



# newsletter coastalfruitgrowers'

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Dear Growers

Welcome to a bumper issue of the Newsletter — a consequence of not having any editions published since the Spring/Summer 2009 edition.

Inside you'll find a range of articles including a focus on some important pests of citrus, including mites and gall wasp. Also there's an update on the pesticides registered for use on both citrus and avocados in NSW.

There's also a study tour report from a trip to California and Florida earlier this year. The article focuses on the 'environment' in which commercial citrus orchardists and nurserymen in Florida have to operate, as a consequence of the devastating Huanglongbing disease.

For stonefruit growers there's an interesting article comparing the costs and returns of different tree training systems.

There's also lots more interesting articles and brief updates.

Happy reading — it will take you a while.

*Sandra Hardy*

## INSIDE

|  |       |   |       |
|--|-------|---|-------|
| Evaluating new varieties   | 2     | Dimethoate & fenthion review: the challenges of managing QFF in crops | 31    |
| Matching tree nutrition to crop load                               | 4     | Farm biosecurity  | 33    |
| Spring La Niña now more likely                                     | 5     | Stonefruit industry to start collecting national data                 | 34    |
| USA citrus study tour report – the impacts of some exotic diseases | 6     | Flying-foxes and damage to fruit crops                                | 35    |
| Controlling mites in coastal citrus                                | 14    | Pest alert: Be on the look out for MYRTLE RUST                        | 36    |
| Managing Citrus gall wasp  | 18    | APVMA restricts horticultural and turf uses of carbendazim            | 38    |
| Flushing drip irrigation systems                                   | 20    | Culinary herb and spice levy proposal                                 | 40    |
| Management of the Australian Plague Locust in citrus orchards      | 21    | Export market development grants                                      | 41    |
| Using chlorine-based sanitisers in packingsheds                    | 22    | News in Brief   | 42–44 |
| What does your chlorine test strip measure?                        | 23    | Registered chemicals for use in commercial citrus crops in NSW        | 45    |
| Day versus night time irrigations                                  | 24    | Registered chemicals for use in commercial avocado crops in NSW       | 51    |
| Citrus thrips project  | 25    | What's on & What's new in publications                                | 53    |
| Citrus Australia News  | 26–27 |   |       |
| Profitability of stone fruit tree training systems                 | 28    |   |       |

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# Evaluating new varieties and ensuring healthy budwood

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*Graeme Sanderson and Nerida Donovan (Department of Industry & Investment NSW) and Tim Herrmann and Michael Arnold (Auscitrus)*

**Extracted from the final report of Project CT04003 July 2009. Contact Horticulture Australia for a full copy of the final report.**

The 'National evaluation of new citrus varieties and maintenance of high health status budwood' project is a continuance of the Australian Citrus Improvement Program. This long term program is an industry driven initiative aimed at maintaining industry productivity and profitability.

Thirty one new citrus varieties have been introduced to Australia in recent years with 20 having Plant Breeders Rights (PBR) protection and 11 available as public access through Auscitrus. A cooperative arrangement was developed between Auscitrus, Horticulture Australia Ltd (HAL), NSW Department of Industry and Investment and variety managers to have these varieties independently evaluated in Australia. The new varieties were also included in the citrus repositories at the Elizabeth Macarthur Agricultural Institute (EMAI) for future supply of 'true to type' high health status budwood.

The 'staggered' release of new varieties from Australian Plant Quarantine has required a number of propagation phases to establish trees in the field. Trees are planted at all sites on Troyer citrange for comparison purposes as well as a second rootstock chosen to suit the soil conditions. These stocks include *Poncirus trifoliata*, Swingle citrumelo, Cleopatra mandarin, C 35 citrange and Volkameriana. The Sunraysia site also has the varieties grafted onto mature Valencia orange trees to generate a larger volume of fruit for grading and test marketing.

Nine of the varieties planted in October 2005 produced a small volume of field fruit at the Sunraysia and Riverina sites in 2008 and this has been quality tested. Samples of the varieties were also provided to the Australian Nurseryman's Fruit Improvement Company (ANFIC) for preliminary market comment. The fruiting varieties in 2008 included: Mor, Nectar, Nouvelle, Cami and Mandalate mandarins, Sidi Aissa and Orogrande clementines and Eureka seedless lemon. The 4 Italian triploid mandarins (Alkantara, C 1867, C 1829 and Tacle) have been slow to come into bearing and produced fruit for the first time in 2009. The 6 varieties planted and

grafted in 2006 have produced field fruit for assessment in 2009. These are: Primosole, IRM1, IRM2, Or, Gold Nugget mandarins and Nour clementine and are being sequentially tested to determine fruit quality and maturity period.

The program also involves the establishment of container grown mother trees and the regular checking of their health status. These 'elite' trees are maintained in insect proof screen houses and are the source material for future rapid multiplication of budwood for tree propagation. The evaluation component of the project is based on comparing the performance of the new varieties in a range of citrus growing regions across Australia with different climates, soil types and management regimes. Data is collected on 'trueness to type', fruit quality, maturity period, phenology and tree growth rate which is then compiled into draft information sheets.

The PBR and public access varieties have been displayed as fruit to general citrus audiences at grower meetings in each state. Selected groups have viewed field evaluation sites in the company of the project coordinator and variety managers. Variety road shows have also been conducted to introduce the new PBR varieties to prospective growers. Fruit samples of the new varieties have also been sent to market agents for assessment and comment. Varieties which have produced fruit at the evaluation sites and are creating commercial interest are: Alkantara, C 1867, Nectar, Mor, IRM1, IRM2, Gold Nugget, Mandalate and Eureka seedless lemon. A further 6 varieties are predicted to crop for the first time in 2010 increasing the fruiting total to 25 of the 31 varieties originally introduced to Australia.

The evaluation program is also trialing crop management techniques on varieties with potential to be commercialised in Australia. The Sunraysia site has 12 trees of each new variety grafted to mature Valencia orange trees and this allows the early development of a large canopy and high crop loads.

C 1867 grafted to Valencia on *Poncirus trifoliata* produced an average of 46.6kg of fruit per tree, four years from grafting, which was used for grower display, cool storage experiments and sequential juice quality testing. Grafted trees have also provided sufficient fruit to grade and determine fruit size distributions on several varieties in 2009.

Nectar trees grafted to Valencia on citrange rootstock had an average yield per tree of 43.7kg but an average fruit weight of only 70gms. Fruit thinning removed an average of 1104 fruit per tree with 625 fruit per tree collected at harvest. Fruit size for this variety is a management issue and has also been highlighted in overseas information. The 64% thinning rate on the grafted evaluation trees did not improve fruit size at harvest in 2009. Tree canopy management, earlier removal of fruitlets and the use of chemical thinning and sizing sprays will be trialed in 2010. Nectar reacted positively to Gibberellic acid (GA) sprays to slow rind aging and achieved a larger natural fruit size in the more sub-tropical growing conditions at the Queensland evaluation site.

Mandalate is another variety identified with commercial potential and has characteristics in common

with the Imperial mandarin but is significantly later to mature. Testing in 2009 is concentrating on increasing fruit size, maintaining skin condition with GA and the use of the growth regulator Cit-tite® to retain fruit on the tree for an extended period. Fruit must be held on the tree for the high acid content to reduce and improve palatability. Mandalate should not be grown on *Poncirus trifoliata* especially in clay soil types or cooler regions as this rootstock can induce higher acid contents in the fruit. The Riverina evaluation site was not able to grow Mandalate with acceptable eating quality due to the consistently high acid content in fruit from trees on *Poncirus trifoliata* rootstock.

Independent variety evaluation can assist Australian citrus growers to make more informed decisions when selecting new citrus varieties. The increasing dominance of PBR varieties with attached minimum

area and royalty structures makes it imperative that decisions are based on best available information. Overseas performance data can assist in the selection process but local results should form the basis of any long term investment in new varieties. The continuance of support for the maintenance and health status testing of citrus varieties along with rapid, independent evaluation of new introductions to Australia should remain an industry priority.



*Alkantara mandarin*



*Gold Nugget*



*C 1867 mandarin*



*IRM2*



*IRM1*



*Mandalate mandarin*



*Mor*

# Matching tree nutrition to crop load

Steven Faliene, Sandra Hardy and Michael Treeby, Industry and Investment NSW

Last season many navel orange trees had very light crop loads. Experienced growers reduced their fertiliser program to help prevent potential fruit quality problems such as coarse textured rinds and delayed colour development. Nitrogen supply and potassium supply (to a lesser degree) influence rind texture and colour development. It was clear that excessively coarse fruit and late colour development was worse on blocks where the fertiliser program wasn't adjusted to take account of the light crop. Just as it is important to decrease fertiliser applications during an 'off' year, it is also important to increase fertiliser applications during an 'on' year.

Increasing fertiliser applications during an 'on' year is not a 'fix' for an excessive crop load, but extra fertiliser may be needed for the tree to support a heavy crop load. Crop regulation (thinning) is the key strategy for reducing an excessive crop load. For more information on crop regulation go to the Industry & Investment NSW website [www.industry.nsw.gov.au](http://www.industry.nsw.gov.au)

The two main nutrients in demand during the fruit growth period are nitrogen and potassium. Industry and Investment NSW is currently developing a citrus fruit nutrient accumulation chart as part of a project supported by the National Program for Sustainable Irrigation and Horticulture Australia. Work is still in progress, but preliminary results provided in Table 1 give an estimate of the amount of nutrients that are removed in the fruit for various yields of navel oranges. This is a good starting point for estimating how much of a nutrient is needed for various yields. As part of this project we are also trying to estimate the total amount of nutrients required by a tree. Preliminary work indicates

| Nutrient | Yield (T/ha) |    |    |    |    |     |
|----------|--------------|----|----|----|----|-----|
|          | 20           | 30 | 40 | 50 | 60 | 70  |
| N        | 32           | 47 | 62 | 78 | 94 | 109 |
| P        | 3            | 4  | 6  | 7  | 9  | 10  |
| K        | 33           | 49 | 66 | 82 | 98 | 115 |
| Ca       | 11           | 17 | 22 | 28 | 33 | 39  |
| Mg       | 3            | 4  | 6  | 7  | 8  | 10  |

Table 1. Preliminary relationship between crop load and nutrient removal rates by navel orange fruit.



Too much nitrogen causes thick coarse rinds and delays fruit colouring.

that 25–40 kg of nitrogen per hectare is needed per year for a double spaced planting of navel oranges.

Remember the information in Table 1 only indicates the amount of nutrient removed by the fruit. Table 1 does not reflect the total amount of nutrient that may be required by the tree, nor does it take into account any inefficiencies in application or uptake. Nutrients, especially nitrogen can be 'lost' through leaching (movement of nutrients below the root zone through over-irrigation or rainfall).

For a 60 T/ha yield, Table 1 suggests that this would mean that about 95 kg/ha of nitrogen would be in the fruit. An allowance of about 30 kg/ha for the needs of the trees themselves would bring the total amount of nitrogen needed to 125 kg/ha. With careful monitoring of irrigation requirements (e.g. using soil moisture probes), a nitrogen (N) efficiency rate of 80% can be reasonably assumed. Therefore around 155 kg/ha of nitrogen needs to be supplied. If the nitrogen efficiency rate is only 60%, then around 205 kg/ha of nitrogen needs to be applied. It is thought that most orchards have nitrogen efficiencies ranging from 60% to 80%, and this can change from year to year depending on seasonal conditions (*i.e.* rainfall). This example suggests a large amount of nitrogen is needed, and the rate can vary depending on site conditions (nitrogen efficiency rate, soil types, rain etc). This is where knowledge and

records of the block (i.e. leaf analysis, fruit quality and yield records, tree vigour observations etc) are important in helping to fine tune the right amount. It is important to remember that soil can't hold a lot of nitrogen in the form in which it was supplied as fertiliser, and this is one reason why supplying nitrogen fertiliser regularly is so important.

The soil can hold considerable reserves of potassium. Application rates and benefits of potassium are somewhat contentious; some growers reporting good responses, but others none. One of the main factors for these reported response differences is probably soil type. Decisions about application rates should be based on previous fertiliser records, tree nutritional status and crop yields.

Some evidence from overseas trials indicates that a foliar application of 3–5% potassium nitrate in late November–

early December can increase fruit size. Dr Yair Erner's (Volcani Institute, Israel) trials suggested that more reliable results were obtained with at least a 5% spray (5 kg/100 L). Dr. Erner also stated that he has used rates of up to 8% without burning leaves. Most growers, however, use a 2–4% spray.

There is no 'one size fits all' when it comes to tree nutrition. Designing a nutrition program involves taking into account a whole range of factors including variety, rootstock, tree age, crop load, soil type and seasonal conditions. Once a program is designed it then needs to be fine tuned by regular monitoring of tree health, fruit quality and nutritional status (leaf & soil testing). Added to this is the importance of keeping good records of fertiliser applications and timing, seasonal conditions, yield, fruit size and quality. More detailed information on citrus nutrient management is available in I&I NSW's two day citrus nutrition workshop.

