very warm, and at Alstonville which is also a warm site.

The lowest temperature in the coolest site by 30th June was -4ºC with temperatures being around zero for many nights. This low range is excellent for stone fruit chill accumulation and low day temperatures below 20º C following these nights allow the chill to accumulate.

Jobs to do in August …

- Make sure regular blossom blight sprays are applied before and after flowering
- Control of peach leaf curl needs to be done before leaves emerge from their buds
- Growth retardants to control tree size need to be applied as a basal drench
- Fruit thinning needs to be completed before stone hardening has occurred

Queensland fruit fly controls in stone fruit and ICA-21 as of July 31st …

Background

The current Lebaycid (*Fenthion*) review being conducted by The Australian Pesticides and Veterinary Medicines Authority (APVMA) is yet to be released. It was supposed to be released by August 2012 but it has been delayed.

There has been a great amount of misinformation at this time of year from growers and resellers. Growers need to be reassured that they can maintain interstate trade and market access for the 2012 season.

Current Situation

As of the week of 22nd July 2012 most low chill stone fruit growers in Qld and northern NSW are at the point of applying their usual first Lebaycid (*Fenthion)* cover spray to conform to ICA21 protocols for interstate trade.

Growers should continue with the normal ICA21 protocol which consists of 5 cover sprays of *Lebaycid* beginning 6 weeks out from the first harvest.

These sprays should be applied at 6 weeks, 4 weeks, 3 weeks, 2 weeks and one week before harvest.

If APVMA suspends the use of Fenthion before the end of the season, growers will be advised and will need to use a combination of three Trichlorfon sprays and *Spinetoram* to be able to maintain interstate trade and conform to a new ICA 21.

Phillip Wilk

NSW Department of Primary Industries – Wollongbar NSW

Products Registered for Control of Qld Fruit Fly …

Department of Primary Industries

Products registered or under permit for control of fruit flies/Queensland fruit fly in NSW Stonefruit crops: August 2012

Compiled by Sandra Hardy and Phil Wilk , NSW DPI. Source: Infopest April 2012 & AVPMA PUBCRIS database

Crop/situation	Active ingredient	Trade name®	Type of product	Withholding period (WHP)	Additional comments
Stone fruit	fenthion	Lebaycid	Cover spray	3	
	trichlorfon	Dipterex 500SL Lepidex 500	Cover spray	2	
	maldison – Permit* 12907 (Oct 2011 to May 2014)	Hy-Mal Fyfanon 440EW Fyfanon 1000EC	Cover spray	3	Only 3 applications per season allowed, with a minimum of 3 days between sprays. The sensitivity of this treatment to some crops has not been fully evaluated – treat only small areas if uncertain about phytotoxicity.
	chlorpyrifos	Lorsban 750WG	Bait spray	14	+ yeast hydrolysate
	maldison – Permit* 5896 (Jan 2007 – Match 2017) *Permit applies only to certified organic farms	Hy-Mal	Impregnated fibreboard blocks	Not required when used as directed	+ yeast autolysate
	spinetoram – Permit* 12590 (Oct 2011 to May 2014)	Delegate	Ground suppression spray	3	Gives suppression only - should be used with other control methods. For ground use only. Only 4 applications per season allowed with a minimum of 14 days between sprays.
Fruit	fipronil	Amulet Cue-lure	Bait stations	Not required when used as directed	Not a stand alone treatment -should be used with other control methods.
	spinosad	Naturalure	Band/spot spray	Not required when used as directed	
Fruit Trees	maldison	Hy-Mal Fyfanon 1000EC	Bait spray	3	+ yeast autosylate or yeast products such as Pinnacle and Natflav
	trichlorfon	Dipterex 500	Bait spray	2	+ yeast autosylate
	hydroxyphenyl butanone acetate	Dakpot Q-fly lure Fruit fly attractant Fly Bye	Trap for monitoring male fruit flies	Not required when used as directed	

**You must obtain a copy of any Permit before you use it. Copies can be found on the APVMA website at http://www.apvma.gov.au/permits/search.php*

Always read the label: Users of agricultural (or veterinary) chemical products must always read the label and any Permit before using the product, and strictly comply with the directions on the label and the conditions of any Permit. Users are not absolved from compliance with the directions on the label or the conditions of the Permit by reason of any statement made or not made in this publication.

Research …

HAL Project # SF 12003:
Establishing a Summerfruit Production Management Trial Orchard

The first Summerfruit Industry/DPI planning meeting for the production management orchard was held at DPI Tatura on Wednesday, June 27. In order to understand how orchard management affects taste (sweetness), yield, quality and uniformity this long term project will conduct controlled trials on the physiological factors known to affect these parameters – specifically canopy management, irrigation and rootstock selection.

A dedicated series of field plots will be established, in the form of a field laboratory at DPI Tatura. Initially, trials will use a yellow nectarine and a yellow peach as model crops, plums and apricots may be added in the future subject to additional funding.

