

G Australian Stonefruit Grower



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**Using a Mexican
peach for breeding
new cultivars in Australia**

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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Welcome...

to the new-look Australian Stonefruit Grower



We, your editorial team at Applied Horticultural Research, are delighted to bring you this refreshed edition of your magazine. We hope to engage and delight, bringing you stories of the latest science, market insights, industry news and the issues that can or will affect your business.

This is a time of great change for stonefruit growers. The loss of chemistry to control fruit fly, falling market returns, a changing environment and the ongoing battle with postharvest diseases have certainly taken their toll, with significant numbers of growers leaving the industry.

However, there are still good news stories and even, for some, light at the end of the irrigation pipe.

The Queen Garnet plum is surely the biggest news in fruit breeding since the Pink Lady apple! The public interest in this new variety has been nothing short of staggering, with demand outstripping supply several times over.

”

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”

In this issue we discuss some of the science behind what the Queen Garnet has to offer, and how the variety is tracking so far.

We also look at some of the latest research on fruit fly. Researchers from the University of Queensland have been investigating a new trap, with some promising results, while we also feature the start of a series on useful tools for Area Wide Management.

Other research in Queensland has been working on new cultivars, including using genes from a Mexican

peach. It may not yell ‘Hola!’, but it does have the unusual characteristic of being completely white, inside and out.

And finally, thanks to Col Scotney, for the many years of dedicated service he has given to the industry, including production of the previous incarnation of this journal.

We hope you enjoy this new issue.

-Jenny Ekman



Summerfruit CEO's Report

Export progress

In my last report I talked about opening up of export markets. Well, nothing moves quickly in the world of biosecurity, but progress is being made. Last month I attended meetings in China, Thailand, Vietnam, The Philippines and India. Some of these markets are open already, others are, at least, moving in the right direction.

Aussie Week in China

The second-ever Australia Week took place in China on April 11-15. This was a major event led by Minister for Trade and Investment Steve Ciobo. More than 1,000 Australian delegates attended, around 380 of whom were part of the Food and Beverage Group.

The week included trade seminars, site visits, product showcasing and valuable opportunities for networking with Chinese business, industry and government leaders. The final event in Shanghai hosted 2,000 Australian and Chinese delegates, including PM Malcolm Turnbull, and Lucy Turnbull.

Inspectors' visit

In December and January we hosted two important Chinese delegations. The first were inspectors from AQSIQ. (AQSIQ - the General Administration of Quality Supervision, Inspection and Quarantine - is a ministerial-level department under the State Council of the People's Republic of China that is in charge of national quality, metrology, entry-exit commodity inspection, entry-exit health quarantine, entry-exit animal and plant quarantine, import-export food safety, certification and accreditation, standardisation, as well as administrative law enforcement. AQSIQ directly administers provincial Entry-Exit Inspection and Quarantine Bureaus and Bureaus of Quality and Technical Supervision.)

AQSIQ inspectors spent nearly two weeks randomly auditing selected farms in Sunraysia (Swan Hill, Victoria), the Riverland in South Australia and Cobram (Greater Shepparton Region, Victoria). They wanted to see evidence of how growers were managing pests and diseases.

In South Australia they inspected the operation of a Pest Free Area for fruit flies which included a visit to the Loxton Research Station in South Australia to find out more about the fruit-fly monitoring and surveillance program. They had a demonstration of how the exclusion zone is operated at the Yamba fruit-fly control point (between Renmark South Australia and Mildura Victoria on the Sturt Highway).

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CEO's Report



Now! in Season Australia delegates, local fruit importers and major retailers, Australian Ambassador to the Philippines Amanda Gorely (front, centre) and John Moore (far right). Photo: Mark Alvarez; courtesy Australian Embassy Manila/DFAT

The inspectors were very impressed with the South Australian program and found no new pests of concern at any of the orchards they visited. In general, they appeared to be very pleased, and indeed, satisfied, with how the Australian stonefruit industry is managing pests and diseases. So, another step forward in the quest for access perhaps.

The second delegation was more interested in how we grow stonefruit. They wanted to see infrastructure, trellising, orchard design, varieties, and so on. They are keen to see how we do things, and take those messages home for their own growers.

As counter-seasonal producers, there are excellent opportunities for us to collaborate with Chinese researchers, sharing germplasm and even a joint breeding program. The Northwest Agriculture and Forestry University in Yangling, located at the heart of China in

“As counter-seasonal producers, there are excellent opportunities for us to collaborate with Chinese researchers, sharing germplasm and even a joint breeding program”

Shaanxi Province, is one such potential collaborator. Professor Han Mingyu, chief scientist for pomology and stonefruit breeding at that university, visited Australia early in 2015, and is keen to work with us.

Breeding programs are time and labour-consuming; working with Professor Han could help us bring new varieties to market sooner.

Now! in Season promotion

Also in April the “Now! in Season” promotion to several Asian countries got under way. This was organised across the industry by the Victorian State Government, together with HIA Ltd.

It is a multi-industry, multi-country promotion of Australian fresh produce, with representatives from the citrus, table grape, cherry, vegetable, apple and pear, and, of course, summerfruit industries.

CEO's Report

The aim is to promote Australian produce to retailers, meet various national regulators, and to ensure that our products are being displayed to maximise their worth. Consumer tastings and promotion are part of the program, which is helping introduce the increasing middle class in Manila and Bangkok to clean, green, high-quality Australian fruit.

India – The tiger in waiting

Finally, Mumbai. It is often said that there are more millionaires in India than in the USA. There is also a rapidly growing middle class, all potential consumers of Australian stonefruit.

Unlike China, Australian stonefruit already has access to India. There are strong indications of increased demand for our fruit, with a delegation due in Australia during June/July this year. They are particularly interested in sourcing fruit for the Indian hotel and high-end retail markets.

India wants to work with us on new varieties, new cropping systems, and advancing both our industries generally.

This is a market that has the potential to be a major importer for our fruit. It's worth a serious look. Contact me (see page 5), if you want to know more.

Workshops for Producers / Exporters

Like last year, IPM monitoring program workshops for potential exporters are planned for Swan Hill and Cobram. One workshop will be held in each location. Dates for your diary are:

- **Swan Hill – Wednesday 15th June**
- **Cobram – Thursday 16th June**

As previously, these workshops will be run by the DoAWR (Department of Agriculture and Water Resources) and the Victorian Department, in collaboration with Summerfruit Australia.