## Spring La Niña now more likely

Source: Source Bureau of Meteorology 1 September 2010

A La Niña event is now well established in the Pacific Ocean. All computer models surveyed by the Bureau suggest Pacific Ocean sea surface temperatures (SSTs) will remain above La Niña thresholds through the southern hemisphere spring, with the majority indicating the event will persist into at least early 2011.

All key indicators of ENSO are at levels typical of a La Niña event. The central Pacific has cooled significantly over the past two weeks, the Southern Oscillation Index (SOI) remains well above La Niña thresholds, cloudiness over the central Pacific remains suppressed and trade winds continue to be stronger than the long-term average in the central and western Pacific.

Recent values of the Indian Ocean Dipole (IOD) index, combined with forecasts from the Bureau's POAMA model, suggest that a negative IOD event may have commenced in the Indian Ocean. Negative IOD events are often, but not always associated with above average rainfall over large areas of southern Australia during the southern hemisphere

### *Australian impacts*

La Niña periods are usually, but not always, associated with above normal rainfall during the second half of the year across large parts of Australia, most notably eastern and northern regions. Night time temperatures are historically warmer than average and Tropical Cyclone occurrence for northern Australia is typically higher than normal during the cyclone season (November–April).

Widespread wet conditions and flooding events have accompanied a number of La Niña events in the past. Substantial flooding impacted NSW and Queensland in the event of 1998, while the event of 1988–89 saw flooding also occur in SA and Victoria.

In general, while La Niña events tend to be wetter than normal for Australia, no two La Niñas have exactly the same impact on local rainfall. So while some regions may experience the typical pattern of heavy rainfall, other regions may miss out altogether. The Bureau will continue to monitor the developing situation and weekly updates of important data are available on the Bureau's webpage at [www.bom.gov.au/climate/enso](http://www.bom.gov.au/climate/enso)

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# USA citrus study tour report – an insight into the impacts of some exotic diseases on commercial citrus orchards and nurseries

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Sandra Hardy & Nerida Donovan, I&I NSW.

## Introduction

In January 2010 a group of citrus industry personnel travelled to California and Florida as part of a Citrus Australia Limited (CAL) study tour to look at the impacts on the US citrus industry of Huanglongbing (HLB caused by '*Candidatus Liberibacter asiaticus*'), citrus canker (*Xanthomonas citri* subsp. *citri*) and the insect vector of HLB the Asiatic citrus psyllid (ACP *Diaphorina citri*).

The tour was lead by Patricia Barkley, world renowned citrus pathologist and Technical Advisor to CAL. Tour participants included citrus growers Craig and Andrea Dobson (Kununurra, WA), Sue Brighenti and Joe Valenzisi (Riverina, NSW) and Greg Parr (Gayndah, QLD); Industry Development Officers Mary Cannard (Murray Valley Citrus Board) and Nathan Hancock (WA Department of Agriculture); IPM consultants Rob Wepler (Riverina, NSW) and Bob Sandery (Katherine, NT); citrus nurseryman Gary Eyles (Kenthurst, NSW) and Plant Scientist Ceri Pearce (Biosecurity QLD), Sandra Hardy (Industry Leader – Citrus) and Nerida Donoval (citrus pathologist) I&I NSW.

HLB and its vectors pose one of the greatest risks to Australia's citrus and nursery industries. HLB and its vector ACP are not present in Australia but both now occur in Indonesia, East Timor and New Guinea. Movement of the pathogen and the psyllid eastward from Asia to Australia through cyclonic winds or illegal movement of infected plant material is highly likely. Experience in overseas production regions indicates that losses caused by the exotic bacterial disease HLB could increase production costs by 40% and reduce productivity by 25%. Citrus canker is another disease that is not currently found in Australia but there have been several incursions of this emergency plant pest over the past hundred years leading to eradication efforts at a significant cost to both government and industry.

This report focuses on the visits to commercial citrus orchards and nurseries and some of the impacts that HLB, ACP and canker have had on production practices.

## CALIFORNIA

The California citrus industry comprises 3000 growers with 286,000 ha and directly employs about 13,000 people with an additional 12,000 people associated with the industry. Citrus is worth US\$1.8 billion with an additional US\$1.2 billion of economic activity created. There is a growing demand for seedless varieties. Mandarin acreage has significantly increased over the past 4 years, stimulated by the release of new varieties like Tango. Fukumoto orange was widely planted and is now suffering a serious decline disorder, the cause of which is undetermined and the subject of research studies. ACP arrived in southern California in 2008, but is not yet present in the main citrus production regions.

The Citrus Research Board (CRB) has a mandated program funded by a carton levy. A referendum of growers in 2008 increased the levy per box to US\$0.04 with a maximum of US\$0.09, with the purpose of creating a fund that can act against ACP and HLB. A conservative estimate of the aggregate economic cost to the California economy of ACP and HLB if it establishes in the Californian citrus regions is over US\$349.3 million per year, and potentially US\$371 million if the damage is left unchecked. It is estimated potential HLB damage at US\$224 million annually, or 20% of total production. The impact of ACP will cause citrus production costs to rise by US\$664.37 per acre (13.31% per box).

A joint surveillance initiative between Californian citrus growers and the CRB monitors for ACP spread in relation to commercial citrus groves. They survey 25% of the total commercial citrus acres in each county annually. Yellow sticky traps are also being used in surveillance programs to monitor for ACP. There are currently 32,000 traps in California for ACP which will increase to 75,000 traps by the end of the year. Traps are changed every 2 weeks.

## Paramount Citrus – Delano, California.

Paramount Citrus is the largest grower, shipper and marketer of fresh citrus in the US. The parent company is also involved in almonds, pistachios, bottled water and agricultural consulting. The group were given a tour of

the packing shed and visited orchard blocks and an in-house research facility.

Paramount citrus has about 12,000 hectares of citrus (9000 ha in California and 3000 ha in Mexico), including oranges, lemons and mandarins. Currently the Mexican operation only produces lemons but limes will be planted soon. Their primary focus is the domestic fresh fruit market. Consumption of navels is steady with limited opportunity for market expansion but growth is predicted for domestic mandarin consumption.

Paramount exports about 30% of fruit produced; markets include Japan, Korea, China, Australia, New Zealand and Russia. Paramount is looking at new export markets for mandarins. They currently have 4000 ha of mandarins, half being Nadorcott and Tango, with a harvest window between the end of October to the end of December.

Paramount's scale of production was impressive with plans to plant 1 million trees per year. They use farm location and climate to spread the harvest windows for their key varieties. On the farm visits we saw the use of



*Paramount citrus orchard and Delano packing shed.*

drip irrigation and fertigation, retractable mechanical netting infrastructure (for bee exclusion to produce seedless fruit), wind machines to protect against frost and different rootstocks to control cropping. They have access to good quality (low EC) underground water via wells. A permit is needed to dig a well but the use of underground water is not regulated. Surface water supplies are more controlled and its use has been restricted as water is diverted from agriculture to the environment.

All aspects of the operation are co-ordinated and pre-determined. Paramount closely monitors fruit quality on farms to determine what market the fruit will be directed to. The profitability of each block is examined every year. All fruit can be tracked down to the block and row from where it was picked. Contract harvesters are provided with detailed fruit specifications (variety, size, quality, colour and amount) in advance and told the date to deliver to the shed. Fruit is rejected if it does not meet the required specifications.

They have three state of the art packing plants located in Delano, Visalia and Mexico allowing them to process up to 10M cartons (200,000 tons) annually. They do not do any juice processing. The packing facility at Delano can process 2150 bins/hour. They also practice long-term storage of lemons and limes on a large scale to target the more profitable out-of-season marketing windows. At the time of our visit there were 7.2 million kg of lemons in storage. The maximum length of time fruit is held in storage is 12 weeks. They check the condition of stored fruit daily – citing that sanitation is critical to success.

### ***Citrus nurseries – Exeter, California.***

Two large commercial citrus nurseries were visited in the Exeter region. Tree Source nursery traditionally produced field grown 'ball and burlap' trees that were removed from the ground retaining some soil around the root system, wrapped in burlap and sold to orchards. Prior to the threat of ACP and HLB, Tree Source changed to growing rootstocks in specialized tubes, with propagated trees transferred to a sock within a plastic container. Trees are sold in the sock so that the container does not leave the nursery.

With the threat of ACP in southern California, Tree Source has embarked on a major development to modernise their entire production system within greenhouses. This is a large investment aimed at securing their future. The new system means they are able to produce a tree in a shorter time frame although

the final tree size is smaller. The greenhouses are designed to be insect proof and fully enclosed, but at this stage they are not operating under the very strict protocols that will be needed if ACP is found in the region. The greenhouses are covered in polycarbonate and have cooling pads and fans installed. The propagation houses are heated to 30°C. All stock is on benches, with a rolling bench system in some houses. All seed is screened by size, soaked in a chlorine solution (method differs depending on variety) to enhance manual coat removal before mechanical planting. This system is more efficient, increases germination percentage and uniformity of seedling growth. They source budwood from the California Citrus Clonal Protection Program (CCCPP) at Lindcove and then propagate their own multiplication trees which are maintained in the ground under screen and replaced every 18 months. The major varieties grown include Washington navel (e.g. Atwood) and Cara Cara blood orange. In recent years orders skyrocketed for mandarin types like Tango, but demand is predicted to decrease. A considerable portion of Tango was propagated onto C35 rootstocks.



*Facilities at Mullholland's nursery are not insect proof.*



*State of the art facilities at Tree Source nursery.*



*At Mullholland's nursery trees are grown in bottomless bags directly on the soil.*

The second nursery visited was Mullholland's, a private nursery owned and operated by Tom Mulholland. Tom has a keen interest in new varieties and is the owner of the 'Delite' trade mark worldwide. His operations include a large acreage of orchards and an insectary. A considerable percentage of the nursery plants produced are used in his orchard. The entire nursery production system is within greenhouses but they are not insect proof. Aspects of the operation are not as modern as at Tree Source. However the end product is a strong and healthy tree. Seed is hand sown into trays on benches in a temperature controlled propagation house. Seedlings are transferred to tubes and then containers for propagation. The potting mix is heavy (60% saw dust, 40% soil) and plants sit directly on the ground in the growing houses. The containers are plastic bags with no bottom so the tree can actually grow into the ground. This method appears to cause no problems at this site, but would not be viable in any area where soil borne pests or diseases of citrus were prevalent. Tom has not yet made any changes to his operations to adjust to the

threatened advance of ACP and would need to screen the opening sides of the plastic growing houses to make them insect proof.

## **FLORIDA**

There are five main citrus production areas in Florida and about 4500 citrus growers. In 2007/08 Florida produced around 9M tons of citrus. Oranges constitute 89% of bearing trees (of which half or 59.4 million trees are Valencia oranges), grapefruit 8% (72% are red grapefruits, 5.2 million trees or 75% of US production) and specialty fruit 3%. Florida is the largest exporter of grapefruit followed by South Africa, Turkey and Israel. Florida has 39.9% of the world's processed grapefruit market.

The vector of HLB, the Asian citrus psyllid was first found in Florida in 1998. HLB was first detected in south Florida in August 2005. Today the overall incidence of HLB in Florida is estimated at 2.4% but possibly as high as 5% (Timmer, pers.comm. 2010). More specifically it is 6% in some counties, 20% in some Southern Gardens groves at Clewiston and 100% in groves around Immokalee i.e. there is an increasing incidence of HLB as you move south. There are 288,000 acres of abandoned groves in Florida which constitute a threat to neighbours through a build-up in HLB and failure to control ACP.

It is estimated that in Florida, post-HLB production costs have increased by approximately \$520/acre i.e. 40% -50% compared to pre-HLB production costs, bringing total production costs to \$1420/acre. ACP is controlled using broad spectrum insecticide sprays, which are applied mainly during the dormant winter period when canopy density is low – the aim is to reduce the psyllid population before the onset of the spring flush. Dormant sprays are being used on approximately 90% of citrus plantings (57,000 ha).

Citrus canker was deregulated in Florida in 2006. Control programs rely mostly on copper sprays targeted between May and September when the rainy season begins. There are concerns over the build up of copper in the soil and copper sprays exacerbating the appearance of wind scar on fruit. Trials are looking at products that can be used in conjunction with a lower rate of copper.