The project has been funded by the industry levy and HAL for up to 5 years, but it is anticipated that trials will extend for at least 10 years. An industry steering committee is being formed to help design and manage the orchard. John Moore, CEO Summerfruit Australia and industry reps are being appointed.

For further information please contact Dr Dario Stefanelli, DPI Knoxfield or Dr Mark OConnell, DPI Tatura.

Summerfruit AUSTRALIA

Industry Information …

The Carbon Price and YOU . . .

Australia now has a price on carbon emissions. While some people expect the carbon price to be removed after the next Federal election, the reality is that the coalition will find it very difficult to reverse the legislation and it will probably take a few years to do anyway.

Now, fruit growers need to come to terms with the carbon price and figure out how to minimise the negative impacts. In this article, I will give a brief summary of how it works, what its effects are likely to be, are how you might be able to minimise any negative effects.

What is it?

The carbon price is the key component of the Commonwealth Government's *Clean Energy Future* policy. The *Emissions Trading Scheme* (ETS) that forms the basis of the carbon price is based on a cap-and-trade model. While it is commonly referred to as a "carbon tax", it is really a charge on greenhouse gas pollution. The same policy approach has been adopted in many other countries (e.g. the European Union, New Zealand and South Korea) because it is believed to provide the cheapest and most flexible method to reduce emissions while sustaining economic growth.

Greenhouse gases

The carbon price targets emissions of greenhouse gases from industrial activities. Carbon dioxide (CO_2) is only one of the greenhouse gases (GHG) addressed by the carbon price scheme. Other common GHGs include methane (CH_4) and nitrous oxide (N_2O). While there are multiple greenhouse gases, the term "carbon" is conventionally used as shorthand for "greenhouse gas" within the context of climate change policies.

Each GHG has a different *global warming potential* (GWP) which describes the strength of its effect on atmospheric temperatures compared to CO_2. The effect is expressed in units called carbon dioxide equivalents (CO_2-e).

How does it work?

Each year, a limit or cap is set on the allowable level of emissions. Businesses included in the scheme will have to purchase permits for each tonne of CO_2-e they emit.

The carbon price mechanism only directly involves energy generation, industrial processes, waste, fugitive emissions (mining) and some transport areas. Businesses within these sectors that emit more than 25,000 tonnes of carbon per year will be required to take part in the emissions trading scheme. It is expected that about 250 businesses will be required to buy and sell permits in 2012-13.

Agriculture is not included in the scheme and no agricultural businesses are required to pay a direct carbon price by purchasing permits.

The scheme will start out with a three year period with a fixed price and no cap. This temporary fixed price period is designed to provide an easy transition to carbon pricing and is also why scheme is mistakenly called a tax. Each tonne of CO_2-e emitted will cost $23 in the first year, rising at 5 per cent (2.5 per cent price increase and 2.5 per cent inflation) per year.

At the end of the fixed price phase, the scheme will transition to a conventional flexible price emissions trading scheme where the cap on emissions will determine the supply of permits while the market will determine demand and price. The Government will set the emissions caps on the advice of an independent *Climate Change Authority*. Caps will be set several years in advance to provide a degree of predictability and certainty to business.

Assistance for horticultural producers

The *Clean Energy Future* package includes a number of compensation packages and assistance measures. While most of these are directed towards households or to those industries directly affected by the carbon price, a few may be of assistance to some horticultural businesses.

- An increase in the instant asset write-off threshold to $6,500 to increase the capacity of small businesses to invest in new equipment or technology
- A support package for communities and regions strongly affected by the carbon price
- Support for research and development of low emission practices and technologies that can be applied on farms
- A number of programs to encourage energy efficiency by supporting investment or providing information on minimising energy costs
- The *Carbon Farming Initiative*, an agricultural offset scheme.

Impacts of the carbon price for fruit and vegetable growers

While no farm businesses are required to pay a direct carbon price by purchasing permits in the emissions trading scheme, the carbon price will cause the price of many important farm inputs to increase. It is possible to estimate the effect of the carbon price on most farm inputs based on the energy intensity of the product. For example, the starting price of $23 per tonne of carbon dioxide equivalent is expected to result in the following cost increases:

Input	Change in costs
Fuel	Fuel for on-farm use will not be affected by the carbon price
Freight	Road freight cost will not be affected until July 2014* when it will increase by approx. 1.1%
Fertiliser	Increase by approx. 0.54%
Chemicals	Increase by approx. 0.54%
Electricity	Increase by approx. 9.8%
Packaging	Increase by approx. 1.5%

* Liquid fuels are treated differently – an effective carbon price will be applied to some sectors via a reduction in the fuel tax credit rate. However, the rate will remain unchanged for on-farm use in the agriculture sector.