SAL/SEDA will be sending out information on these workshops shortly to those who have previously registered

” There are more millionaires in India than in the USA. There is also a rapidly growing middle class, all potential consumers of Australian stonefruit. ”

(2015-2016) as potential exporters of stonefruit to China. While this can be a once-only workshop for those simply considering export, they are not one-off events but annual updates that growers and third parties need to attend every year.

If you are planning to export to China, or involved as a third party, then attending this workshop is mandatory in advance of a later audit inspection by DoAWR.

Funding package

Summerfruit has been successful in winning a Package Assisting Small Exporters (PASE) grant of \$220,000 (inc. GST).

The funds will be used to bring together a “How-to export” manual for stonefruit growers. This will include information on logistics, registration, documentation, checklists, import requirements and so on. The manual will include specifications and procedures needed to access both interstate and international markets.

Through the project we will also develop an online registration system for orchard block identification, with up-to-date information on importing country maximum residue limits (MRLs) and live pest and disease records from orchard monitoring.

To help growers implement this program the project will develop a chemical and regulatory awareness program for exporters. An authority on this issue, Kevin Bodnaruk, will be helping us with this task.

One of the real side-benefits of this grant is that it will help us to rebuild the Summerfruit Australia website so as to provide confidential grower access through a password portal. Once we have this option, it will be much easier to make research reports and other industry documents easily available to levy payers.

This is clearly well overdue, and will be a major benefit for stonefruit growers.

- John Moore

Chairman's Report

the PFA to be re-established, with government support, they have also realised that they need to take control of their own destiny.

The good news is – it seems to be working.

The region has the advantage of a certain amount of geographic isolation, being surrounded by dry areas with few alternative fruit fly hosts. Also, the community has got totally behind the effort – there may not be a trap in every backyard, but there are certainly a lot out there!

There has also been an extensive program of baiting. Baiting needs to be done regularly as it only really targets young flies. In Swan Hill, baiting has proven effective as part of an overall Area Wide Management (AWM) program. Read the article [insert anchored internal link to the article] on AWM in this issue.

Sterile flies

Of course, Sunraysia's isolation from external populations also makes it a perfect candidate for use of the sterile insect technique (SIT).

If the SIT Plus program now underway in South Australia delivers to expectation, it has the potential to be a really valuable tool in our AWM systems. One of the key objectives is to develop a production method that results in male flies only.

This would address one of the key concerns with the current system, where both male and female flies are released. Sterile female flies still sting the fruit – even if they can't lay viable eggs. This can cause visible marks on some fruit and increase disease.

”
This season we packed something like 4 million plums, all produced in areas where sterile flies were released. We saw no sting damage at all, despite intense releases of large numbers of flies.
“

We have been involved in smaller scale SIT trials over the last couple of years. This season we packed something like 4 million plums, all produced in areas where sterile flies were released. We saw no sting damage at all, despite intense releases of large numbers of flies. Even on nectarines we couldn't really see sting damage.

So, perhaps the bigger issue with using SIT is cost. It is not only the cost of the flies themselves, but the labour involved in doing the pupal releases and monitoring the results.

We shall wait with interest on the outcomes of the SIT Plus project. Hopefully, it will bring real benefits for stonefruit growers, at least for those in isolated production areas. Perhaps the future is not so grim after all.

And the next few months...

I am sure many growers are concerned about water allocations right now. Things are obviously not as bad as during the millennial drought, but we still need some good rains this winter to top up storages. It is part of the increasing climate variability which certainly seems to be a world-wide phenomenon.

Without some good inflows we are looking at higher costs for water. With fruit prices the way they have been, there is not that much money about in the industry.

The Bureau has been predicting the end of El Niño and above average rainfall for some parts of Australia at least. Let's hope they are right.

- Andrew Finlay



Low Chill Australia President's Report



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Despite harvest-time rains last season, let's look on the bright side – more effective weapons against fruit fly and new exciting varieties of stonefruit are in the pipeline.

Good news on fruit fly

Warming trends

The weather is still a bit upside-down in the low chill areas. We had a warm, dry winter that continued into spring. So warm in fact that some of the older varieties such as Tropic Beauty didn't get enough cold to have a proper dormancy – they are low chill, but not no chill.

At least, that's why we think crops were down for some of these varieties. Despite the low volumes early in the season, prices were the same or worse than last year. And then of course some of the high chill fruit came on a bit early. This may be why fruit sizes that were perfectly fine in 2014 got binned instead.

Rain generally seems to come when you least want it, and sure enough rain came right during harvest. Fruit filled out and were full of juice, but perhaps a bit lacking in flavour.

Fruit fly management – latest

With the end of fenthion on 31 October last year, our industry is sailing into uncharted waters in terms of fruit fly management.

Only 3 to 4 years ago many of us thought that without cover sprays for fruit fly our industry was finished. The good news is that ? this summer just gone at least ? things went pretty well.

We have learned a lot in the past few years, and I think many of us are becoming more confident that we can find ways to manage this pest.

One of the great helps has been the "Tell it like it is" session that we have at the AGM each year. This is an opportunity for growers to talk about their production problems, and learn from the experiences of others.

We now understand that fruit fly management doesn't stop during autumn and winter, and that we need to use all the tools available, including monitoring, baits and MAT. There seem to be some new chemicals that might help, and of course the search for better traps and the elusive female lure continue, see article in this issue.

It is good to see HIA investing strongly in fruit fly management, across all industries. Although sterile insect releases (SIT) are unlikely to be a practical control method in endemic, highly diverse areas such as North Coast NSW, we are hopeful that the major SITPlus project is going come up with some useful information for us as well.

For example, how high does a fruit fly fly? Is there a difference between black and white netting? What about visual barriers? This is the sort of information we need, and can incorporate into our control strategies.

President's Report

New varieties for niche markets

The low chill industry has invested a lot of money over the years into new varieties, and now it really is starting to pay off.

For example, Bruce Topp's work using the white Mexican peach, which is featured in this issue.