### ***Nursery regulations – Florida***

With the end of citrus canker eradication efforts in 2006 and the discovery of HLB, strict new state and federal rules were put in place for nurseries in order

to limit the spread of canker and HLB. The rules were partially influenced by guidelines developed by an 'ad hoc' committee of the Florida Citrus Nurserymen's Association and the Florida Citrus Production Managers Association. These guidelines evolved into the Florida Citrus Budwood Protection Rule 5B-62 and were subsequently incorporated into the Federal Citrus Health Response Plan (CHRP). These new rules required that as of 1<sup>st</sup> January 2007, all citrus nursery propagations occur in an enclosed greenhouse, and after 31<sup>st</sup> December 2007 no trees could be sold unless they were propagated in an approved structure. New greenhouses must be insect proof, have positive pressure displacement, have double entryways and be on an approved site. State regulators compromised on a controversial measure requiring Florida's citrus nurseries to operate at least one mile away from a commercial grove. The new regulations allowed existing citrus nurseries, including those shut down by canker, to continue operating without the one-mile buffer. Without that 'grandfather' clause, most existing nurseries would have been forced to relocate or close because of nearby commercial groves. However the one-mile buffer does apply to all new nurseries.

The Nursery Inspection Department of the FDACS inspects each nursery every 30 days. The department also approves new sites and structures, and inspects a one-mile radius around the sites for pathogen and pest risks. Perhaps the greatest challenge that the nursery industry had to overcome was the loss of the FDACS Dundee and Immokalee budwood facilities. Nearly 8,000 budwood source trees were lost due to canker eradication. These losses resulted in a critical shortage of budwood for the establishment of nursery increase trees to fulfil their propagation needs. The new nursery regulations require that all budwood must be registered with and originate from the Bureau's screened budwood sources. Budwood increase nursery trees must be enclosed and are valid for 36 months from the time of budding.

### ***Citrus orchard visits, Vero region, Florida.***

Peter Spyke is a citrus orchardist with a focus on fresh fruit, mainly supplying gift fruit direct to the customer through online orders. He produces grapefruit, mandarins, lemons and oranges. The orchard at Vero suffers from HLB, canker, blight, heavy soils and high salt levels. In particular HLB has redefined their production system because infected orchards have a shorter productive life. He has high density plantings



under an ‘advanced citrus production system’ (open hydroponics) and manipulates crop load to control vegetative growth. He has observed that some citrus selections appear more attractive to ACP and that this in turn affects HLB infection rates. He is currently employing no control measures for canker.

Tom Hammond is the owner of Hammond Grove with 400 hectares planted to grapefruit (50%), tangerines, tangelos and navels. His farm has been devastated by canker and HLB. To combat canker he has planted windbreaks (mostly bamboo, some *Eucalypt* and *Casuarina* species). Foliar nutrients are applied and tree flush is managed via irrigation and fertigation. The spray program for canker relies mostly on frequent copper sprays (no red copper is used). Psyllid control (including aerial sprays as part of an area wide program) is targeted during the winter months to reduce the populations going into spring. He monitors for ACP in spring using sticky traps. Orchard workers at Hammond Grove attend meetings about orchard management, with a particular emphasis on building awareness of



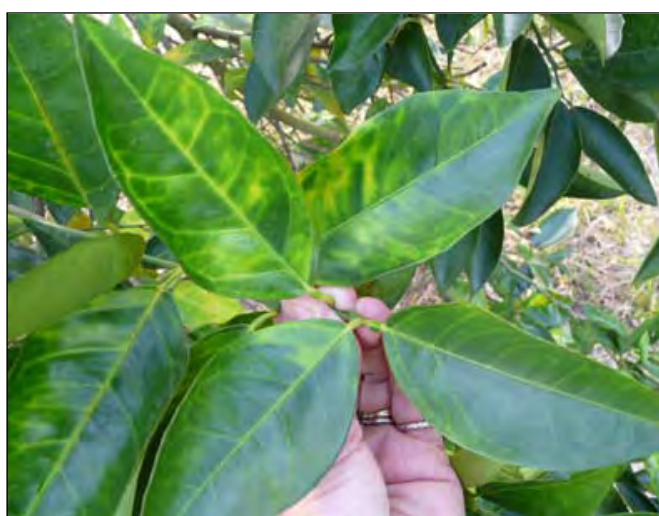
*Bamboo windbreaks are used extensively in Tom Hammond’s orchard to reduce the spread of canker spores.*



*Maury Boyd is taking an unconventional nutritional approach to manage HLB in his orchard.*



*Peter Spyke’s orchard has high density plantings using an ‘open hydroponics’ management system with a focus on nutrient and water management.*



*Typical leaf symptoms of HLB on trees.*

biosecurity issues. To reduce the spread of canker, all equipment is treated with Cankerguard® before entering and after leaving the orchard and workers wear gloves which are treated between trees. Tom is concerned about neighbouring abandoned groves where ACP is not being managed.

Maury Boyd has taken an unconventional approach to HLB management. Initial HLB scouting and molecular testing of his orchard in 2006 indicated between 25-35% of his trees were positive for HLB. Removal of infected trees would have resulted in him going out of business. To avoid this he began a campaign of aggressive psyllid control combined with a plant nutrition program which aims to enhance the ability of the tree to cope with HLB. They are also reducing vegetative flushes by not using mechanical harvesting and only hedging every second row in alternate years, with no selective pruning performed. Maury believes his trees look better than they did two years ago, despite HLB infection. It is possible that the trees are simply benefiting from the extra nutrition and the response may be temporary, circumventing one of the impacts of HLB infection where the vascular tissue is blocked. His approach means that his infected trees are a source of HLB inoculum for his orchard and other orchards in the vicinity. Leaving HLB infected trees in the orchard is not currently recommended as an approach to HLB management.

Another impact of HLB is that it causes the fruit to become bitter. Growers with infected orchards have not yet reported any effect on the quality of their juice. This could be because infected fruit are smaller and either not picked or graded out in the packing shed, so not many infected fruit are making it into the juice. The impact of this may be a problem when the number of infected, bitter fruit reaches a level where the juice quality is affected.

### ***Southern Gardens Holding (US Sugar Corporation) – Clewiston, Florida.***

US Sugar is a private company which owned 13,350 hectares of citrus (now almost halved due to canker and HLB) and a modern processing plant, being the biggest supplier to Tropicana. Some of the first HLB detections were made at Southern Gardens. The basic HLB field management program involves disease free planting material, four grove inspections for HLB symptoms per year; removal of infected trees, full-time scouting for ACP and an aggressive ACP control program (minimum of 6 sprays / year). Production costs have increased by almost 40% (by US\$1284 / ha) as a direct result of managing HLB and ACP. In 3 groves HLB infection rates were increasing at a linear rate (up to 25%). In 2 of those



*Decontamination procedures for entering orchards and regular scouting for HLB symptoms at Southern Gardens orchards.*

groves the infection rate per inspection is now declining, probably as a result of the vigorous management program. At the 3<sup>rd</sup> grove where only psyllid control was practiced the infection rate continues to rise. Mike believes they may be able to maintain a low level of HLB infection in their orchards by implementing their full HLB/ACP management program. Mike highlighted the need for a regional approach. Significant tree removals were observed along the edge of the groves, near roads or dams, creating a visible 'edge effect', particularly on the south west margins of groves. This is thought to be due to primary infection by infected psyllids as they enter the grove.

The HLB diagnostic laboratory offers free testing to growers and researchers. The service aims to provide rapid results to facilitate more rapid implementation of control strategies. The lab test around 40,000 samples per year but has the capacity to process up to 1600 samples per week. They have tested 160,000 samples since 2005.

### ***Philip Rucks citrus nursery – Frostproof, Florida.***

A visit to Phillip Rucks nursery, the largest citrus nursery in Florida, provided us with an insight into how commercial citrus nurseries should be set up when HLB and ACP are present. Prior to the arrival of HLB and ACP the nursery was much smaller and grew trees in containers under shade cloth. When the new Florida regulations were introduced Phillip made the decision to build a 'state of the art', insect proof production nursery with a loan of US\$4M. The nursery was re-established in 2007 with a square footage of 210,125, comprising 64 houses, an annual tree capacity of 1.1 million and employs over 40 workers. All production, dispatch and growing areas are contained within the insect proof facility. The greenhouses are covered in polycarbonate with the amount of insect proof screen minimised. This is because the screen is vulnerable and more easily breached than polycarbonate. The screen is replaced every few years because experience has taught them that no matter the quality of the mesh, the threads still separate over time creating holes. Biosecurity measures



*New greenhouse development and rolling bench system at Philip Ruck's nursery.*

to avoid canker include anti-bacterial foot baths and spray booths for entry to the facility. Staff change into uniforms and visitors are asked to wear a lab coat and not touch the plants. All areas are environmentally controlled with growing areas maintained at a higher temperature (90°F = ~32°C) than the working areas (~24–27°C). The nursery has a Dutch rolling bench system that allows one person to take care of about 40,000 trees per year. Rucks obtains buds from the Florida budwood scheme's foundation trees which are then propagated as their budwood multiplication trees. Currently, Rucks has one of the largest nursery budwood sources in the state. These trees are kept in insect proof conditions for 3 years while buds are cut from them (approx. 4 times per year) after which they are replaced. Rootstock seed is either grown by the nursery or purchased from a citrus seed supplier, mainly Carrizo and Swingle but US 812 is recommended if growers have a problem with *Diaprepes* weevil. Their potting media contains 30% Canadian peat and 70% pinebark with dolomite, phosphorous and slow release fertiliser added. Plants are also drip fertigated and top dressed. Plants are propagated using an inverted T bud and the rootstock is completely cut off at the time of budding. Plants are overhead irrigated twice a week in summer and every 17 days in winter because the cooling system dries the plants out more in summer. Mites (broad and two-spotted) are their biggest pest problems but they also have issues with leaf miner on the young flush and armadillos burrowing under the structure.

The nursery employs a full-time stock control clerk and uses a wireless inventory control system from BizSpeed to track thousands of citrus trees that are growing at any given time. The system uses Symbol-Motorola MC9090 handheld computers that have wireless and barcode capability, along with a Motorola wireless network. Rucks citrus trees are grown on 320 movable benches, with each bench holding up to 311 trees. For a given table, the clerk uses the mobile computer to enter tree variety (liners or budded trees), grade of the trees, quantity on bench, associated customer, root date, propagation date, estimated finish date, general notes and bench location. The shipping screens support scanning benches as they are placed into a truck, which automatically records products shipped to the customer by barcode and prints a Shipping Ticket. Each bench has a unique barcode label and each row in the greenhouse has a unique barcode label that identifies the range and row for that bench. At any time, reports can be run that will show inventory locations, varieties, grades, customers, quantities, etc. All sales are on a contract basis with payment required from

growers throughout the growing phase, US\$2 per tree paid at the time of sowing the rootstock seed, US\$2 per tree paid at time of propagation and the balance paid on tree delivery. Growers have 60 days to pick up trees, after that they are charged a holding fee (US\$0.50/tree/month).

The group also visited the tissue culture laboratory that is not operating at full capacity but was designed to produce 5 million trees per year. Some rootstocks are tissue cultured if the seed supply does not meet the demand.

### ***Industry impacts and management strategies***

The study tour provided the participants with an insight into some of the impacts that HLB, ACP and canker have had on the Florida citrus industry. These are some general observations.

**Citrus industry:** The Florida citrus industry has been fighting citrus canker since 1995 with several hurricanes spreading the bacteria throughout the state. ACP was first found in Florida in 1998, with HLB detected in south Florida in 2005. In October 2006 HLB infected trees had been found in 12 counties, by October 2007 this figure had risen to 28 counties and now all citrus producing counties have infected trees. These problems have resulted in significant losses in production area and yield.

Management of ACP and HLB has largely relied on growers undertaking removal of infected trees and chemical control of ACP — although this is not a mandatory requirement. The result has been an increase in the number of abandoned orchards due to growers being unable to bear the huge costs associated with both tree removal and the chemical control program. These neglected orchards are a potential source of infection for the rest of the industry. The ACP control strategy includes an area-wide approach to management during winter, combined with pest monitoring and the use of targeted chemical applications throughout the growing season. Broad spectrum insecticides are used such as fepropanthrin, imidacloprid, lorsban, carbaryl, aldicarb, dimethoate and pyrethroids. New fogging spray systems are being used with low volumes (2–5 gallons/acre) in addition to aerial sprays. Some orchards are experiencing up to 6–8 ground applications and 2–3 aerial applications per year. The chemical control program required has devastated the citrus IPM system which had been successfully implemented over the past 20 years. Overall the industry is struggling to manage ACP and HLB and at this stage the long-term future viability of the Florida citrus industry is questionable. Some in the

industry are pinning their hopes on the development of resistant varieties and rootstocks in the next 5 years — although the likelihood of this happening in a short time frame is questionable. The tour participants and some of the Florida researchers commented that the development and commercialisation of HLB resistant citrus is more likely to be 20 or more years away.