Impacts on farm profit

Growcom recently completed an analysis of the impacts of the carbon price on fruit and vegetable growers (funded by Horticulture Australia Limited). This project included economic modelling of six case study farms to examine how the carbon price will flow through the supply chain and affect profitability.

This analysis found that the carbon price will increase input costs of these farms by between about $5,000 and $42,000 per year, which equates to between 0.3 and 0.8% of gross farm income. Given the typically low profit margins of most fruit and vegetable farms, these cost increases represent a significant reduction in farm profits.

As expected, the biggest impact on fruit and vegetable farms will result from the increased cost of electricity (about 10%). Of course, electricity prices will actually increase by considerably more than that because of other factors in addition to the carbon price.

As a result, the best opportunity to reduce the impact of the carbon price will be through improvements in on-farm energy efficiency. There are many measures that can be used to increase energy efficiency and lower the overall electricity needs. Simple measures, such as minimising unnecessary consumption and waste, can save money. More complex measures, such as improving the efficiency of refrigeration or irrigation systems, may require significant effort and capital investment.

Other steps revolve around changing or refining processes. Can you minimise the time produce stays on farm post-harvest, minimising the refrigeration required? Can you reduce the amount of on-farm processing? Can you streamline processes to minimise running time?

And of course, on-farm renewable energy systems can reduce consumption of grid electricity and you may be able to sell excess power back to the grid.

While you're tackling on-farm efficiency and cost reductions, Growcom will continue to argue for the Government to provide more effective compensation and assistance to combat the cost increases.

More information

Department of Climate Change and Energy Efficiency
http://www.climatechange.gov.au/

Department of Agriculture Fisheries and Forestry
http://www.daff.gov.au/climatechange

Horticulture Australia Limited
http://www.horticulture.com.au/areas_of_Investment/Environment/Climate/climate_home.asp

The Author

Dave Putland is the Policy Manager and Climate Program Coordinator at Growcom, the peak body for production horticulture in Queensland. *Reproduced with Appreciation*

New tools and management practices for the integrated control of brown rot …

Industry and researchers tackle the brown rot problem

Control of brown rot of stone fruit is becoming increasingly unsustainable with the exclusive use of fungicides especially during wet growing seasons. Project MT08039 (2008-2011) began addressing this issue by developing an infection risk predictive tool (wetness and temperature-based model) to improve the time of application of fungicides, particularly post-infection treatments prone to resistance development, and thus management of blossom blight and brown rot. The project also developed a simple assessment method to determine shortly before harvest the risk of fruit rots, from latent infections after harvest. In addition, it investigated *Monilinia* sensitivity to key fungicides used by growers, when fruit (peach and nectarine) is most susceptible to infection and the effect of carphophilus beetle on brown rot incidence to help industry develop better strategies for the integrated control of brown rot.

This article summarises project outcomes and other aspects of brown rot epidemiology and management, with an emphasis on disease forecasting, to provide orchardists with suggestions on how to improve control of brown rot. The search for sustainable management practices is planned to continue during a new project (2012-2015) developed jointly by industry and researchers.

The new research will enhance the predictive ability of both disease risk prediction tools and fast-track their adoption by evaluating them in commercial trials in key fruit growing regions of Australia. Enhanced prediction will be achieved by incorporating vital orchard information including potential disease carry over and host susceptibility into an overall estimate of infection risk to help industry improve decision making on fungicide use and management of brown rot. Other tools to be evaluated include new low-risk fungicides and alternative controls as well as different spray programs aided by disease forecasting.

Photos *– Blossom and shoot blight (top) and brown rot (bottom)*

Understand the disease cycle

Blossom blight and brown rot

Brown rot is a disease that causes significant damage to stone fruits during wet seasons. Early infection appears as blossom blight or twig canker and later infections as fruit rots especially on ripening fruit on the tree and in storage.

At least four species of *Monilinia* (*M. fructicola, M. fructigena, M. laxa and M. polystroma*) can cause brown rot of stone fruit, but only *M. fructicola* and *M. laxa* are known to occur in Australia.

In orchards in Victoria, *M. fructicola* was found to be the main *Monilinia* species causing yield losses pre and postharvest on fresh market peaches, nectarines and plums and canning peaches and plums. *M. fructigena* and *M. laxa* have been the main species causing brown rot in Europe, but *M. fructicola* has been recently detected in some countries

in Europe. *M. fructigena* does not occur in Australia. Although *M. fructicola* is now present in Europe, this species is still a market access barrier for Australian stone fruit exports to Europe.

The brown rot disease cycle starts with flower infection (blossom blight), leading to twig infection, which provides additional inoculum for green and ripe fruit infections throughout the season. Controlling infections on blossoms and twigs is therefore important because they provide additional inoculum sources for fruit infections. Severe blossom infection occurs when overwintering inoculum is high and prolonged wet weather occurs. Blossom blight can reduce fruit set by killing blossom. Shoot blight can also occur under similar conditions. The disease is most severe when warm and wet conditions occur close to harvest during fruit ripening.