However, that is just one of the lines he has been working with. We now have new varieties of low chill yellow flesh nectarines and peaches ready to go. The names Q32-59 and Q113-21 may not sound glamorous, but these are terrific varieties with melting flesh, good yields, and great flavour.

There is also a non-melting flesh peach with virtually no fuzz (Isn't that a nectarine? – Ed). It is a large fruit that develops really attractive skin colour. It's not commercial yet, but available for large-scale testing.

Then there are a number of novelty varieties. These include a nectarine-apricot hybrid Bruce calls a "nectacot". It has typical apricot skin colour with very little blush, but

is extremely sweet with flavour more like a nectarine and good storability. There is a donut style nectarine and a peach that's pure white, inside and out.

We are always hearing about how consumers want something new, different and unusual. Products like these are what keep our customers excited about stonefruit. More than that, they're willing to pay good money for niche products such as these.

However, no grower can launch a new product alone. We need volume to supply, and consistency over time, even if our target is independent retailers rather than the major supermarkets.

This breeding program was funded using industry money, and the proceeds of plant sales go back into the program. So, buying new varieties will keep these exciting new cultivars coming, help our industry grow as a whole, and potentially provide good returns to the investor. What you might call a win-win!

- Mark Napper



Flat peach. Photo: Ross Stuhmcke



Q217 Peach. Photo: Bruce Topp



Nectacot. Photo: Ross Stuhmcke



Q113-21 Peach. Photo: Bruce Topp



Q32-59 Nectarine. Photo: Bruce Topp



Q223 Nectarine. Photo: Bruce Topp

Queen garnet plum. Photo: Alison Alexander
Seasonal Pursuits



The plum whose time has come

By Jack Rozycki

A recent ABC *Landline* program reported on a new plum variety being bred in Queensland which has created a stampede by savvy consumers. The Queen Garnet plum has been shown to have astronomically high levels of antioxidants.

Why are antioxidants important? Antioxidants are a red-hot item in the marketplace right now, with the interest spiking in fighting obesity and healthy eating.

Antioxidants occur most frequently in fruits and vegetables. They can mop up molecules called free radicals that damage our cells. Such damage has been shown to lead to cancer and heart disease.

Free radicals are essentially molecules that are unstable with a “free” or unpaired electrons, making them liable to migrate to other molecules and stick them, damaging and inflaming cells. On artery walls the action of free radicals have been associated with unstable plaque.

Coronary artery plaque is particularly dangerous when it is unstable and “unsticks” itself from the artery wall and starts to float around in the bloodstream. That can lead to clots and thus heart attacks and strokes. Also research

has shown that in the formation of unstable plaque inflammation is a major culprit.

It turns out that the Queen Garnet plum is not only full of antioxidants, this superfood plum is also full of anthocyanins.

Anthocyanins are health-giving compounds (polyphenols) that provide certain fruits and vegetables berries with deep red and purple colours.

It appears that anthocyanins in particular have very strong anti-inflammatory properties.

Furthermore, as luck would have it, for those trying to lose weight they enhance glucose metabolism and reduce glucose absorption.

Many overweight people desperately trying to lose weight find it fiendishly hard to do so, even though they drastically reduce food intake and even exercise like mad.

News

But the problem is that the body cannot access the fat for fuel stored in fat cells because of continued insulin production. (Insulin prevents the release of fat from the fat cells). Without using up the fat stored in the body it is impossible to lose weight.

The main problem seems to be a dysfunction of the glucose absorption process, with the body demanding more and more sugar or carbs, much of which is turned immediately into more fat.

This is why some people are always hungry – the body’s demand for sugar and carbohydrates is constant.

Landline revealed that a controlled trial using obese rats, some of which were fed the Queen Garnet plum extract lost weight at an amazing rate. [See here.](#)

” The Queen Garnet plum now has a justly deserved reputation as a superfood and the demand for it so enormous that Nutrafruit, the company with the commercialisation rights, has been flooded with inquiries from around the globe... ”

The Queen Garnet now has a justly deserved reputation as a superfood and the demand for it is so enormous among consumers that Nutrafruit, the company with the commercialisation rights, has been flooded with inquiries from around the globe as well as here at home in Australia.

(Indeed, consumer demand has even created a counterfeit plum industry with unlicensed growers selling fake plums!)

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

[See more here.](#)

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Summerfruit exports up

Trade is booming as overseas consumers lap up Aussie summerfruit, reports **Wayne Prowse** of Fresh intelligence Consulting.

Australian summerfruit exports have increased 14% in the season to February 2016 (86% of 2015/16 season) achieving 12,188 tonnes worth \$41.4 million.

Overall, unit values were 10% higher at \$3.40 per kg compared to the same period last year, Wayne Prowse reports.

Trade to Hong Kong accounted for 47.5% of the trade to date and Middle East markets accounted for 28% of trade to date. Significant increases off low bases are seen in other markets such as Malaysia, Indonesia and India.

Peaches & Nectarines accounted for 68% of the trade and increased 11%(see Table 2). Apricots increased 20% for their season, mostly to Middle East markets. Plums are 27% higher to-date.

February export results were 32% higher than February last year and recorded the highest month of trade since February 2003 when Taiwan trade was more than 2,500 tonnes.

Table 1 : Summerfruit Key Measures

EXPORTS	YTD	Chg LY
Volume (tonnes)	12,188	14%
Value (M AUD)	41.41	26%
\$ per kg	\$3.40	10%

Source: World Trade Atlas; Fresh Intelligence analysis

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

EXPORTS	Tonnes	Share	Change
Peach & Nectarine	8,325	68%	11%
Plums	3,269	27%	21%
Apricots	594	5%	20%
TOTAL	12,188	100%	14%

Source: World Trade Atlas; Fresh Intelligence analysis

The Nieve for innovation

Using a Mexican peach for breeding new cultivars in Australia

By Bruce Topp, Dougal Russell and Edward Howell

A low-chill peach-breeding program in Queensland is seeking to use a range of parents to meet new and challenging consumer demands.

White petals and green wood of the Nieve fruit tree indicate lack of anthocyanin production.

Photo: Bruce Topp

Feature

The Tropic Beauty peach is the industry standard and has been used extensively as a parent in the early generations of our breeding.

More recently, non-melting parents have been incorporated, including UFSun and UFRoyal from the University of Florida and a number of selections from Brazil.