**Citrus nurseries:** When ACP was first detected in Florida in 1998, a lack of action by industry and government led to the widespread establishment of the pest. With the detection of HLB in Florida orchards, the citrus nursery industry had to make significant changes to their operations. The Florida Citrus Budwood Protection Rule 5B-62 was introduced on the 1<sup>st</sup> January 2007, requiring all citrus nursery propagations to occur in an enclosed greenhouse. After the 31<sup>st</sup> December 2007 no trees could be sold unless they were propagated in an approved structure. New greenhouses must be insect proof, have positive pressure displacement, have double entryways and be on an approved site. Additionally each nursery has to be inspected every 30 days. These changes had a significant impact on both the nursery and citrus sectors. Many nurseries went out of business unable to finance new facilities with the flow on effects including a shortage of nursery trees and increased cost of trees for industry. In the short term there was also a critical shortage of propagation budwood for nurseries due to the loss of government budwood facilities, because these also were not held in insect proof greenhouses. Added to this is also the cost of implementing and managing the government inspection service.

### ***Florida Citrus Show – Fort Pierce, Florida.***

The Florida Citrus Show is dedicated to providing citrus growers with the latest information on new production techniques and industry trends. The program at the 2010 show included updates on insect and disease control (mainly HLB, ACP and canker), nutrition and irrigation management and new scion varieties and rootstocks. Presentations from the show are available to download at <http://stlucie.ifas.ufl.edu/2010FLCitrusShowPresentations.html>

### ***References***

Richards TJ (2009) California Citrus in 2009: Impact Analysis and Policy Simulation. California Citrus Mutual. USA.

The study tour report '*Huanglongbing and Citrus canker study tour to USA* Project CT09043 is available from Horticulture Australia Ltd.

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# Controlling mites in coastal citrus

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*Sandra Hardy, Industry Leader – Citrus, I&I NSW, Gosford and Andrew Beattie, Professor of Agricultural Entomology – University of Western Sydney, Hawkesbury.*

## Introduction

There are several plant feeding mites which can cause damage to citrus fruit. They include:

- **Broad mite** – which damages mostly lemons and limes causing fruit silvering.
- **Brown citrus rust mite** – which causes a shiny brown russeting on fruit, usually on the exposed sides (i.e. facing the outside of the tree).
- **Citrus bud mite** – which causes fruit to be distorted or deformed.
- **Citrus rust mite** – which causes a surface bronzing, usually on the protected sides of fruit (i.e. facing the inside of the tree). Can be confused with damage caused by brown citrus rust mite.
- **Two-spotted mite** – which causes pale yellow-green stippling on the fruit rind.
- **Citrus red mite** – which causes straw coloured stippling of the fruit rind. (citrus red mite is a quarantine pest only found in the Sydney and Central Coast regions).

On the coast, the mites that cause the most economical damage to citrus fruit are the rust mites (mainly affecting Valencia and navel oranges) and broad mite (mainly affecting lemons and limes). Fruit damage is a result of the mites piercing the surface cells and sucking out the cell contents. Often the damage is not noticed until the fruit start to colour and mature, by which time the mites may be long gone and it is too late for control. On the coast, citrus trees and fruit should be checked for mites fortnightly between November and May. A guide to the main mite pests of coastal citrus is outlined in Table 1.

Most mites are very small and not readily seen with the naked eye. To look for mites you need to use a 10x hand lens. Most mites have a lifecycle that has 4 stages – egg → larvae → nymph → adult. The lifecycle is completed in 3-4 weeks in summer and in just 2 weeks for the eriophyid mites (~rust mites and bud mite). During winter the mites are generally dormant, over-wintering as either adult females or eggs.

In coastal areas most plant feeding mites are controlled by natural predators and pathogenic fungi and usually do not cause enough damage to warrant spraying. However mites can be a problem if the right climatic conditions occur and there are few natural predators present. Pesticides especially organophosphates and pyrethroids severely disrupt natural predators and mite problems can occur as a direct consequence of the pesticides used in the orchard. Additionally fungicides, such as copper sprays reduce the natural pathogenic fungi living on the tree branches and twigs and also impede predation by ladybeetles. Most mites have a broad host range infesting weeds other fruit and vegetable crops and ornamentals — so it is important that the orchard is kept free of other host plants.

## Control strategies

There are a range of options to try — depending on your circumstances. You need to regularly monitor young citrus fruit and foliage between November and May to work out when mites are present and then target this period using a combination of the available control measures. Pay special attention if relative humidity in late summer and early autumn is above average, as rust mite and broad mite populations increase rapidly in warm moist weather. If chemical control is required it is important that you get good spray coverage of the plant parts where the mites are feeding — this is especially important for bud, broad and rust mites which prefer protected sites (in flower buds, between fruit, under leaves and inside the trees).

Mites can be difficult to control because:

- they are small and difficult to see;
- infestations can develop very quickly during ideal weather conditions — so regular monitoring is essential in order to identify a mite problem and apply suitable control measures;
- there are many generations of mites per year so damage can extend over a long period, especially if weather conditions are right;
- the pesticides registered for mite control in citrus have a limited impact on eggs — so one spray on its own will not usually be effective. A selection of control measures needs to be used in order to control any nymphs that hatch from the eggs that are not killed.

Table 1 – Main mite pests of coastal citrus

| Mite                                 | Pest location & damage  | Damage  | Monitoring      | Natural predators   | Other information   |
|--------------------------------------|---|---|-----------------|---|---|
| Brown citrus rust mite (0.18mm long) | Young green fruit and mature leaves, in exposed positions.                              | Smooth dark brown blemish on exposed fruit surfaces and leaves. Blemish cannot be scratched off.                      | November to May | Predatory mites: <i>Euseius elinae</i> ; <i>E. victorienis</i> ; <i>Amblyseius herbicolus</i> and <i>A. lentiginosus</i>                                      | Prefers warm-humid conditions. Damage more common on oranges and mandarins. 20–30 generations/yr.   |
| Broad mite (0.2mm long)              | Young foliage and newly set fruit in spring-summer. Prefers protected sites.            | Thin silver-grey "sharkskin" scarring, which can be scratched off.  | November to May | Predatory mites: <i>E. victorienis</i> *, <i>E. elinae</i> ; <i>A. herbicolus</i> and <i>Neoseiulus cucumeris</i> *   | Lemons & limes most susceptible – especially fruit set during summer/autumn. Most damage done to lemons when 1–4 cm long. Limes susceptible till they are two-thirds mature. Prefers high humidity & populations often increase following rain. Does not like dry conditions. 20–30 generations/yr.   |
| Bud mite (0.17mm long)               | Leaf buds, blossoms.  | Twisting and distortion of fruit and young leaves   | November to May | Predatory mites: <i>E. victorienis</i> *, <i>E. elinae</i>  | Most susceptible varieties are Lisbon lemon, navel oranges & grapefruit. 20 generations/yr.   |
| Citrus rust mite (0.15mm long)       | Young green fruit, leaves (undersides) & twigs, in sheltered positions inside the tree. | Slightly rough brown blemish on protected (inside facing) fruit surfaces and leaves. Blemish cannot be scratched off. | November to May | Predatory mites: <i>E. victorienis</i> *, <i>E. elinae</i> ; <i>A. herbicolus</i> and <i>A. lentiginosus</i>  | Prefers warm humid conditions. Damage more common on grapefruit and lemons. 20–30 generations/yr.   |
| Citrus red mite** (0.5mm long)       | Leaves, twigs and fruit.  | Straw coloured stippling of fruit and leaves.   | November to May | Predatory mites: <i>E. elinae</i> ; and <i>A. lengtiginosus</i> *. Predatory ladybeetles: <i>Stethorus nigripes</i> .   | Oranges preferred host. Does not like hot dry conditions or prolonged periods of high humidity. Not a major pest in commercial orchards on the Central Coast as natural predators keep in check. 8–10 generations/yr.<br><b>**NB Citrus red mite is a Quarantine Pest</b> — only present in the Sydney and central Coast regions. Nursery trees & plant material needs to be treated before sending to other regions. Contact your local regulatory inspector for more information. |
| Two-spotted mite (0.5mm long)        | Young shoots, mature leaves & fruit.  | Pale yellow-green stippling of leaves & fruit.  | November to May | Predatory mites: <i>Phytoseiulus persimilis</i> * and <i>Typhlodromus occidentalis</i> *. Predatory ladybeetles: <i>Stethorus nigripes</i> and other species. | Meyer lemons especially. 10–20 generations/yr.  |

\* These predatory mites are available commercially from suppliers of beneficial organisms such as Bugs for Bugs in Mundubbera, QLD or Biological Services in Loxton, SA.



*Brown citrus rust mite damage on an orange.*



*Bud mite damage on a lemon.*



*Broad mite damage on a lemon.*

## **Control measures**

### **Predatory mites**

There are a range of predatory mite species that feed on plant feeding mites. Predatory mites naturally occur in citrus orchards but their presence can be severely affected by the pesticides you use. Organophosphate and pyrethroid pesticides severely disrupt these natural predators. Quite often mite problems occur as a consequence of the pesticides being used in the orchard. Aim to select pesticides such as mineral oils (MO) which have a minimal impact on beneficial insects.

For best results predatory mites need to be introduced early in the season when the pest mite first starts to appear (i.e. numbers are low), well before the main population peak. Several releases of predatory mites a couple of weeks apart may be required. On the north coast of NSW releases may also need to be made each year. If you want to promote and use these natural predators then you will need to watch what pesticides you use in the orchard. Predatory mite release could be used in conjunction with MO sprays. Additionally the targeted use of mancozeb, zineb or sulfur sprays could be used – remembering that these can also harm some predatory mites.

Some species of predatory mites are commercially available and can be purchased from suppliers of beneficial organisms. Two companies who deal with citrus crops include Bugs for Bugs in Mundubbera 07 4165 4663 or Biological Services at Loxton (08) 8584 6977.

### **Pesticides**

There are a range of pesticides specifically registered for mite control on citrus, including abamectin, sulfur, mancozeb, zineb and mineral oils. A summary of these products is contained in Table 2. Not all products are registered for all mites, check product labels for full registration details.

**Mineral oils (MO):** Horticultural mineral oil or agricultural mineral oil sprays have been shown to reduce mites from feeding and laying eggs (oviposition). MO's will also suffocate adults & juveniles. Use high volume low dose sprays of MO (i.e. 0.3–0.5%). Depending on mite numbers, several sprays, 2 weeks apart may be required. You need to get good coverage of plant parts where the mites are feeding. Remember the total amount of oil used in one season should not exceed 2%. Do not apply MOs in high temperatures (>35°C) or high humidity (>90%). Do not use sulfur within 1 month of an oil spray. Do not apply to moisture-stressed trees.

Table 2: Products registered for control of mites in citrus

| Active ingredient                      | Registered Trade name® | Activity  | Stage controlled                                       | Comments/precautions   |
|--|------------------------|---|--|--|
| Abamectin                              | Vertimec               | Contact and stomach action, limited systemic activity but some translaminar movement. | Juveniles and adults. Does not kill mite eggs.         | Only 1 spray permitted per year. Will kill predatory mites – a gap of at least 2 weeks necessary before release.   |
| Mineral oil (MO) (petroleum spray oil) | Various                | Contact/smothering action. Oil deposits reduce feeding and egg laying.                | Eggs, juveniles and adults.                            | Do not use in hot weather. Do not use in high humidity. Do not apply to moisture stressed trees. See Agfact H2.AE.5 for all precautions for use. .   |
| Mancozeb & Zineb                       | Various                | Contact action.   | Juveniles and adult rust mites. Do not kill mite eggs. | Although fungicides, these products have a suppression effect on rust mites. They should not be relied on solely to control rust mites. They have also been found to increase populations of Tetranychid mites such as two-spotted mite. |
| Sulfur                                 | Various                | Contact action.   | Juveniles and adults. Does not kill mite eggs.         | Do not use in hot weather. Do not use within 1 month of an oil spray. Will kill predatory mites – a gap of at least 1 week necessary before release.   |

See Agfact H2.AE.5 “Using petroleum-based spray oils in citrus” for all precautions. The Agfact is available on the I&I website at [www.dpi.nsw.gov.au](http://www.dpi.nsw.gov.au).

**Abamectin** (Vertimec®): is a miticide that kills by contact or ingestion. Only one spray is permitted annually to reduce the chances of mites developing resistance to this chemical. The one abamectin spray per year is probably best used for knocking out a high population of adults and nymphs. Abamectin will not kill mite eggs, so you need to follow up this spray with some other control measure to kill any hatching juveniles. Abamectin is toxic to predatory mites and can have an affect on natural predators for at least 2 weeks after spraying.

**Sulfur:** Sulfur is registered for use against some citrus mites, but will also kill some beneficial predatory mites. You need to leave a gap of 1 week after a sulfur spray before introducing predatory mites. Use recommended rates every 14–21 days during the susceptible fruit development period. Do not use sulphur in hot weather — pesticide labels recommend use on citrus only in mild weather in spring, autumn or winter. Do not use sulfur within 1 month of an oil spray.