The Australian industry has relied on fungicide applications during bloom, fruit development and postharvest, in combination with low temperature storage, for brown rot control. Despite these practices, yield losses still occur both in the field and postharvest, especially during recent wet growing seasons. This highlights the need for an integrated approach that includes sanitation measures to reduce disease carry over and infection risk prediction for scheduling preventive and post-infection fungicide applications for controlling this disease. Other beneficial orchard practices are discussed below.

Key control strategies

After harvest	Winter	Bud-swell	Blossom	Mid-season	Harvest
Remove unharvested and fallen fruit	Prune out infected twigs	Monitor blossom blight		Monitor brown rot	
	Remove mummies from trees	Monitor wet events (infection periods) conducive for spore infection			
		Protective spray program			
		Use infection period, host susceptibility and block history information to guide protective spraying and application of post-infection sprays			
				Remove infected fruit	
				Control pests (i.e. Carphopilus beetle) which spread disease	
					Assess postharvest rot risk prior to harvest

Reduce inoculum carry-over

Spores (conidia) produced in mummified infected fruit and on infected twigs (cankers) are believed to be the only overwintering source of inoculum for primary infections in Australia. The sexual stage of the fungus (ascospores) has not been reported as a major source of primary inoculum in Australia. Infected mummified fruit and twigs produce conidia more abundantly when conditions are warm and moist. Conidia are then dispersed from mummies on the ground or in trees by wind currents or spread from cankers within trees by rain splashing.

The amount of disease carry over can be reduced by removing fruit mummies and pruning out cankers before spring. However, these measures do not completely prevent brown rot disease and growers are still dependent on the application of fungicides for controlling blossom blight and fruit infections throughout the season. Good management of brown rot therefore involves integrating orchard sanitation practices with well-timed applications of fungicides for more effective disease control.

Know when your crop is susceptible

Knowing when the fruit is most susceptible to *Monilinia* spp. infection is also key for improving the time of fungicide applications. Overseas, peach fruit has been reported to be highly susceptible to *M. fructicola* infection for several weeks after the end of bloom and again 2-3 weeks before harvest, but less susceptible following pit hardening. Apricots and peaches were reported to have similar stages of susceptibility to *M. laxa*, with green fruit at the pit hardening stage being the least susceptible to infection.

Inoculations using detached fruit and high levels of *M. fructicola* inoculum at optimal temperatures for infection have confirmed that peach (Figure 1) and nectarine fruit are highly susceptible to *M. fructicola* for approximately 50 days after bloom and 2-3 weeks before harvesting and least susceptible at the pit hardening stage. These findings are supported by the orchard study that indicated which unprotected infection periods contributed most to fruit rot. However, more detailed information on the susceptibility of the different stone fruit types under variable *M. fructicola* and *M. laxa* inoculum levels and infection conditions is required to optimise fungicide use in orchards.

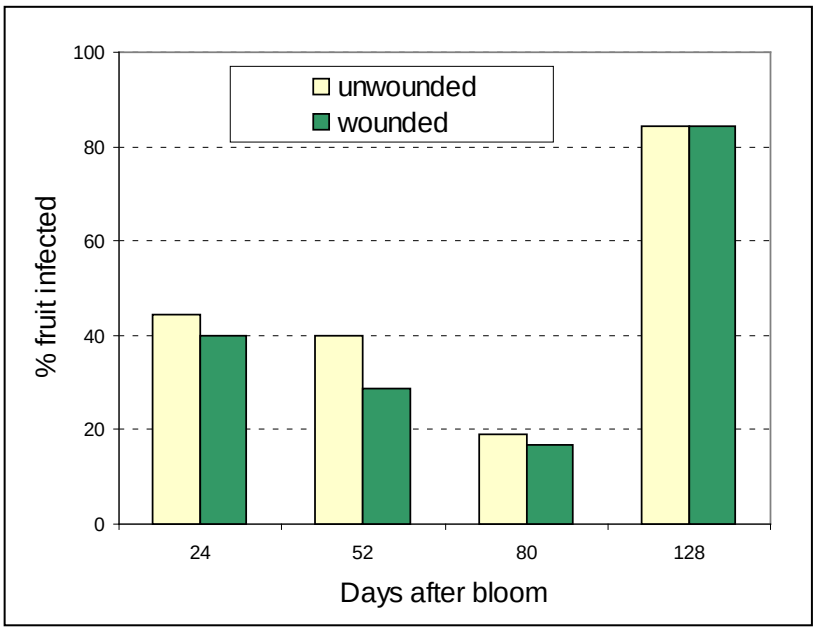

Figure 1. *Detached peach fruit susceptibility to M. fructicola infection.*

Quick facts about pathogen survival and host susceptibility

After harvest	Winter	Bud-swell	Blossom	Mid-season	Pre-Harvest
Rotten fruit a source of inoculum for next season, especially later maturing varieties	Fungus survives in mummified fruit and infected twigs	Spores infect blossom Infected flowers and twigs provide more inoculum for fruit infections		Developing fruit highly susceptible but less susceptible at pit hardening stage Infection can stay dormant in green fruit	Susceptibility increases again as fruit ripens