Increasing the diversity of our base-breeding population allows incorporation of new traits in future cultivar development. This article describes the introduction, evaluation and use of Nieve, a Mexican landrace peach.

Origin and characteristics of Nieve peach

Landrace peaches have been grown in Mexico for centuries. The conquistador Pedro de Alvarado is reported to have carried peach seeds into the Central American highlands in 1524. Since that time, peaches were cultivated by planting and replanting orchards from seed, with each new orchard planted using the seed from the best trees. Over generations, these landraces of peach developed distinct varietal characteristics that were favoured by the local consumers and were adapted to the region.

Nieve was selected from a seedling population that was grown at San Juan del Rio, Queretero, Mexico, at an elevation of 2,100m, with a mean temperature of the coldest month at 12.7° (corresponding to about 340 CU).

The Nieve landrace develops low to medium-chill, semi-dwarfing trees that produce large, white flesh peaches with high flavour and aroma.

The Nieve has distinctive white petals. The one-year old wood also lacks any red pigment and so stands out from our regular selections whose wood turns red on the sun-exposed side.

It appears that the Nieve germplasm has a mutation that blocks anthocyanin production throughout the plant. This lack of red pigment may be a useful trait in the fruit where red streaks through the flesh or around the stone are undesirable.

We imported 100 seed of open pollinated (OP) Nieve via the Australian Quarantine and Inspection Service. The resulting seedlings were planted at Nambour which has a mean coldest monthly temperature of 15°C (corresponding to 200 CU).

Performance of budded selection Q311-29

The Nieve OP family first fruited in 2011 when the seedlings were two years old. The Q311-29 was selected because it was the earliest ripening seedling and had very sweet fruit. It was harvested on 22 November, 2011 and produced a light crop with white skin, and white, non-melting flesh. The fruit were round with a slight tip, small (58g), sweet (TSS 20%), low-acid, clingstone, moderately dry and had an acceptable level of

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DOUGAL RUSSELL is a senior experimental scientist with the Queensland Department of Primary Industries and Fisheries.

EDWARD HOWELL is a field trial horticulturalist at QAAFI, University of Queensland.



The Q311-29 peach selected at Nambour from Nieve OP seedling family. The fruit and tree lack red colour development. Photo: Bruce Topp

Feature



Note the high syyleptic shoot development on a Nieve selection (at left) compared to Tropic Beauty (at right).

Photos: Bruce Topp

fuzz (see picture). The fruit did not develop any off-flavours after two weeks of cold storage.

There was a complete lack of anthocyanin development in any part of the plant, including the fruit, flowers and branches. This corresponds to the white flower phenotype previously reported as controlled by a single recessive allele symbolised as *w*. This differs from the highlighter phenotype also a single recessive allele (*h*), which is characterised by lack of red in the skin, flesh and around the stone at fruit maturity but with red on the branches and petals. The highlighter phenotype can develop some red as the fruit becomes over-mature. In this regard the white flower phenotype may be more useful in producing non-red peach cultivars in that the red does not develop under any conditions.

As a budded tree on Okinawa rootstock, Q311-29 had a distinctly different tree growth habit to the standard Tropic Beauty. The trees were bushier due to higher syyleptic shoot development (immediate branching from each node on the main stem), with Q311-29 having 115% more syyleptic shoots (see picture). Tropic Beauty shoots grew nearly a third faster than Q311-29. The leaves of Q311-29 were smaller than those of Tropic Beauty. So Tropic Beauty

produced fewer but faster growing shoots than the Nieve selection. The slower growth rate of the Nieve selection is a desirable trait but the increased branching would be an added cost requiring increased pruning.

The influence of this type of tree architecture on light penetration and subsequent fruit quality may be investigated further.

Seedling Nieve OP family compared to local families

Nieve seedlings were smaller, had higher chilling requirement and lighter crops than the local seedlings. Small trees are desirable in subtropical peach locations because excess tree vigour requires costly control with the use of growth regulators and regular pruning.

The desirable fruit traits in the Nieve family were the high TSS, firm, non-melting flesh, and the all-white appearance. These traits would be useful in our breeding in that they may allow the production of cultivars which produce visually distinctive fruit that consumers associate with a pleasant, sweet flavour.

However, the Nieve family has the undesirable fruit traits of late ripening, long FDP, small, pointed fruit, dry

Feature

flesh and high fuzz. This means that several years of selection are required to develop acceptable cultivars.

However, the heritability of many of these traits is moderate to high and so reasonable progress is possible. We have started on this process and in 2014 planted the first generation of hybrids of Nieve, with short FDP and low-chilling parents.

In 2015 we selected two elite seedlings which are now being used as parents to recover the all-white fruit characteristics.

In Mexico, Nieve has been crossed with cultivars from the US: Arkansas, California; Brazil, Spain (Valencia); Korea and Canada, resulting in the

Acknowledgement

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production of selections in the range of 250 to 450CU with non-melting flesh and TSS of 18–20%.

Nieve has also been reported to have some tolerance to leaf rust. The complete lack of red, and the firm flesh, high TSS, with tree health and small tree size are valuable traits that we will attempt to incorporate into our breeding populations.

*Any grower who would like to obtain information on our low-chill selections or on the breeding program should contact **Bruce Topp** at the Maroochy*

Research Facility, phone 07 54535973 or email b.topp@uq.edu.au



Local peach seedling population in the foreground followed by the Nieve seedling population. Note the smaller tree height and denser foliage of the Nieve. Photo: Bruce Topp

Ripe for the enterprise

How a new non-destructive fruit maturity meter could help growers deliver higher quality fruit

By Dr Dario Stefanelli

A tool to simply, quickly and easily determine the maturity of fruit before it's packed and sent will enhance profitability and marketability by ensuring customer satisfaction.



Dario Stefanelli with the meter. Photo: DEDJTR

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Variable quality in pome and stone fruit has been identified as a major impediment to producer profitability and sales in both domestic and export markets.

Supply of consistent quality fruit to consumers is one of the major challenges facing the Australian fresh fruit industry. Fruit maturity is linked – but at the same time not directly correlated – to most of the variables that comprise fruit quality such as sweetness, 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 within and between fruit batches.