**Mancozeb & Zineb:** Although fungicides, mancozeb and zineb have been shown to have a suppression effect on eriophyoid mites which include rust mites and bud mite. These products are not considered to be effective on their own, but need to be used in conjunction with other control measures. These fungicides may also reduce populations of some of the predatory mite

species. Mancozeb and zineb are not effective against Tetranychid mites which include the two-spotted mite and can actually increase densities of this mite.

### Best Practice Tips

- ☑ Encourage a good population of beneficial insects in your orchard by selecting pesticides which have minimal impact, such as MO.
- ☑ Minimise growth of broadleaf weeds.
- ☑ Using a hand lens regularly check young developing fruit/foliage for mites between November and May in coastal areas.
- ☑ When a heavy mite infestation is identified - immediate control is often necessary to prevent damage to developing fruit, especially if climatic conditions in late summer and early autumn favor rapid mite development.
- ☑ If chemical control is required more than 1 pesticide application will normally be required because the registered pesticides have a limited impact on mite eggs.
- ☑ Predatory mite releases need to be done early in the season when pest numbers are low. On the north coast of NSW predators may need to be released every year.
- ☑ Some sprays are toxic to natural predators — so be careful of the sprays you use.

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# Managing Citrus gall wasp

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Industry Leader – Citrus, I&I NSW

Extracted from Primefact 1010, Citrus Gall Wasp. For the full Primefact go to [www.industry.nsw.gov.au](http://www.industry.nsw.gov.au)

## Introduction

Citrus gall wasp, *Bruchophagus fellys*, is an Australian native insect pest whose natural host is the Australian finger lime (*Citrus australasica*).

Citrus gall wasp has traditionally been a pest of citrus trees in the growing regions of Queensland and northern and central coastal NSW, but can also be found in the central inland citrus growing regions of NSW. In the past decade it has been found in isolated pockets in the southern growing regions of the Sunraysia and riverland areas and more recently has been identified in backyard trees in the city of Griffith.

The movement of citrus gall wasp into other regions of Australia is thought to have occurred mainly through the distribution of infected nursery trees. It is recommended that on arrival any new trees should be thoroughly checked for the presence of galls, especially highly susceptible varieties such as lemons and grapefruit. If galls are found, contact the nursery and return the trees to avoid gall wasp establishing in your orchard or region.

Citrus gall wasp infests young flush growth in spring causing woody galls to form around the developing larvae (Figure 1). Heavily infested trees can be covered with galls, reducing crop yield and causing branch dieback. All varieties can be attacked but lemons, grapefruit and some rootstocks (e.g. rough lemon, troyer citrange) are most susceptible. Two parasitic wasps are important natural enemies of citrus gall wasp and where present should eventually keep the pest in check.

## Description

The gall wasp has a 12 month lifecycle producing only one generation per year (Figure 2). The small (2.5 mm), shiny-black coloured adult wasp emerges in spring. Adult wasps live for 5–14 days. They lay about 100 eggs under the fresh young green bark of the spring flush.

The larvae hatch after about 2–4 weeks where they feed inside the stem for 9–10 months. Unsightly woody galls form around the developing larvae (Figure 3). After a



Figure 1. Old and new galls on citrus branch caused by citrus gall wasp larvae.

short pupation period the adult gall wasps emerge in spring (Figure 4). Wasp emergence is closely linked with tree phenology and is associated with the appearance of the spring growth flush. After emergence the adult wasps normally do not move very far, but can be transported longer distances on prevailing winds.

## Monitoring

In orchards with citrus gall wasp, monitoring for infestation levels can be undertaken between June and September.

Suggested monitoring protocol:

- Check 5 sites (branches) per tree and monitor 20 trees per block.
- record the presence or absence of galls and their size (small/medium/large).



Figure 2. Citrus gall wasp lifecycle.  
 1. Eggs. 2. Legless larva. 3. Pupa. 4. Adult wasp.  
 5. Emergence holes of adults. 6. Galled lemon twig showing exit holes of adult wasps. 7. Portion of gall cut open to show chambers or cells in which the wasps develop. 8. Adult wasps laying their eggs in a young succulent shoot. (E.H. ZECK July 1965 – Agricultural Scientific Collections Trust)

- An active management program should be implemented if there is greater than a 30%\* presence of galls.

\*In regions with no natural parasitoid populations any amount of gall wasp infestation should be actively controlled to avoid spreading the pest throughout the orchard and/or growing region.

### Management

The preferred long term management option for control of gall wasp is to rely on the use of the natural beneficial insects (parasitic wasps).

Cultural practices such as the application time of fertilisers and the timing of pruning operations are important strategies to help reduce gall wasp numbers, by limiting the amount of suitable flush into which adults can lay their eggs.

The current chemical treatment is difficult to time, does not provide complete control of the pest and is disruptive to Integrated Pest management programs.

### Natural enemies

Both *megastigmus brevivalvus* and *m. trisulcus* are important natural enemies of citrus gall wasp. These parasitic wasps insert their eggs directly into the gall wasp egg where it slowly develops in the host larva, eventually killing it. *Brevivalvus* is usually the more abundant parasite present and when well established can parasitise more than 90% of gall wasp larvae. Peak emergence of the adult parasite wasp is about 2–3 weeks later than that of citrus gall wasp.

Currently the only commercial supplier of parasitoids is 'Bugs for Bugs' in munduberra Qld and supplies are limited. Additionally the parasitoids are normally only available between late October and early November – which does not always coincide with the correct time for release in some regions.

Ideal timing for parasitoid release is 3 to 4 weeks after gall wasp emergence is complete. Ideally parasitoids should be released close to galls in small lots. It is estimated that parasitoid release needs to be undertaken annually for 3 to 5 years in order to establish a local population in the orchard/region. It is important to assess both parasite establishment and levels of parasitism after release, especially in regions outside coastal NSW and Queensland.



Figure 3. Woody galls forming around developing gall wasp larvae.



Figure 4. Emergence of adult citrus gall wasps; note the small black wasps and the emergence holes.

## Cultural practices

Where gall wasp is a problem, it is important to reduce the amount of spring leaf flush which is suitable for wasp oviposition (egg laying). Over-fertilisation (particularly heavy nitrogen applications) can promote excessive amounts of spring flush.

Observations from some orchards with citrus gall wasp infestations in the Sunraysia region showed that severely affected trees were growing vigorously under a high fertiliser regime and had lots of young flush growth. Galls also appeared to be more abundant in the lower parts of the tree canopy, which may be a result of the more humid micro-climate caused by the use of under-tree sprinklers.

Hedging, pruning and skirting operations are best undertaken immediately after gall wasp emergence is completed to reduce the amount of new growth suitable for egg laying.

Removing gall infected shoots at least 1 month prior to wasp emergence (i.e. before September), will also help to reduce adult populations. The fresh prunings should be slashed or mulched to accelerate the drying/decomposition process.

## Chemical control

Currently the only chemical registered for control of citrus gall wasp is methidathion (Supracide®). Supracide® is a Schedule 7, non-systemic pesticide (Dangerous poison) and is highly disruptive to Integrated Pest management systems.

Chemical treatment is difficult to time and does not provide complete control of the pest. Currently spraying is only recommended in commercial orchards with high infestation levels and for highly susceptible varieties. For example, spraying lemons or grapefruit adjacent to infested blocks should help to reduce the spread of gall wasp in the orchard. If chemical control is required, apply Supracide® to the spring flush of infested trees 4 weeks after gall wasp emergence is completed. Do not use Supracide® in blocks where parasitoids are being released.

## Acknowledgements

We would like to thank Dan Papacek (Bugs for Bugs) and Dr. Andrew Beattie (University of Western Sydney) for their valuable contribution to this publication.

# Flushing drip irrigation systems

*Jeremy Giddings, Irrigation Officer, Industry & Investment NSW, Dareton.*

Source: Murray Valley Citrus Board, Citrep Newsletter No. 61

Drip irrigation is becoming the most common method of irrigation for citrus growers. Managers who adopt drip irrigation also need to begin implementing the appropriate management practices that are required for it to function correctly.

The most important of these is the need to flush the irrigation system regularly. Filtration is also important with drip irrigation, however, the filter system is not designed to remove all particles from the water source.

Good drip filtration should remove particles at least 130 microns and above. Clay particles are typically less than 2 microns so they are allowed to pass through the filters and emitters. However, not all of this material passes through the system, and if algae and other organic material exist, coagulation can occur. The only way to remove this from the system is by flushing.

Important points to remember when flushing are:

1. Flush in the correct order - main, submain, laterals.
2. When flushing the laterals, wait for the second slug of sediment to be removed before closing the end of the lateral.
3. If flush valves exist on laterals, these should be removed at least once per season to ensure a good flush occurs.
4. A flushing velocity of greater than 0.5 m/sec is required to obtain a good flush. To determine if this is the case run the water from a lateral into a bucket and time for one minute. A good rule of thumb is a discharge of no less than 5 l/min for 17 mm diameter laterals, and greater than 7 l/min for 20 mm diameter laterals.
5. Take note of the sediment being flushed. If it is thick and dark in colour, more frequent flushing is required.

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# Management of the Australian Plague Locust in citrus orchards in NSW

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## ***Frequently asked questions***

### ***Will locusts feed on citrus trees?***

Locusts have a preference for green grass or herbage – but if none is available they will feed on anything green including citrus trees. On rare occasions, citrus have been attacked by adult locusts.

### ***What to look for and where?***

Adult locusts prefer to lay eggs on compacted undisturbed ground and bare earth areas such as unsealed roads, nature strips, road sides and unploughed paddocks. When nymph locusts first emerge they are translucent, wingless and very difficult to see. After 1-2 days in the sun they turn darker and become more noticeable. They are usually about 3-4mm long. Around the 2/3rd instar stage of development they begin to congregate in a band. These bands are generally 1-2m in width and can vary in length from a few metres to 1-2 kilometres. Nymphs, after 5 instar stages of growth, then fledge and develop into adult locusts. Adult locusts have fully developed wings and can swarm and migrate to other areas.

### ***When will they appear?***

In 2010, in southern NSW the first hatching is expected to commence mid to late September, depending on temperature and weather conditions. Hatching will occur a few weeks earlier (end of August) in northern NSW and southern Queensland.

### ***What to do when you see locusts?***

There is a requirement to report all locust activity. If you see any locust activity please report this to your local Livestock Health and Pest Authority (LHPA). Your report will be assessed and prioritised for inspection.

### ***How do I control nymph locusts?***

The control of locusts is most effective when undertaken at the nymphal 'banding' stage. When locusts are in these dense bands they are congregated together and this reduces the need for broad-acre spraying. **All NSW property owners are legally obliged to report and**

**control locusts on their property under the Rural Land Protection Act 1998.**

The only insecticides/biological agent that can be used for locust control in citrus orchards are metarhizium which is registered, or maldison and chlorpyrifos which are both covered by an APVMA permit (Permit 11843, expiry date 30/10/11).

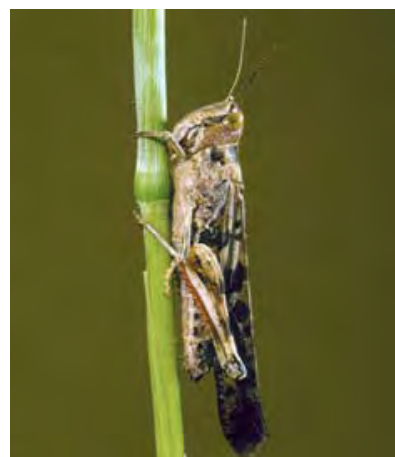
The best time for insecticide control is when the locusts are 'banding'. Apply insecticides using a boom or boomless jet. For best results, spray the locust band as well as the area directly in front of the moving band (i.e. at least 5-10m ahead). To avoid spray drift onto non-target areas/crops, use the boom as per label instructions and use appropriate nozzles (please refer to the Department's Spray Drift Agnote available at [www.dpi.nsw.gov.au](http://www.dpi.nsw.gov.au)). Since the locusts favour grass, there should be no need to spray the actual citrus trees. It is a requirement under the pesticides Act to keep spray records.

### ***Can I control adult locusts?***

The spraying of adult locusts once they have swarmed and are mobile is considered to be ineffective and raises safety concerns. Mobile swarms are extremely difficult to target with the pesticide spray and it is also hard to implement effective spray buffers to avoid spray drift onto sensitive areas.