Photos *– Monilinia spores and twig infected (top) and infected fruit mummies (bottom)*

New tools help manage brown rot

Predicting infection risk

Monilinia spp. spores require surface moisture at a suitable range of temperatures to germinate and infect susceptible tissue. The monitoring of leaf wetness and temperature is therefore key to determine wet events (infection periods) conducive to blossom blight and brown rot infection when host tissue is susceptible. Monitoring infection periods allows more efficient use of post-infection (curative) treatments to support a preventive (protectant) spray program.

The Australian Bureau of Meteorology provides district-wide brown rot warnings based on forecast temperature and rainfall in some fruit-growing regions of Australia. While these warnings can be very useful to schedule protectant fungicides, forecast leaf wetness conditions do not always eventuate and sprays may be applied unnecessarily. Weather data collected at the location/orchard level is therefore more desirable for determining infection periods to aid fungicide spraying. This was investigated by project MT08039 in an orchard study conducted over several seasons in southern Australia.

The study used low-cost weather stations to collect weather data and leaf wetness and temperature thresholds described by peach brown rot model (Table 1) to estimate infection periods. The benefit of using infection periods information to guide fungicide application was determined. Brown rot control was most effective in blocks where trees were protected with fungicide treatments during all infection periods occurring during the periods of bloom and 3-4 weeks before harvest (HAL Report MT08039). Control tended to be more effective in blocks with fewer unprotected infection

periods through the post bloom (e.g. 50 days after bloom) and pit-hardening periods. In general, growers found infection period warnings useful to improve the timing of post-infection spraying, taking into account residual activity of previously applied fungicides, and for monitoring application of protectants.

Table 1. *Infection risk index based on temperature and wetness duration thresholds for brown rot infection*

Infection risk level	Disease Index[1]	Blossom blight [2]	Brown rot
Marginal	90-120	Weather and orchard history should be used to determine level of control measures	Use weather, orchard history and fruit susceptibility to determine level of control measures needed
Light	121-150		
Moderate	151-180		
Severe	>180		

[1] Disease index (Tate et al., 1995) is the product of temperature x hrs of wetness; for example susceptible fruit need to be wet for 6 hrs at an average 20°C for spores to cause infection. The severity of infection increases with increasing wetness at suitable temperatures for pathogen development.

[2] Flower infection (blossom blight) may occur at lower disease indexes (i.e.. 46-90) but this requires verification under Australian conditions.

Photos *– Weather station and leaf wetness sensor*

Predicting post-harvest rot potential

The brown rot fungus also has a latent symptomless infection phase which is the cause of fruit rots after harvest. Fruit rots are expressed only after the fruit reach the necessary stage of ripeness, usually after harvest during storage and distribution. Consequently, the risk of postharvest fruit rot can be determined prior to harvest using methods which accelerate fruit ripening and senescence.

Project MT08039 found that a simple incubation test conducted shortly before harvest whereby fruit are incubated at room temperature in a plastic bag induced rots within 7 days enabling an estimate of postharvest rot potential (Figure 2). The method is a simple, reliable and inexpensive tool for determining latent infections in ripening plum, nectarine and peach fruit, with sufficient time to determine storage potential, and safe distribution conditions.

The incubation technique currently requires a 120 fruit sample for each block, but with further development and validation it is expected that lower numbers of fruit will be required. The prediction of fruit rot potential can be enhanced by integrating other relevant information such as block history, spray diary and Carpophilus beetle trapping data.

The incubation test can also help determine the need for postharvest fungicide treatment and assist the more orderly marketing of high risk fruit. The overall aim of postharvest rot management is to avoid fruit injuries, remove pathogen inoculum from the surface by sanitation, inhibit the pathogen in infections that may occur at harvest and protect the fruit from infections during postharvest handling, and distribution.

The fact that brown rot is often evident after postharvest treatments shows that fungicides are not completely eliminating either superficial spores or latent infections. In addition to efficacy issues, some resistance has been detected in two of the three fungicide groups used for postharvest treatment (dicarboximide and DMI).

This combined with the scrutiny of fungicide residues in domestic and export markets means they need to be used judiciously and integrated with cultural controls such as sanitation for best effect. Several research groups worldwide are investigating new fungicides and alternative controls for postharvest use.