Recently, a new non-destructive fruit maturity index meter was developed in Italy and is being tested by the Department of Economic Development, Jobs, Transport & Resources (DEDJTR Victoria). The DA-Meter from the Italian company T.R.

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 at harvest
- Identify and predict the optimal picking window
- Monitor and quantify maturity of stored fruit and determine 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, Controlled Atmosphere or ethylene blockers (i.e. 1-MCP)
- Increase market flexibility by measuring and predicting 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.

” 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. ”



The DA meter can be used to track how fruit are developing and maturing on the tree. Photo: DEDJTR

Turoni 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. As the level of chlorophyll gradually decreases, the level of ethylene produced by the fruit increases and this relationship provides an indication of the fruit maturity.

The maturity index (IAD) decreases in value during ripening of the fruit, until it reaches a minimum value when fruit ripening is complete. Each fruit species and cultivar has a specific relationship between the IAD value and fruit maturity.

Consequently, a set of reference indices are required for each cultivar, but once established they can be used year after year as IAD 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. Currently, IAD value ranges at each step of the chain for key cultivars are unknown and DEDJTR, in collaboration with pome and stone fruit industries, is

Research

undergoing research projects that will help identify them (SF12003, SF13001, SF15001, AP15013).

Fruit maturity could now 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 IAD values along the supply chain will allow the identification of best management practices at each step that would reduce losses due to variable quality and should increase efficiency and profitability.

Knowing the ideal IAD 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. This will increase consumer satisfaction and return sales. Currently, DEDJTR is undergoing a series of consumer evaluation testing on pears and stone fruits in Indonesia (Jakarta) and Thailand (Bangkok).

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 DA-Meter has been in use as a research instrument on both stone and pome fruit at DEDJTR for almost five years. Close collaboration with the University of Bologna team (which has developed the IAD technology) has allowed researchers and data exchange and frequent discussion to further develop this revolutionary instrument.

Studies are currently being undertaken at DEDJTR to



Dario Stefanelli says experiments on stone fruit have shown remarkably positive results. Photo: DEDJTR

Monitoring fruit maturity using IAD values along the supply chain will allow the identification of best management practices at each step

explore aroma development in fruit. The aim is understand the consumer odour perception of intact fruit (in shelf) and fruit pulp (at first bite).

PhD student Christine Frisina is examining the relationship between aroma volatiles and fruit maturity (through the IAD) on intact fruit. A complementary study by Alessandro Ceccarelli, an international PhD student from Bologna hosted by DEDJTR, is exploring the development of aroma volatiles in the pulp of peach and pear fruit during ripening in the field as well as the effect of cold storage on pulp aroma.

Most of DEDJTR experiments on stone fruit have shown remarkably positive results both in pre- and post-harvest. Last season, DEDJTR was able to develop a grower protocol for collection

of ethylene samples in the field, greatly reducing the costs of establishing cultivar-specific reference indexes. The relatively easy to follow steps of the protocol will be released to the industry shortly.

Full adoption of the DA-Meter will help propel the current Australian horticulture supply chain into the 21st century, transforming it into a powerful value chain leading the worldwide horticultural market in terms of volume and quality. The DA-Meter can be obtained in Australia through Summerfruit Australia Limited, which is the official importer.

Acknowledgement

This project has been funded by Horticulture Innovation Australia using the summerfruit industry levy and funds from the Australian Government.

Total crop loss in parts of the USA

Source: *Harvard News*

USA stonefruit is just about to reach Australian shelves. Exports to Australia are almost entirely from California, where stonefruit, cherries and apples are grown on an industrial scale. But elsewhere-disaster.

In much of northeastern USA, stonefruit growers will be sitting twiddling their thumbs this season.

This summer, from Wisconsin to New York State and as far south as Delaware, most trees will be sitting bare and fruitless.

Warm weather at the beginning of February caused the trees to break dormancy early. Unfortunately, this false spring ended on Valentine's Day, when temperatures plummeted as low as -17°C , killing the developing buds.

While most damage occurred on that February weekend, some growers were still hoping for a light crop at the start of March. However, any remaining buds were finished off when temperatures dropped again, hitting -6°C on 4 April.

According to Harvard Press, the situation is much the same throughout the northwestern USA, with frost damage reported as far south as South Carolina.

Fruit from the northeast normally ripens during July–August. In contrast, Californian orchards can start picking during May. While this season's projections are looking good for California, it will be interesting to see what happens to prices – and therefore, indirectly, exports to Australia – as the northern summer progresses.



Frank Carlson, from Carlson Orchards examines peach tree buds (top) and the brown centre inside this peach bud shows where freezing temperatures have killed the king blossom (right).

Photos by L. Aciukewicz, *Harvard Press*



Ladd traps – a visual trap for male and female fruit fly

Previous editions of this magazine have discussed one of the holy grails of fruit fly research: the elusive female lure.

By Dr Jenny Ekman

Lures in existing traps include a synthetic chemical (kairomone) as an attractant, together with an insecticide. Medfly is attracted to trimedlure, Queensland fruit fly (Qfly) responds to cue-lure, and a number of other *Bactrocera* species are attracted to methyl eugenol. Unfortunately, all of these lures only attract male flies – whereas we are more interested in the females.

There are traps for female flies, but these often use wet, food-based lures. Not only do these catch a lot of other, non-target insects, but need to be cleared out regularly to avoid them turning into a smelly, decaying

mess. Attempting to identify half-decomposed flies is both difficult and unpleasant.

Traps are mainly used for monitoring the numbers of flies in an orchard, particularly during fruiting. However, the number of male flies found in a trap is not necessarily an accurate predictor of the total population. Females searching for suitable host fruit may be more likely to enter the orchard from surrounding areas.

Another study by the Queensland University of Technology group involved simply watching flies within a nectarine orchard. The results suggested that there were at

What is a Ladd trap?

While a Ladd trap wouldn't look out of place on a Red Nose Day, it is also an effective visual trap for a number of fruit fly species.

Ladd traps are used to manage the apple maggot fly *Rhagoletis pomonella* in the USA. The trap is basically a yellow panel with a red sphere in the centre. Both are coated with sticky material, and baited with apple volatiles. It is thought that this is attractive because the yellow mimics "super" foliage, while the red sphere + aroma mimics a ripe apple.