### ***Where do I get more information?***

More detailed information on plague locusts is available from the Department of Industry and Investment NSW website at [www.dpi.nsw.gov.au](http://www.dpi.nsw.gov.au)



# Using chlorine-based sanitisers in packingsheds

Source: Packer Newsletter, Vol 97, June 2010

Nancy Cunningham, SARDI

Over the last decade the use of sanitisers in Australian citrus packingsheds has increased significantly. Many who work in citrus packingsheds know that sanitation plays a key role in reducing the spread of decay. Using sanitisers to clean equipment or to sanitise wash water or fungicide tanks reduces the risk of contaminating healthy fruit with spores of sour rot (*Geotrichum citri-aurantii*) or blue and green mould (*Penicillium italicum* and *P. digitatum*). Sanitation can also reduce bacteria levels including human pathogens *Salmonella* and *E.coli*.

Many packers often contact us to ask, “what is the best sanitiser for my shed?” The answer to this is not as simple as rattling off a particular sanitiser product — each shed is different and there are many things to consider before choosing one that is best suited to any particular shed. The wide choice of sanitisers on the market can also make the decision difficult. Essentially all sanitisers generally do the same thing or have the same ‘mode of action’. That is to disrupt the membrane of the fungal cell wall. Depending on the circumstances some sanitisers can be more effective than others in certain situations (for example high organic loads). In this article I am going to focus on the main sanitiser that packingsheds are familiar with — hypochlorite’s and will discuss some of the issues that packers may face when using this particular sanitiser.

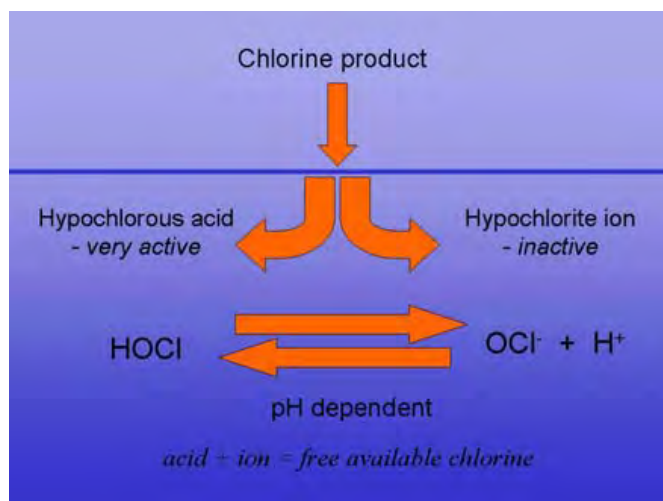


Figure 1 shows how hypochlorite (as chlorine product) dissociates in water – the relationship is dependent on the pH of the solution.

## Chlorine

Chlorine based sanitisers are the most widely used sanitisers in the world. In citrus packingsheds the most common form of chlorine used is sodium hypochlorite (common ‘bleach’) or calcium hypochlorite (pool chlorine). The chlorine dissociates in water to form hypochlorous acid — the main antimicrobial ingredient. The amount of hypochlorous acid in any mixture will be dependent on the pH of the solution. Figure 1 illustrates this point.

The hypochlorous acid (activity) is highest in the acid pH range, but it gases off quickly. The reverse is true in the alkaline range, where hypochlorous acid (activity) is lower, but more stable. The best compromise is considered to be a pH of 7 (see Table 1).

| pH | % Hypochlorous acid |                                   |
|----|---------------------|-----------------------------------|
| 3  | 99.7                | Very high activity, Very unstable |
| 6  | 97                  | Very high activity, Very unstable |
| 7  | 75                  | High activity, stable (ideal)     |
| 8  | 28                  | Low activity, stable              |
| 9  | 3                   | Very low activity, stable         |

Table 1 shows the percentage of hypochlorous acid (activity) at different pH. The most stable with high activity is around pH 7.

## Advantages

Hypochlorites are cheap, readily available and easy to mix and use. Some forms of hypochlorite are available for use in automatic dosing machines — however many do not incorporate automatic buffering devices.

## Disadvantages

When mixed, hypochlorites tend to be in the alkaline range (pH 8–10) with little or no active hypochlorous acid, so buffering is required to bring it down to a more neutral pH. High concentrations of hypochlorites (above recommended) can cause corrosion to packingshed equipment. Organic matter (large amounts of leaves and debris from trees and rotting fruit) can rapidly deactivate available chlorine.

The Packer Newsletter can be found at [http://www.sardi.sa.gov.au/foodinnovation/publications/citrus\\_packer\\_newsletter](http://www.sardi.sa.gov.au/foodinnovation/publications/citrus_packer_newsletter)

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# What does your chlorine test strip measure?

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Peter Taverner, SARDI

Source: Packer Newsletter, Vol 97, June 2010.

If you have just read Nancy's article on chlorine-based sanitisers, then I suggest that you read on.

When first looking at chlorine tests, I assumed that the parts per million (ppm) reading in tests were giving me a direct reading of activity; but I wasn't sure. So, I spent some time reading various articles on chlorine chemistry to find a clear, simple explanation on the relationship between the various 'chlorine' readings and their biocidal activity. I didn't really find it. However, I did get a basic understanding on the relationship between pH and activity.

When 'chlorine' is mixed with water it separates into two parts; the hypochlorous acid and the hypochlorite ion. The total of the acid and ion components is called the free available chlorine. This total is usually what the test strip reads. If you read Nancy's article you will realise that the level of acid alters with pH, and it is the acid that is biocidally active. However, the total remains the same; only the proportion of these two components varies with pH. This means test strips read the same free chlorine (ppm) regardless of the proportion of acid. In other words, the test strip reading doesn't give you all the information; you need to find out the pH as well.

If we assume a solution reading of 100 ppm; what can we say about its activity? From Table 1 in Nancy's article,

- at pH = 7, 75% acid (75% of 100 = 75 ppm)
- at pH = 8, 28% acid (28% of 100 = 28 ppm)
- at pH = 9, 3% acid (3% of 100 = 3 ppm)

The above calculation is simplistic, but you should get the point. All these solutions give the same reading (of 100 ppm), but their activity is very different depending on the pH of the solution.

As you are aware, some of our water tends to be on the alkaline range before adding sanitisers. In addition, we advocate adding carbonate salts, which shift the solution further into the alkaline range. You can compensate by changing to sanitisers that are less sensitive to pH, but can also still use hypochlorites if you are careful with your pH range. However, you may need to increase your rates.

If you topped up a solution at 400 ppm, you could theoretically maintain good activity somewhere between pH 8–8.5. The solution may only have 15% as acid, but this is 15% of 400 ppm (~60 ppm). There are even some advantages to using a more alkaline solution. The alkalinity reduces the risk of corrosion, despite the higher overall chlorine concentration

The main message is that you need to know both the concentration and pH to determine the biocidal activity of your hypochlorite solution. If you understand this you may be able to manipulate either the pH or the concentration to achieve the level of biocidal activity you require.

## ***New post-harvest fungicide available***

Source: Syngenta Crop Protection Ltd, 21/6/10

Australian fruit growers and packers are set to reap immediate benefits from the introduction of the first new post-harvest fungicide in more than 20 years. SCHOLAR®, from Syngenta Crop Protection, is a completely new chemistry group offering a unique mode of action. Its broad-spectrum disease control capability makes it an excellent risk management option in terms of disease resistance. SCHOLAR's active ingredient – Fludioxonil – delivers protectant activity which provides an anti-sporulation effect, reducing the potential spread of disease in the packing shed, during shipment and long term storage. SCHOLAR is derived from a natural compound (the soil-borne bacterium, *Pseudomonas pyrrocinia*) and is considered a reduced-risk fungicide, having a very favourable residue and environmental profile. The product has been registered in the USA for some time.

SCHOLAR's is now registered for the following uses:

- Citrus diseases Blue Mould (*Penicillium italicum*), Green Mould (*Penicillium digitatum*) and Diplodia stem end rot;
- Pome fruit diseases Blue Mould (*Penicillium expansum* and *P. solitum*) and Grey Mould (*Botrytis cinerea*);
- Stone fruit diseases Brown Rot (*Monilinia spp.*), Grey Mould (*Botrytis cinerea*) and Rhizopus Rot (*Rhizopus stolonifer*); and
- Kiwi fruit disease Grey Mould (*Botrytis cinerea*).

# Day versus night time irrigations

Jeremy Giddings, Irrigation Officer, Industry & Investment NSW

Source: Murray Valley Citrus Board, Citrep Newsletter No. 59

Lower allocations have forced irrigators to look at their water management more critically. One relatively simple method of ensuring more water is used by the tree is to irrigate at night rather than throughout the day. The benefits of watering at night have always seemed logical, but also anecdotal.

The graphs below demonstrate the benefit of night time irrigations compared to day time. The EnviroSCAN graphs represent six 10-hour irrigations from late January to early March, 2002. Mature Washington Navel trees in the Coomealla District were irrigated with full cover under tree sprinklers. As can be seen by Graph 1, the first, second, fifth and sixth irrigations were much more effective, producing higher peaks in soil water content at each irrigation. The middle two irrigations (third and fourth peak), were less effective, with the peaks approximately 2/3's the height of the other irrigations.



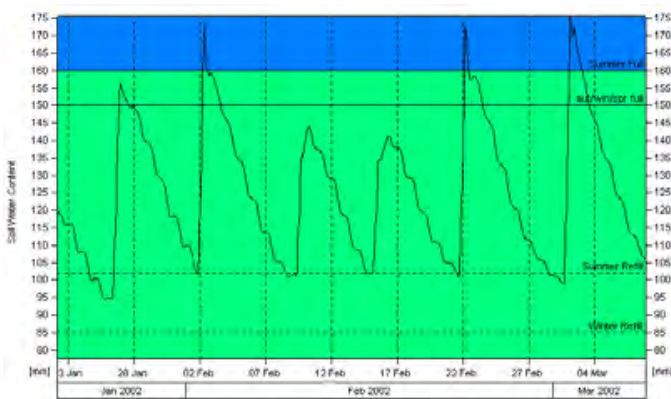
The difference between these peaks is that the middle two irrigations were applied during the day, whilst the other four were applied at night.

Graph 2 shows the split level graph which provides managers with an indication of the water depth of penetration. The middle two irrigations did not reach 80 cm depth (circled), whereas the two irrigations either side of this did reach 80 cm in depth, and even reached 110 cm. All of these irrigations were applied for 10 hours.

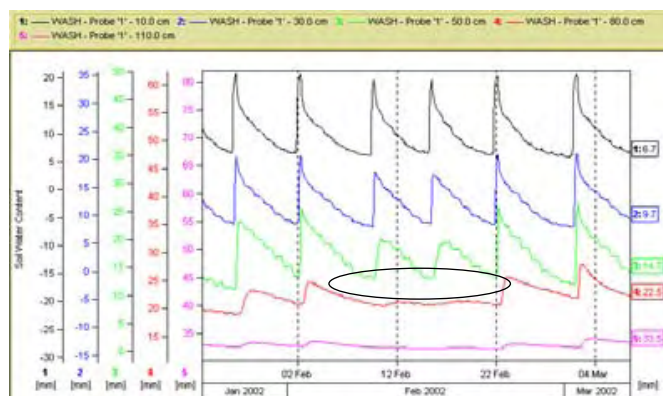
As the two middle irrigations were not as effective, the irrigation interval following these needed to be narrowed from seven days down to five days, to avoid moisture stress. Whilst this does not sound like much of a saving, if the same amount of water was able to supply the tree for seven days instead of five over the November to the February period, approximately 7–8 fewer irrigations would be required, resulting in an approximate water saving of 3–4 ML/Ha. This assumes that the manager has recognised the greater water requirement needed for daytime irrigations and is applying extra as a result. If not, the trees are being under-watered.

The example described relates to low level sprinkler irrigation. Similar results have been experienced for drip irrigation, although not to the same degree. Overhead sprinklers can obviously be very inefficient, and EnviroSCAN graphs have been observed to not even register a seven hour irrigation applied throughout a hot windy day.

Taking into consideration the daytime conditions and potential water loss, switching to night irrigations with the appropriate monitoring technology should be seriously considered.



Graph 1. Summed rootzone graph for Washington Navels in Coomealla



Graph 2. Split level graph for Washington Navels in Coomealla

# Citrus thrips project find unexpected benefits for horticulture



Know-how for Horticulture

Source: Hortlink, Autumn 2010

A current project looking at managing Kelly's Citrus Thrips (KCT), a key pest in the Riverland-Sunraysia region, has found unexpected positive results of higher fruit size and yield that can be extended to other horticultural industries.

Apart from successful results in controlling KCT by applying composted green waste, significantly higher soil moisture and carbon levels were measured, which produced significantly higher crop yields (up to 60 per cent), fruit size and density resulting in returns of up to 500 per cent for growers over five years. Such positive results could mean that this integrated pest management (IPM) system becomes standard practice.

"The outcomes of the project have great potential for being taken up by other tree fruit and nut industries," Brad Wells, HAL's plant health manager said.

Greg Baker of the South Australian Research & Development Institute, who conducted the studies, believes there are IPM benefits for horticulture.