Photo *– Latent infection detected on peaches using incubation test*

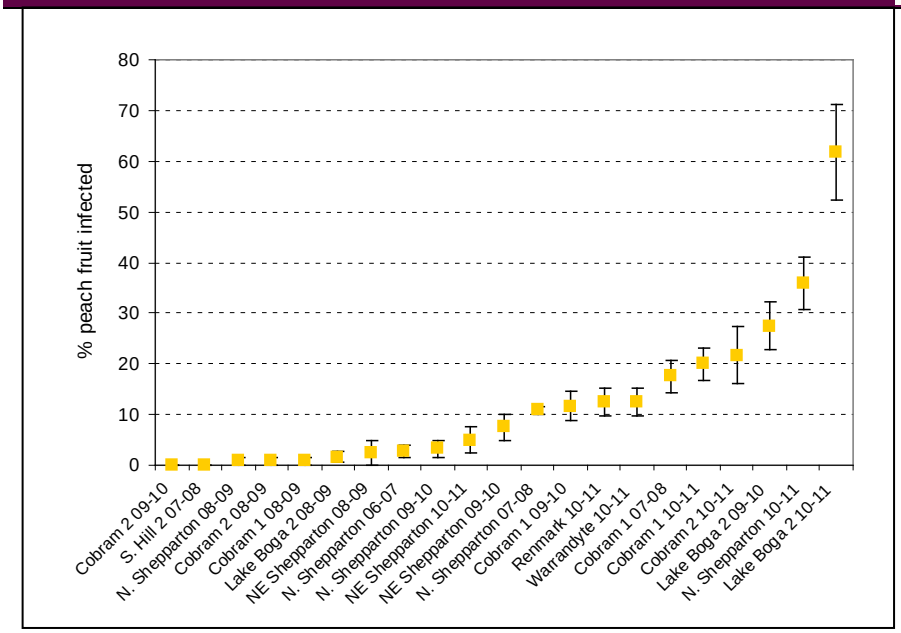

Figure 2. *Postharvest rot potential determined in fruit batches after 7 days after incubation at 20°C.*

Chemical control still the key component of IPM

The stone fruit industry has relied on fungicides applied during bloom and fruit development for managing brown rot. However, yield losses still occur despite intensive application of fungicides.

Examination of grower's spray programs from several orchards indicates that failures to control brown rot are due in part to leaving trees unprotected during wet events (infection periods) when nectarine and peach crops are highly susceptible to *M. fructicola* infection.

The time of application of both protectant and post-infection fungicides can be greatly improved by using infection period warnings in combination with information on other factors that influence infection risk such as crop susceptibility. There are other reasons which could be affecting fungicide efficacy; these include poor application (e.g. coverage), loss of fungicide sensitivity and reduced persistence (e.g. wash-off during heavy rain), type of spray program (e.i. calendar *vs.* mixture protectants and curatives), and spray intervals especially during protracted wet periods when trees are growing fast under high inoculum levels.

The effect of heavy and frequent rain on fungicide persistence may explain poor control achieved in recent wet seasons where spray diary information indicated fungicide were applied during all important infection periods. All these issues highlight the importance of proper selection of fungicide and spray intervals according to the level of infection risk and the intensity of rain.

Worldwide, many fungicides are available for brown rot control, but few are highly effective against brown rot in the field. Some of the most efficacious fungicides belong to the demethylation inhibitors (DMIs), dicarboximide, anilinopyrimidines, and the quinone outside inhibitors (QoIs) fungicide activity groups.

In Australia, only a very limited number of fungicides with good systemic (eradicant) activity against *Monilinia* spp. are currently registered for brown rot control (http://services.apvma.gov.au/PubcrisWebClient/welcome.do). Propiconazole (DMI) and iprodione (dicarboximide) are systemic fungicides which have been used intensively in stonefruit orchards for many years. They also have some protectant activity, and iprodione can also be used postharvest.

The anilinopyrimidines cyprodinil and pyrimethanil have been successfully used to control brown rot in California but are reported to underperform in moist and warm climates of south-eastern United States. They have been shown to have both protective and curative properties. Going on overseas experience, the Australian industry could benefit from an increased arsenal of good systemic fungicides with curative activity. These ideally should be highly effective against blossom blight and brown rot, but less toxic to beneficials and able to be used close to harvest when the fruit is most susceptible to infection.

Resistance management is vital

Another factor that may influence the efficacy of fungicides is the presence of *Monilinia* spp. strains resistant to fungicides used in stone fruit orchards. Field resistance in fungal pathogens can build up slowly over time (quantitative resistance) as was the case with DMI fungicides and the apple scab pathogen. Field resistance can also develop within a few years of market introduction, as was the case for the benzimidazoles (i.e. benlate) leading to complete resistance (qualitative resistance). Benomyl-tolerant isolates of *M. fructicola* were identified as early as 1976 from a stone-fruit orchard in New South Wales, very soon after its introduction.