The trap has been shown to be attractive to other fruit flies as well, particularly the Oriental fruit fly *Bactrocera dorsalis*. As a close relative of our own Qfly, this suggested it would be worth trialling the trap in Australian orchards, even without the addition of a volatile fruit aroma.

least four females present for every three males, possibly even more.

Using MAT (male annihilation technique) in the orchard adds a further complication. MAT uses cue-lure to attract and kill male Qfly. Using the same tool to both control and monitor reduces the value of any information from the traps. It also makes it difficult to argue a case with regulators with regard to area freedom or low pest prevalence.

Australian trials

Mark Schutze and his team at the Queensland University of Technology (QUT) have tested various versions of the Ladd trap in field cages as well as out in the Queensland Department of Agriculture and Fisheries nectarine orchard in Redland Bay.

The first field cage trial compared the standard Ladd trap to a yellow panel only, or a red sphere only. The Ladd trap caught significantly more flies than the other versions. This confirms that the yellow and red together are key to the unit's attractiveness.

A second field cage trial compared the three-dimensional Ladd trap to a two-dimensional version with

the red circle simply painted onto a yellow board, as well as an all-red Ladd trap and one with a red panel only. Again, the standard Ladd trap caught the most flies, although in this case it was not significantly different to the 2D version. As previously, the single colour units were less attractive.

Having confirmed that both ball and board were important, the researchers moved into the orchard.

Ladd traps with red, blue, black or yellow spheres were hung in the nectarine orchard for two weeks in November,



¹Ero MM, Hamacek E, Clarke AR. 2011. Foraging behaviours of *Diachasmimorpha kraussi* and its host *Bactrocera tryoni* in a nectarine orchard. *Aust. J. Entomol.* 50:234-240.

Research

2013 and October, 2014. The result was more than 1,000 trapped Qfly in the first year, and 488 the following year.

The traps captured significantly more female flies than males. However, in the field cage trials the numbers of each sex were similar. This supports the previous observation that there are actually more female than male flies present in the orchard.

While there are a number of potential explanations for this result, it suggests that female flies may fly in from other areas in search of suitable hosts. Males, on the other hand, have less reason to travel.

Many studies have found that most Qfly travel only a relatively short distance during their lifespan. For example, one study found that 98% of flies were trapped within 500m of the original release point. However, these results have been based on catches of male flies using cue-lure, not females searching for a fruit in which to lay eggs.

Unfortunately for stonefruit growers, this appears to confirm that female fruit flies that want to lay eggs really do like ripening nectarines!

” The traps captured significantly more female flies than males. However, in the field cage trials the numbers of each sex were similar. This supports the previous observation that there are actually more female than male flies present in the orchard.

Interestingly, females were more likely than males to be found trapped on the sphere itself – especially when it was a red sphere. This suggests that they had oviposition in mind. Overall, however, all of the different coloured spheres were equally effective at catching flies.

Unfortunately, it was not all good news. Like other non species-specific traps, the Ladd traps also caught non-target insects. This included beneficials such as ladybirds. Yellow is attractive to many insects, so this issue may be hard to avoid.

Conclusions

According to Dr Schutze, the trial results demonstrate that commercially available Ladd traps have potential for use in monitoring Qfly. Importantly, they avoid the issue of using the same lure for both monitoring and control, if MAT is being used as part of a control strategy. They also avoid the operational issues that occur with liquid food-based lures.

“Our initial interest in testing the Ladd trap was as a component of our ongoing project developing a female lure for Qfly” commented Dr Schutze, “however, the Ladd traps worked even without a volatile compound to attract the flies. While a lot more work is needed on timing and placement, these devices seem to have some potential for future use in orchards”

Perhaps all these red noses need is the aroma of a ripe nectarine to make them totally irresistible to female fruit flies....

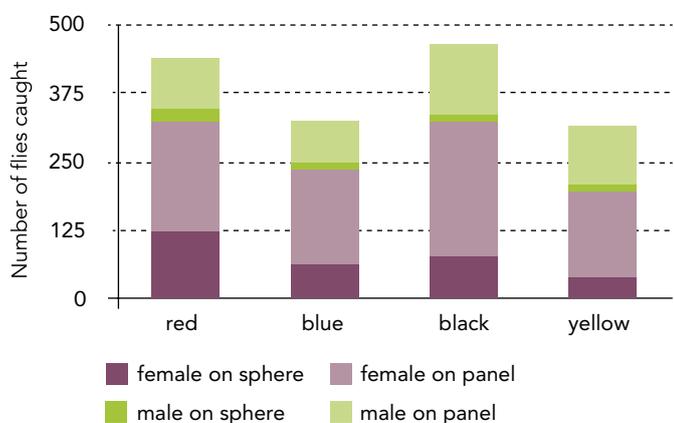


Figure 1. Number of male and female flies captured on the panel, and on the coloured sphere, by various versions of the Ladd trap. Total flies caught on yellow panels with red, blue, black or yellow spheres were not significantly different.

²Weldon CW, Meats A. 2009. Dispersal of mass reared sterile, laboratory domesticated and wild male Queensland fruit flies. J. Appl. Entomol. 134:16-25.

Ladd Research Industries (the producers of Ladd Traps) supplied traps for research at a cost below commercial rates, and we thank them for this support. They played no other role in the initiation, design, analysis or write-up of the research; the authors have no commercial interests in Ladd Research Industries or Ladd traps. The research was supported through Plant Biosecurity Cooperative Research Centre grant CRC3066 ‘Creating a novel lure and kill device for Queensland fruit fly’. The authors acknowledge the support of the Australian Government’s Cooperative Research Centres Program. Additional support for the research was obtained as part of Horticulture Innovation Australia Limited Project SF12013 ‘Fruit fly IPM for Summerfruit, with a focus on developing an effective female lure-and-kill device’. The project was funded by Horticulture Innovation Australia Limited using the summerfruit industry levy and matched funds from the Australian Government.

Irrigation channel off the Murray.

Photo: W. Van Aken

Good inflows needed for next season

By Luke Englefield, RuralCo

Although we are now coming into the cooler months, demand for water has remained very strong, even increasing in some areas. This is a result of several factors including:

- Continued strong demand for temporary allocation water across the whole Southern Connected Basin for pre-watering of cereal crops/pastures
- Topping up of overdrawn accounts from summer overuse, and for carryover
- Continued hot and dry weather and only minor increases in market supply, with no further increase in both the Murrumbidgee and NSW Murray valley allocations.