"These citrus studies were conducted in the Riverland region, on sandy, inland soils so the extent to which these compost amendments will benefit other crops will depend on the attributes of the crop and the soil it's grown in, but positive results are still expected.

"As well as increasing soil moisture, these composts increased the total invertebrate biomass in the top layer of soil, including the predators that control KCT."



*Kelly's Citrus Thrips cause scurfing on fruit.*

The study also demonstrated that the runoff from foliar sprays of organophosphate insecticides was unwittingly damaging the soil biology, eliminating the soil-dwelling predatory mites and allowing KCT pupae to survive in greater numbers.

"For horticulture this means potential pest management benefits, including less foliar applications," Mr Baker said.

Current control programs rely heavily on application of organophosphate insecticides. However, KCT are developing resistance resulting in increased spraying and IPM disruption.

The initial aim of the project was to find a better way to control KCT, which cause scurfing, rind bleaching and reduced packout, by increasing predatory mites in the soil, but the higher moisture and nitrogen levels provided by the compost amendments, resulting in reduced water use, better fruit and higher yield, were unexpected benefits.

"Decreasing water consumption and maintaining good nutrition are primary agronomy goals in horticulture, so I'm sure these findings will be of interest to other fruit and nut industries," Mr Wells said.

This project was funded by HAL using the citrus levy, voluntary contributions from industry and matched funding from the Federal Government.

For more information contact: Greg Baker, South Australian Research & Development Institute [greg.baker@sa.gov.au](mailto:greg.baker@sa.gov.au)



*Kelly's Citrus Thrips on an open lemon flower.*

## ***Citrus representatives see firsthand the devastating effects of Huanglongbing and its vector the Asiatic Citrus Psyllid***

A group of citrus representatives including citrus growers, pathologists, nurseryman horticulturists and Queensland biosecurity surveillance personnel were left shocked, witnessing firsthand the devastating effects of Huanglongbing (HLB) and its vector the Asian Citrus Psyllid (ACP) on the citrus industry in Florida during a study tour in January 2010. The group also visited California to see how attempts are being made to stem the incursion of the psyllid into that state.

Citrus Australia technical advisor Pat Barkley, who led the tour, said “the trip was highly successful and invaluable for the study tour participants to see firsthand what the Australian citrus industry could face if there is an incursion of HLB and ACP. Many of the group also saw for the first time how disfiguring citrus canker can be, especially in grapefruit.

Ceri Pearce, Senior Plant Health Scientist, Biosecurity Queensland said she had not seen HLB or ACP before so it was invaluable to see the damaging effects of the disease and learn about the latest research and surveillance, diagnostic and management strategies being employed to manage them. Dr. Pearce said “It is critical that this insight into how Florida is attempting to manage HLB and psyllids and how California is surveying psyllids, be used to improve our surveillance and response systems. We need to keep these pests out of Australia.”

Sue Brighenti, a NSW citrus producer said “the industry needs to be proactive and put measures in place before an incursion takes place”. Ms Brighenti said the study group is working on a strategy to increase awareness of the risks to the citrus industry and broader community.

HLB and the ACP pose a huge threat to the Australian citrus industry and as ACP and HLB are endemic to the Indonesian Archipelago and East Timor, and in Papua New Guinea, the Australian citrus industry needs to be vigilant in their surveillance efforts to detect an incursion and be ready to respond.

## ***Citrus Australia appoints General Manager Market Development***

Citrus Australia, the national peak body for citrus growers has appointed Andrew Harty as General Manager Market Development.

Mr Harty will drive national marketing committees to improve market access and encourage marketing cooperation. He will oversee national and regional projects focused on market development and promotion, information management and communication. He will lead a small team of industry development staff and external providers, and manage high level stakeholder relationships to ensure industry priorities are met.

Citrus Australia’s CEO Judith Damiani said Mr Harty’s appointment was a welcomed addition to the Citrus Australia team, bringing a strong citrus management, technical and marketing background.

“Andrew has extensive international experience from South Africa and New Zealand where he has been involved with the development of citrus marketing programs and the technical management of production and quality throughout the value chain”

Mr Harty said that “he strongly identifies with citrus growers and wants to make a meaningful difference to the profitability of the industry base.”

Andrew can be contacted at the Citrus Australia office in Mildura on (03) 5023 6333.

## ***Japan gives grapefruit the green-light***

Citrus Australia has welcomed Japan’s announcement of market access for Australian grapefruit from non-fruit fly free areas.

Until now Australia has only been able to export grapefruit that is sourced from fruit fly pest free areas to Japan.

The Japanese Ministry of Agriculture, Forestry and Fisheries, agreed to the new trading arrangements, after Australian fruit fly research work, relating to cold disinfestations treatment and biosecurity measures, convinced them the risk of fruit flies would be adequately managed.

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# Citrus Australia News

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Citrus Australia Ltd chief executive officer Judith Damiani said “The exciting development was a testament to government and industry’s commitment to gaining market access for cold-treated grapefruit into Japan.”

“Citrus Australia representatives, in particular our red grapefruit grower members, WA disinfestation researcher, Horticulture Australia Ltd, and the Australian Government Department of Agriculture, Fisheries and Forestry are to be congratulated on their combined effort,” she said.

The industry has been developing its niche product mix in anticipation of improved access to Japan.

Sweeter red grapefruit varieties and growers in central, western and northern Australia will be the major beneficiaries with export orders set for the new season early next year.

“We estimate that over the next 5 years, with increased production and market development strategies, export volumes should peak around 4,000 tonnes valued at \$4.8 million annually – a great export earner for the Australian economy,” Ms Damiani said.

## **National Citrus Conference 2010**

**31 October – 3 November 2010**

**Peppers Pier Resort**

**Hervey Bay, Queensland**

Citrus Australia is pleased to announce that registrations are now open for the 2010 National Conference. The Citrus Australia National Conference is the only annual event for the Australian citrus industry, attracting a variety of people across the citrus value chain.

The program will be held over three days featuring international and national speakers with a focus on industry marketing issues. One day will be dedicated to a field trip to Gayndah to showcase orchards and packing facilities. The Queensland coastal venue will provide a relaxed atmosphere for networking and catching up with industry friends.

For full information on the conference including program, accommodation options and registration details, please visit [www.citrusaustralia.com.au](http://www.citrusaustralia.com.au)

## Riverina Citrus wins \$900,000 QFF Project



Source: Riverina Citrus, 28 June 2010

Frank Battistel, Chairman of Riverina Citrus, is excited to announce Horticulture Australia Limited (HAL) has confirmed Riverina Citrus has been successful in its application for funding for the Riverina Queensland Fruit Fly (QFF) Pest Free Area (PFA) project. HAL has committed to the three year project valued at \$900,000.00

This is a similar project that helped the Riverland and Sunraysia reach pest free area status.

“PFA will allow citrus exporters to deliver to some markets such as Japan without the need for cold sterilisation. This should mean a saving for growers of between \$2 to \$4 per carton or around \$150.00 per tonne, helping to restore our export competitiveness,” Mr Battistel said.

This is a Voluntary Contribution project meaning Riverina Citrus will have to contribute a little over half of the funding. The bulk of the expenditure will go towards extra road blocks, back yard tree removal, new signs and roadside pits; community awareness; legislative changes; improved bio-security measures and project management.

Mr Battistel said it was one of the largest citrus projects funded by HAL for some time.

“It is a credit to the Committee members, notably Mrs Sue Brighenti, who worked tirelessly on the PFA project, but now the real work begins. It is critical that both the industry and the general public work together to make the PFA a success.”

“We will be looking to the communities of Griffith, Leeton, Narranderra, Coleambally, Hillston and Goolgowie to step up and ensure they don’t harbour Queensland Fruit Fly host trees and educate their friends and families about the dangers of moving untreated fruit into the Fruit Fly Exclusion Zone,” Mr Battistel said.

The project is expected to take between 3 and 5 years, giving the local citrus industry an important goal to strive for at a time of tightening terms of trade.

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# Profitability of four low chill stone fruit tree training systems

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Bob Nissen, Maroochy Research Station, Nambour and Phillip Wilk, I&I NSW, Alstonville.

## Introduction

Low chill stone fruit are sub-tropical peaches, nectarines and plums that are produced in coastal Queensland northern NSW and Western Australia.

This fruit is usually the first stone fruit of the season and it therefore commands a higher grower return than stone fruit from traditional areas. Production costs in these sub-tropical regions are greater due to higher pest and disease pressure so growers need greater returns to cover these additional costs.

Over the last 10 years grower returns have gradually been eroded due to higher production costs generally associated with labour and inputs. Growers already use a number of orchard management practices to control tree vigour and improve fruit quality but many have been trialling different tree training systems to minimise labour input. The greatest labour component is associated with pruning (summer, winter, pre-harvest), fruit and flower thinning and picking. Growers need to maximise their production by changing tree architecture as it is impossible to grow fruit in this region without total exclusion netting.

Four main tree training systems now being used by low chill stone fruit growers are:

Open vase system,

- Free standing tall palmette system
- Free standing short palmette system
- Tall palmette with trellis system

### Open Vase system

The open vase system has trees pruned to a vase shape or an inverted cone. These trees are usually at a row spacing of 4.5–5.0 m and within a row 4.5–5.0 m resulting in approximately 450–500 trees per hectare.

These trees are up to two metres tall and all orchard operations including pruning thinning and harvesting can be performed from the ground.

### Free standing tall palmette

The free standing tall palmette trees are close planted and form a continuous hedgerow effect. They are spaced

at 3.8–4.5 m between rows and 2.5–3.0 m within a row. This resulted in 900–1000 trees per hectare.

There are a number of leaders trained horizontally either side of the central leader. This results in approximately four tiers of horizontal laterals either side of the central leader. Fruit is hung on smaller laterals off these main leaders. The height of these trees is up to 3 metres. The trees usually protrude into the row approximately 0.5 metres either side.

These trees due to their height need to be managed with a mechanical platform. All operations are carried out from these platforms to treat the higher part of the canopy. The lower part of the canopy is managed from the ground. Most picking, pruning and harvest is performed with either extra labour or doing more than one pass for each of the above operations.



Figure 1. Tall palmette with trellis.

### Free standing short palmette

This training system is the same as the tall palmette system except that due to the smaller trees row spacing is 3.0 metres and within a row 2.5–3.0 metres. This gives 1000–1200 trees per hectare. Trees are maintained at no more than 2 metres in height. The trees protrude a maximum of 0.5 metres into the row on either side.

### Tall palmette with trellis

This system is similar to free standing tall palmette system but utilises a number of structural wires (four) that are spaced horizontally (0.75 metres apart) and supported by structural vertical timber poles to maintain the trees in a vertical plane. Horizontal leaders are attached with plastic clips to horizontal wires. There are usually three tiers with the top tier being angled

as a V structure to fill all the space. Once the tree is established the lower horizontal wires may be removed to allow easy access between rows. Tree spacing is 3.8–4.5 m between rows and 2.5–3.0 m within a row. These trees are managed for thinning and harvest using a picking platform and pruning is done with a vertical, tractor mounted, mechanical cutter bar. Some clean up hand pruning from tearing of the bark is done after mechanical pruning is completed.



Figure 2. Trellised palmette

### Method and assumptions

Economic information was collected from stone fruit growers that use four different methods of tree architecture. A standard variety of peach *Tropic Beauty* was used to calculate all pruning, thinning and harvest costs.

A standard gross margin was used for all other costs with the only difference being the tree training system and associated costs.

### Assumptions

1. It was assumed that growers all had total exclusion netting over their orchards.
2. Growers all had standard orchard machinery such as tractor, packing shed and spray units.
3. All growers packed their own product.
4. Growers with tall trees would use a picking platform which is discounted over 10 years.
5. Growers using a trellis system would pay for the trellis in the first year and discount it over 10 years.
6. Labour is costed at \$21.00/hr
7. All fruit is packed in trays (5 kg) and no bulk trays (10 kg) are produced. A gross return of \$5/kg was used for the calculations.
8. All other costs for orchard operations are the same except for tree training system, harvest, pruning and thinning costs.

## Results and discussion

In Table 1 total variable cost was greatest with tall palmette and lowest with the trellised system. This is due to a cost reduction in pruning due to mechanical hedging. Tall palmette whether mechanically pruned or done by hand can only be successful for growers on relatively flat land. Slopes of greater than 5–7 degrees make it impossible to work safely with picking platforms.

The numbers circled in Table 1 are to highlight the fact that both growers are under utilising the space under their netting structures. The short palmette orchard is used where orchard slope is variable and in some parts may be greater than 10 degrees. All orchard operations are performed from the ground. If small palmette trees are effectively one metre shorter than tall palmette trees, growers using this system will need to increase their tree numbers to around 1200–1300/ha to maintain production volume. Tall palmette orchards either with or without trellises need to have approximately 1000 trees/ha to maximise the area under netting.