Overseas, strains of *Monilinia* spp. resistant to the dicarboximides (i.e. iprodione) the DMIs (propiconazole and fenbuconazole), MBC (eg thiophanate-methyl), the QoI (e.g. strobilurins) and SDHIs have already been reported. This raises serious concern about the sustainability of fungicides, prone to resistance development currently used for brown rot management in Australia, where very little work has been done to monitor resistance.

A recent *in vitro* study (Project MT08039) provided some insights into the sensitivity of *M. fructicola* isolates from stone fruit orchards in Victoria to propiconazole, iprodione, the MBC thiabendazole and the new fungicide fludioxonil. As expected, all *Monilinia* isolates were sensitive to low concentrations of fludioxonil, a product mostly used as a post-harvest treatment in the USA. However, some Victorian isolates were tolerant to high concentrations of iprodione and thiabendazole, with an isolate found to be highly resistant to thiabendazole, a fungicide no longer registered for stone fruit.

New cost-effective tools are required to assess *Monilinia* spp. sensitivity to fungicides at the orchard level to help growers improve selection of fungicides. In the meantime, to minimise the risk of resistance development it is important to follow recommended fungicide resistance management strategies (http://www.croplifeaustralia.org.au).

In regions of the world where fungicide resistance in brown rot and other pathogens is a problem, the aim of anti-resistance measures is to slow the build up of resistant strains and to control resistant strains using other fungicide groups. In some of these regions, brown rot management programs that use protectants with QoIs, DMIs, and dicarboxamides when needed is the preferred approach to control brown rot while maintaining pathogen sensitivity to each of the three site-specific fungicide groups.

***Photo** – An isolate of M. fructicola growing on media amended with different concentration of propioconazole*

Avoid Carpophilus damage

In southern Australia, *Carpophilus* spp. are major pests of stone fruit including cherries. Economic losses of up to 30% have been reported at harvest due to direct consequence of Carpophilus damage. Carpophilus beetles have also been implicated as vectors of *M. fructicola* spores. Anecdotal evidence suggests that controlling Carpophilus reduces the brown rot incidence in fruit. However, little work has been published to demonstrate the link between beetle populations with disease risk.

Project MT08039 has demonstrated that Carpophilus beetle populations can be lowered using the attract-and-kill (A&K) system which in turn reduced the incidence of brown rot. However the A&K system can only be effective if the Carpophilus population is at a medium to low level and it may take more than three seasons of trap deployment to achieve a low beetle population. More research is needed to better understand the relationship between Carpophilus population and brown rot spread and severity to guide a more rational control of both problems.

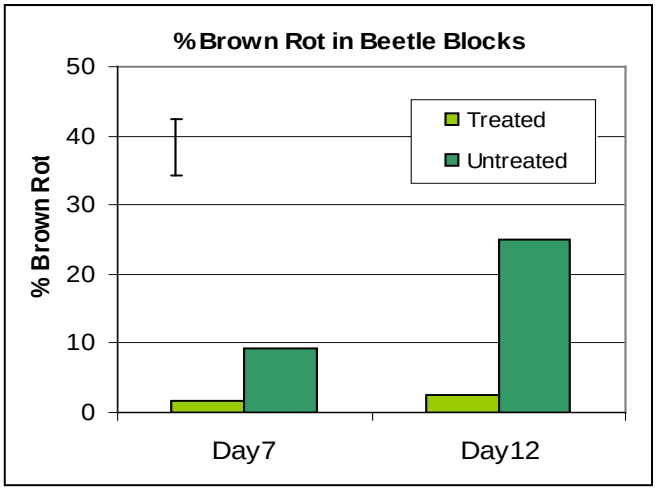

***Figure 3.** Brown rot levels 7 and 12 days after harvest in blocks treated with and without the attract-and-kill (A&K) system for Carphopilus beetles.*

Bottom line: integrated control the key

- Chemical control is still a key component of IPM, however, because the brown rot pathogen is adapted to infect stone fruit throughout the season, it is best managed using an integrated approach that includes sanitation measures and infection risk prediction for scheduling preventive and post-infection fungicide applications.
- The monitoring of infection periods is a key element of infection risk prediction and best management practices to ensure systemic post-infection treatments are only used when necessary, minimising the risk of resistance development.
- Fungicides with curative and some protectant activity should be used if possible preventively to stop spores from infecting susceptible tissue. This is because applying such fungicides to suppress established fungal infections increases the risk of resistance development.
- It must be remembered that fungicides are only tools and in reality what affects the success of brown control with fungicides depends on orchard inoculum levels, spray timing in relation to stage of crop susceptibility, fungicide mode of action, the spray strategy, and then everything else.
- In the absence of information on sensitivity of *Monilinia* spp. populations to site-specific fungicide groups prone to resistance development such as the DMIs, fungicide resistance management strategies should be used to ensure the efficacy of site-specific fungicides is not lost through resistance.
- The prediction of infection risk can be greatly enhanced by integrating information on orchard factors that influence infection risk such as inoculum potential, stages of crop susceptibility and Carpophilus beetles trapping data in addition to knowledge of disease cycles and fungicide efficacy.
- The integrated approach should also include assessing rot potential at harvest and practices which minimise postharvest losses due to fruit rots.