The result is a further firming of the water market.

The announcement on 15 April saw the Murrumbidgee general security remaining at 37% and NSW Murray remaining at 23%.

In Victoria, Goulburn High Reliability Water Shares, will end the season on 90%, and Murray High Reliability at full allocation;

Historically, autumn is when prices normally decline.

This can be highlighted, as seen in the accompanying

graph, at the tail-end of the 2013–14 season. Obviously, prices in a given year will depend on supply and demand rather than always following a historical pattern. This was the case this time last season (2014–15), as irrigators scrambled for carryover and water for cereal crops and pastures.

Current pricing is a good example of this, where demand has increased while supply has not increased to the same degree. Hence, prices have increased over the past month.

Cooler weather on the horizon and the prospect of additional water being released on to the market by High Reliability/Security (and other) holders mean we may be near the peak of temporary prices for the remainder of this water year.

A seasonal break with widespread rain may help to reduce the price of temporary water. In the meantime it's certainly a good opportunity for water sellers to obtain good prices.

The outlook for early favourable allocation announcements early in the 16/17 irrigation year appear to be unlikely outside of a rapid return to average inflows, given the current below-average storage inflows and a

slowly declining El Niño. Water availability forecasts for the forthcoming 2016/17 season (starting 1 July, 2016) have been made. In the NSW Murray, the initial outlook for High Security next season on 1 July is largely favourable with full allocation likely (97%) but this may be delayed until inflows improve. Meanwhile the initial outlook for General Security is currently unfavourable, with the likelihood of 0% high.

2016/17 NSW Allocation forecasts under 'extreme dry' to 'average' inflows

	1 July	1 Sept	1 Nov
NSW Murray HS	Most assured 1 July, with balance accruing shortly after		
NSW Murray GS	0%	0-24%	0-42%

2016/17 VIC Allocation forecasts under 'extreme dry' to 'average' inflows

	1 July	15 Aug	17 Oct	15 Feb
VIC Murray HR	0-0%	0-31%	0-56%	6-100%
VIC Goulburn HR	0-17%	4-42%	12-82%	20-100%

In Victoria, the initial outlook for High Reliability next season on 1 July for Goulburn and Murray is minimal and may open on as little as 0%. Any improvement from 1 July in all valleys is heavily dependent on future inflows.

Carryover volumes are likely to be consistent with that of last season in both NSW and Victoria which, similar to earlier this season, may elevate some upward pressure on prices. Note that rainfall in April, May and June could allow increases to these estimated allocations.

From a risk-management point of view, the sorts of tools buyers are using to guarantee at least some water for the 16/17 year include Forward Water Agreements and buying for Carryover. Those looking to carryover can do so in either physical storages, carryover accounts on their own licenses or by renting carryover space on other licenses.

Should any local irrigator wish to discuss their water requirements for the coming irrigation year please contact your local RuralCo Water Broker on 1300 007 939.



Weather Report

Water allocations down, but rain is coming!

According to Paul Feikema from the Bureau of Meteorology (BOM), growers in southern Australia at least may be up for a wetter than average winter.

Growers will know that the El Niño has brought generally dry conditions to much of Australia. As a result, water storages in the Murray Darling Basin are well below 40% full – which is their lowest level since the end of the drought in 2010.

However, the breakup of El Niño combined with warm sea temperatures in the Indian ocean, make it likely that growing areas in Victoria will receive above average rainfall over the next few months.

Despite this, the BOM expects that streamflows will remain slow, as dry soils soak up much of the rain.

Full weather reports available through *Landline* and the **BOM**.

Tools in the AWM toolbox

A SERIES OF ARTICLES FOLLOWS WHICH DESCRIBE SOME OF THE STRATEGIES GROWERS CAN USE AS PART OF THEIR AWM CONTROL METHODS. THE FIRST OF THESE, COVERING USE OF TRAPS, IS REPRODUCED BELOW

Area Wide Management of Qfly

the sooner the better

By Dr Penny Measham

Many growers will already have heard about the major new research program on sterile insect technology (SIT). Developing a comprehensive SIT program against fruit flies will be a major step forward in the battle against this costly pest, and help improve and maintain market access for stonefruit into the future.

However, even a highly effective SIT program cannot control fruit fly on its own. SIT is best used as part of a wider, comprehensive program. This program is called Area Wide Management (AWM) and the time to put it into practice is now!

AWM has been used successfully for other fruit flies in Chile, Israel, Mexico and South Africa. Queensland fruit fly (Qfly) presents a unique opportunity for the horticulture sector in Australia to work together on an AWM approach.

Essentially, AWM is a pest management strategy employed across a well-defined local area or region, including all fly habitats within that area, to reduce the Qfly population. A reduced population in all habitats reduces the likelihood of Qfly moving into farms and orchards from habitats such as backyard gardens and/or native hosts. This means that any strategies used on-farm should become

more effective, and, over time, contribute to lower pest populations.

However, ensuring all habitats within an area are appropriately managed is not an easy task.

AWM requires that any and all control methods are synchronised and coordinated. This needs to be done across neighbouring orchards as well as throughout nearby urban areas. AWM therefore requires commitment and participation from all community members; gardeners, growers and government agencies.

AWM is seen as a sustainable pest control approach; one that is not entirely reliant on chemicals. With the loss of key chemical controls for Qfly such as dimethoate and fenthion, AWM poses a good alternative solution.

Qfly can breed and achieve large populations off-farm. These can often go unnoticed, or unmanaged. In fact,

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AWM is an appropriate choice for Qfly because it matches the biology of the fly.

Qfly is:

- mobile – so we need to treat all areas. This will reduce the likelihood of flies moving from neighbouring land back into production areas
- polyphagous (laying eggs into a large number of different plants) – treating all areas must include all potential host plants that support Qfly populations, including native vegetation
- multivoltine (producing multiple generations within a season) – treatments need to take into account that eggs, larvae, pupae and adults can all be present at the same time

AWM is a long-term approach and needs to be considered as a year-round approach; as per management of Qfly on-farm.