References and more information

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Summerfruit AUSTRALIA

NEW WAYS TO FIGHT FRUIT FLY!

Readers of this newsletter are no doubt well aware of the continuing challenge of finding ways to control Queensland fruit fly. Last season saw an unprecedented number of outbreaks of this pest, even in areas which are normally fruit fly free. Detections are still occurring within the fruit fly exclusion zone at a time of year when cold temperatures would normally kill off the summer intruders.

At the same time, growers have lost access to a critical tool in controlling the pest – dimethoate insecticide. The APVMA has suspended both postharvest and pre-harvest use of dimethoate on many fruit crops, including summerfruit and cherries.

While pre-harvest application of fenthion is currently permitted for control of Qfly, this insecticide is also being reviewed by APVMA. It appears likely that some or even all uses will be withdrawn within the next few months.

That leaves trichlorfon. Like dimethoate and fenthion, trichlorfon is an organophosphate insecticide. However, it is possibly less effective and it too may have a limited future due to suspected effects on human health.

New methods of controlling fruit flies are therefore needed urgently. While quarantine treatments to access fruit fly free markets are obviously important, unless we can find ways to produce fruit which is maggot-free they won't be required.

During the 2011 – 2012 growing season we conducted some initial trials at the NSW DPI orchard in Bathurst testing the use of kaolin clays and spray oils. Both products are already used to control other insect pests. There is now good evidence from overseas that these products can also repel fruit flies, although why this is so is not yet clear.

The orchard contains peaches, several varieties of apples, and pears. The pears were not fruiting in 2011 but were sprayed anyway as "buffer" trees. Kaolin clay (Surround®) and mineral spray oil (Caltex *n*C24) were applied to randomised blocks of trees using a tractor drawn airblast spray rig. We aimed to apply the sprays 3 times during the weeks leading up to harvest.

Author with a peach covered in spray oil

We undoubtedly chose the worst possible season for the trials. Torrential rain was followed by flooding, severe winds demolished part of the hail netting and brown rot turned plump peaches to slop within days of picking. Moreover, the conditions caused the peaches to ripen early, so they were only treated once before harvest.

Despite this, both spray oil and kaolin clay significantly reduced infestation by Qfly. The best results were for apples with kaolin clay. Kaolin reduced the number of sting marks on apples from an average of 4.6 to 0.4 per fruit, a decrease of 92%. Moreover, no actual Qfly larvae were found in any of the kaolin treated apples.

Unfortunately kaolin failed to protect the peaches, possibly because of the poor coverage provided by a single spray application. However, the oil was more effective, reducing the number of Qfly larvae recovered from harvested fruit by 63%.

While these improvements might not seem exciting, the atrocious conditions during the trial combined with high infestation rates meant we had had little hope that the treatments would have any effect. It seems likely that dryer weather combined with more frequent and thorough application of both kaolin and oil would have increased their effectiveness.

Further work is needed to determine the most effective way to use these products. We also need to examine the impacts on fruit quality and, in the case of kaolin, the best way to remove the product postharvest. Kaolin can certainly be washed off apples and should be removable from nectarines and plums, although fuzzy peaches could be problematic. We hope to start to answer these questions in the coming season.

Neither of these treatments is likely to provide the simple, cheap and effective control of Qfly offered by dimethoate. Kaolin or spray oil would most likely need to be used in addition to baits, traps and / or visual barriers, each being part of a Qfly management system. However, in a chemical-constrained world, where "magic bullets" are fast disappearing, this may be the best option we have!

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Picking tub full of peaches with kaolin

Industry Information …

Do you use agricultural chemicals available under a minor use permit for horticulture?

Have you had an adverse experience with products for uses covered by a minor use permit?

An adverse experience is an unintended or unexpected effect on plants, plant products, animals, human beings or the environment, including injury, sensitivity reactions or lack of efficacy associated with the use of an agricultural chemical product(s) when used according to label (or permit) directions.

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You can view the permits available for your horticultural industry at the following Australian Pesticides & Veterinary Medicines Authority (APVMA) website: http://www.apvma.gov.au/permits/search.php .

If you believe you have had an adverse experience following use under a minor use permit for one of the above horticultural industries, please email pds@agaware.com.au for an *adverse experience report form* and return it to the same email address. This information will be forwarded onto the APVMA.

This mechanism will assist the APVMA to receive and consider horticultural industry feedback on adverse experiences relating to the use of agricultural chemicals under minor use permits. This information may also assist in making informed decisions on the suitability of pesticides for the future needs of your horticultural industry.

Further details about the APVMAs Adverse Experience Reporting Program for Agricultural Chemicals may be found at: www.apvma.gov.au

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