” Any AWM approach requires coordination, consistency and continuity. Commitment from all involved is vital for its success. ”

The methods or treatments used in AWM can be the same as those used on-farm, depending on the acceptance of those methods by the wider regional community. Treatments used on-farm – such as hygiene, baiting, trapping and monitoring – can also be used off-farm as part of an integrated AWM program.

Hygiene, such as removal of unmanaged fruit trees or destruction of infested backyard fruit, is a significant challenge for AWM. Only with good community support can this be achieved. Developing a trapping program can certainly help enhance awareness of the fruit fly issue in urban areas. Traps are contained, involve minimal chemicals and require little maintenance. Finding the best suite of strategies for your area takes time and planning.

Any AWM approach requires coordination, consistency and continuity. Commitment from all involved is vital for its success.

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Infested peaches. Photo: Jenny Ekman

Now for the SIT

The SITplus consortium is dedicated to implementing an integrated AWM approach. The Adaptive Area Wide Management Project aims to develop guidelines for adaptive AWM of Qfly that can incorporate SIT.

For example, the biophysical component of the project is developing a habitat-suitability model, which will be tested in the field later in the year. This will lead to better understanding of where and when the fly is present. Knowing where flies are will help growers target their AWM resources, whether that is bait spraying, MAT or an SIT release.

The social component of the project is conducting focus group sessions in five regional areas. These aim to unravel the key factors that and encourage involvement in, or create barriers to, an AWM approach.

The economics component is working on a baseline-costing model for current management practices, as well as for AWM and SIT. This will help growers choose the most cost effective strategy for their farm, or indeed their whole community.

As results and new discoveries come to light, they will be incorporated into our on-the-ground support of AWM. Communication of up-to-date knowledge will help AWM in your region. It is difficult to participate in anything when you don't know what's involved or why.

For more information please contact:

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Practical results

The Adaptive Area Wide Management of Qfly using SIT project is committed to providing practical outcomes, ensuring research is regionally applicable. It has been very encouraging to see such a high level of input from growers to date, especially given that the last few months have been a busy harvesting time.

Information from the recent Qfly survey is extremely valuable as it is being used to inform future support for regions; regionally focussed extension and AWM support. There is genuine interest and positive feedback from growers about the development of AWM and the potential use of sterile insect technology within the context of AWM.



Trapping fruit flies

By Dr Penny Measham

AWM is considered vital for control of fruit fly, and enhances the success of Sterile Insect Technique (SIT). AWM is a long-term approach. It needs to be undertaken over the full year, not just during the growing season.

The main tools available when implementing an AWM program are hygiene, baiting, male annihilation technique (MAT), mass trapping and monitoring – although some other novel methods have also been proposed. All of these methods can be used off-farm as well as on-farm.

Urban areas within an AWM region often provide habitats for Qfly. The choice of strategies for urban areas depends on acceptance by the community and the level of support for participation. Trapping provides a good option in urban areas as traps are contained and require little maintenance. It is important to be very clear about the purpose of trapping as there are a number of ways in which traps are used.

Uses for traps

Maintaining or establishing a Pest Free Area (PFA)

The National Code of Practice for managing fruit fly details

a trapping system that may be used to demonstrate area freedom. This system supports international recognition of Tasmania as a PFA. Trap type, placement and monitoring are specified. Traps placed in a grid system of 1km² in production areas and 400m² in residential/urban areas are monitored regularly. Detections of Qfly in this trapping system within a PFA trigger a range of emergency eradication responses.

Meeting export protocol requirements

Whether exporting domestically or internationally (from a non-PFA) some protocols have specific requirements for trapping.

Interstate certification assurance protocols (ICAs) require that certain procedures have been undertaken. These may include trapping; please check with your state body for ICA information.

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Likewise, meeting international protocols may require that some form of trapping is undertaken; please check with the Department of Agriculture and Water Resources for current export information, or the MiCOR (Manual of Importing Country Requirements).

Monitoring to inform fruit fly management

Monitoring does not necessarily indicate the population at a particular point in time, but can demonstrate population trends. Traps can show when fruit flies start to appear in the orchard, triggering the start of control methods such as bait spraying and MAT (male annihilation technique).

Reducing fruit fly populations

Some growers are trialling mass trapping as a treatment that can be used in conjunction with other treatments, such as bait-spraying. Mass trapping involves placement of traps at a high density. A number of commercial traps are now available that could be suitable as mass trapping devices. It is likely that mass-trapping over longer periods of time and large areas are needed for the method to be effective.

Choosing traps

Traps used for monitoring purposes use lures that attract male flies only. Male flies respond to chemical lures such

Acknowledgement

This project has been funded by Horticulture Innovation Australia using industry levies and funds from the Australian Government.

as cuelure (Qfly), trimmedlure (Medfly) and methyl eugenol (tobacco fly).

There are also commercially available female-biased traps. These are generally intended as a control measure rather than for monitoring purposes. They are designed on the principle that female flies require

protein to become sexually mature. Female attractants are therefore food based.

Currently available examples of female-biased traps include the CeraTrap and the BioTrap. The CeraTrap contains a liquid attractant. No toxicant is used, as the flies simply drown in the liquid. The BioTrap consists of a protein-based attractant gel inside a standard plastic trap. While flies are trapped inside the device to some extent, it is best used with a toxicant. Both the Biotrap and CeraTrap will capture male and female flies. Female flies are more likely to be trapped while young, before they begin mating.

However, it is important to note that although these traps may contribute to reducing the population of females within the immediate area, they will not attract flies over large distances.

For more information please contact:

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Deciding where to put traps

The Adaptive Area Wide Management project is engaging a number of Queensland fruit fly experts and developing a risk model for Queensland fruit fly – this will help resolve where fruit flies are hiding in the landscape. This will tell us the best places to put baits or traps for optimum effects. The eventual aim is to develop guidelines which help regional communities develop their own, effective, AWM program.

AWM approaches are taking place in regions across Australia. While there are many good results there are also many challenges. It is a difficult logistical exercise, and needs to consider the social and regulatory frameworks in each area. However, a regional approach is encouraged. Residents and growers are both affected by fruit fly and will both benefit from a coordinated approach. There is a lot to look forward to!

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