The real figure growers should examine in all

|                         | Gross Returns per ha \$ | Total variable costs | Profit or loss | Ay returns/kg | Trees per ha | yield /tree kg | Yield Kg/ha | Total hours/labour |
|-------------------------|-------------------------|----------------------|----------------|---------------|--------------|----------------|-------------|--------------------|
| Tall Palmette           | \$100,000               | \$ 84,262            | \$15,737       | \$ 5.00       | 1000         | 20.00          | 20000       | 1057               |
| Open Vase               | \$ 86,450               | \$ 69,802            | \$17,048       | \$ 5.00       | 266          | 65.00          | 17250       | 514                |
| Tall palmette trellised | \$ 79,400               | \$ 66,565            | \$12,835       | \$ 5.00       | 794          | 20.00          | 15880       | 224                |
| Short palmette          | \$ 82,000               | \$ 78,622            | \$3,377        | \$ 5.00       | 1000         | 16.3           | 16300       | 953                |

Table 1: Pruning and harvest summary costs

|                         | Gross Returns per ha \$ | trees per ha | return per tree | cost per tree | cost as % of returns | Nett return /tree | Nett return /ha |
|-------------------------|-------------------------|--------------|-----------------|---------------|----------------------|-------------------|-----------------|
| Tall Palmette           | \$ 100,000              | 1000         | \$ 100.00       | \$ 22.47      | 22.41                | \$ 77.59          | \$ 77,593       |
| Open Vase               | \$ 86,450               | 266          | \$ 325.00       | \$ 40.58      | 12.49                | \$ 284.42         | \$ 75,666       |
| Tall palmette trellised | \$ 79,400               | 794          | \$ 100.00       | \$ 5.92       | 5.92                 | \$ 94.08          | \$ 74,686       |
| Short palmette          | \$ 82,500               | 1000         | \$ 82.50        | \$ 20.01      | 24.28                | \$ 62.49          | \$ 62,487       |

Table 2: Costs and returns per tree

calculations when making decisions whether to change an orchard is the nett return per hectare. In Table 2, the nett returns per hectare for all 4 systems are fairly similar (column shown circled). If the growers of the short palmette orchard and the tall palmette with trellised systems were to increase tree numbers so as to maximise the space under netting, returns for both

systems would increase by approximately 25%. There will however be additional costs for purchase of additional trees and costs in changing irrigation lines as rows will be narrower.

The other unknown in using trellised systems with mechanical hedging is the effect on trees of increased disease risk. In parts of QLD around Kumbia, which is a drier climate than the coastal areas of northern NSW, growers have been mechanically hedging their trees over summer for many years with good results. On the coast, with higher humidity over summer, growers are unsure of the long term effects of mechanically hedging trees due to fungal diseases such as gummosis.

## Conclusions

Stone fruit growers that produce fruit under netting to protect their crop from birds and flying foxes must utilise the space effectively to cover production costs by varying tree architecture.

This study found that growing tall palmette stone fruit trees using mechanical hedging and having optimum tree numbers of 1000 trees /ha gave sound economic returns provided land was relatively flat. On slopes of greater than 5–7 degrees growers utilised a short palmette tree training system where all orchard operations were performed off the ground. In this system, tree numbers needed to be increased to 1200 to 1300 trees/ha to compensate for the loss of tree height.

## Orchardists' 'bible' is an enduring scripture

History was made in a small hall at Nashdale with the launch of the 50th edition of the most enduring agricultural extension handbook – the Orchard Plant Protection Guide For Deciduous Fruits In NSW, published by Industry and Investment NSW (I and I).

Retired plant pathologist, Ken Hutton, who was responsible for the first edition of the guide, attended the celebrations.

Half a century later, the independent and reliable information from the NSW Government's horticultural advisers has been welcomed by growers and industry representatives from across NSW.

The Guide is the longest-running Australian agricultural advisory publication available to growers, and it's an up-to-date guide which continues to give growers the latest information on orchard and pest management.

Past authors, Graham Thwaite and Ken Hutton, have contributed to a special historical supplement in the latest edition. The new guide will be welcomed by apple, pear, cherry, stonefruit, plum and prune growers in the Central West, Northern and Southern Tablelands, Riverina, Batlow, Bilpin and northern NSW.



*I and I NSW horticulture research leader, Dr Shane Hetherington, holds the latest edition of the fruit growers' "bible" as past authors, Graham Thwaite and Ken Hutton, reminisce on the contributions they made to the department's most enduring advisory publication.*

Copies are available from your local District Horticulturist, the I&I NSW bookshop (1800 028 374) and website, [www.dpi.nsw.gov.au](http://www.dpi.nsw.gov.au)

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# Dimethoate & fenthion review: the challenges of managing Queensland fruit fly in crops

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## *Introduction to a systems approach*

*Katina Lindhout & Jenny Ekman, Industry and Investment NSW, Gosford and Robert Nissen, Maroochy Research Station, DEEDI, QLD.*

The organophosphate chemicals fenthion and dimethoate are used by stonefruit growers to control Queensland fruit fly (QFF) and secure access to southern states which are reported to be free of QFF. An update on the reviews of these two chemicals was provided by Robyn Schipp of the APVMA at the National Low Chill Stonefruit Conference, held at Ballina in April 2010.

Although the draft reviews have not been released, it is speculated that the current use patterns for both chemicals may not continue for stonefruit. This means that these chemicals may no longer be available for use, or that their use pattern may be restricted to a level where they are no longer practical for QFF control. At present it is generally believed that the postharvest use of these chemicals will not continue.

The challenges faced by stonefruit growers and producers of other highly susceptible crops grown in areas of high QFF prevalence are two-fold. Firstly, there is a need to produce quality fruit which does not contain QFF eggs or larvae. Secondly, the fruit needs to undergo postharvest disinfestation to ensure access to markets in southern states or overseas. In the absence of dimethoate and fenthion, there are currently few alternative treatments available for QFF control, thereby jeopardising industry viability.

To meet this challenge, a workshop was held in Brisbane on June 8 to investigate potential alternatives for stonefruit and other crops grown in areas of high pest prevalence. Attendees at the workshop included research, extension and biosecurity officers from Queensland and New South Wales Government Agencies, Macquarie University, Queensland University of Technology, representatives from Growcom and Summerfruit Australia Ltd., as well as stonefruit growers. The workshop clearly demonstrated that the major issue is producing a harvestable crop, with market access a secondary consideration.



Currently, dimethoate and fenthion are used in the stonefruit industry in three ways:

- pre-harvest cover sprays for pest-free production (following label directions) and/or
- postharvest dips or sprays for market access (dimethoate only, ICA-1\* and ICA-2) or
- pre-harvest sprays for a combination of pest-free production and market access (fenthion only, ICA-21).

Potential changes to the pre-harvest use patterns of these chemicals could mean that dimethoate and fenthion are no longer able to protect fruit from QFF infestation.

In the absence of chemical control, very few pre-harvest management options remain. Traditionally, a single step postharvest treatment (e.g. postharvest dipping in dimethoate) that provides a Probit 9 (99.9968%) level of mortality has been accepted as a means for gaining market access. However, these treatments assume very few or no insects are present, as consumers will not be happy finding dead larvae in their fruit.

A possible solution to this problem is the use of a systems approach, which not only protects fruit pre-harvest, but is also an alternative to single step postharvest treatments for quarantine purposes. A systems approach is based on the integration of two or more independent pre-harvest and postharvest control measures. Combining these

treatments delivers the required level of phytosanitary protection. ICA-21 is an example of a systems approach that combines a pre-harvest fenthion cover spray program with a postharvest inspection. Components of a systems approach must be auditable to ensure that the control measures are being implemented.

A number of barriers exist for the adoption of a systems approach. This is particularly true for areas where high pest numbers are present and environmental conditions reduce the success of management methods. These factors reduce consistency between growing regions and seasons and make it difficult to develop a systems approach robust enough to be accepted by trading partners.

The most widely-accepted systems approaches are based on factors such as host status, fruit maturity, winter windows where the pest is not present, complete exclusion (e.g. insect-proof greenhouse) or the use of highly effective chemicals. These options are not suitable for many tropical and sub-tropical crops. Less effective control measures, such as protein baiting, cannot guarantee pest freedom. These controls are generally not used in systems approaches without the support of other factors, such as low pest prevalence (e.g. ICA-28). While a combination of a number of less effective measures could produce a favourable result, too many auditable steps will make the process of achieving ICAs cumbersome and costly, so it is important to develop a systems approach that is practical.

Another barrier to the adoption of a systems approach is their acceptance by regulators in other states or countries. Single step Probit 9 treatments have been accepted for decades and are based on mortality of individual insects following postharvest treatment. This is easily demonstrated experimentally. A Probit 9 level of mortality means that only three insects survive out of every 100 000 insects treated, although in practice this often equates to a zero tolerance.

Unlike Probit 9 treatments, the effectiveness of a systems approach is likely to be gauged by the number of infested fruit allowed in a consignment, not the number of insects allowed. Additionally, some components of such a system applied in the field can be difficult to demonstrate experimentally. The acceptable number of infested fruit present in a consignment is likely to be zero for many importing states or countries, so systems approaches may not be a feasible option for many crops unless new, very effective QFF control measures can be developed.

Without the use of fenthion and dimethoate the stonefruit industry and other industries with similar constraints will most likely need to use an integrated pest management (IPM) approach to QFF control and apply a postharvest disinfestation treatment to gain market access. Unlike a systems approach, an IPM program will allow a wide range of management tools to be used and no formal auditing process is required. As these IPM programs are refined, it is hoped that particular components could be extracted and adapted for use in a formal systems approach in the future. In the meantime, however, there are some available disinfestation options that have the potential to replace dimethoate if its postharvest use is lost. These include cold treatment (ICA-7) and methyl bromide fumigation (ICA-4). Irradiation could become available on application. Although these are less convenient and more expensive options they do provide some security for market access provided that pest-free fruit can be produced.

The next part in this series of articles will provide an outline of current and potential pre-harvest management options for QFF in stonefruit and other tropical and sub-tropical fruit crops.

\* For more information on Interstate Certification Assurances (ICAs), please refer to the Domestic Quarantine and Market Access Working Group (DQMAWG) website: <http://www.dqmawg.org.au/go/dqmawg/ica-database>

## Available Now

2010–2011

*Orchard plant protection  
guide for deciduous fruits in  
NSW.*

Contact your local District  
Horticulturist for a copy.

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# Farm biosecurity – Secure your farm

## Secure your future

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Source: [www.farmbiosecurity.com.au](http://www.farmbiosecurity.com.au)

Australia's coastlines and extensive quarantine system have provided a barrier against many exotic pests and diseases. Sound biosecurity practices are needed more than ever to protect properties from pests and diseases and to ensure continued market access for Australian produce.

Biosecurity is everyone's responsibility. Some quick and simple measures built into your everyday practices will go a long way towards protecting your farm and your future from the costly consequences of diseases, pests and weeds.

Think about these four risk areas and consider which measures you can take to reduce your risks.

### **Product movement**

The movement of anything onto, around and off your property increases the risk of transferring and spreading diseases, pests and weeds.

*Think about:*

- New product entering the property – always request history and supporting paperwork (seed or nursery stock certification).
- Planting and propagation material – ensure they are free from pests visually and by documented testing or certification.
- An effective pest monitoring/management program – know the usual appearance of crops and existing pests to ensure you are more able to recognise new pests.
- Product transport – ensure no soil, waste plant material or pests are left on or in bins or transport containers.

### **People movement**

People can unintentionally carry diseases, pests and weeds and transfer them without even realising - this means anyone visiting your property.

*Think about:*

- Restricting access to the property – ideally there should be one entry point only so that all movements can be recorded and you always know who is on your property.

- Designated visitor parking – direct all visitors to a designated parking area away from crops and ask them to report to management and sign a visitor register.
- Signage – don't assume visitors know what to do, provide signs that ask them to comply with your biosecurity measures.
- Visitor risk assessments – conduct a risk assessment before you allow a visitor onto your property. If visitors are assessed as high risk, implement appropriate mitigation measures such as cleaning or changing clothing and footwear, washing hands etc.
- General hygiene – Wash hands, clean boots and ensure clothing is clean before and after coming into contact with plant production areas.

### **Vehicles and equipment**

Vehicles and equipment can carry pests, weeds and disease around or onto your property.

*Think about:*

- Equipment hygiene – clean and disinfect tools and equipment before and after use. Clean equipment between blocks or paddocks - preferably with a disinfectant solution so endemic diseases, pests or weeds are not transferred to clean areas.
- Avoiding sharing equipment between properties – if you borrow or lend equipment, clean and disinfect thoroughly before using on your own property again.
- Vehicle entry points and access – have one vehicle entry point and minimise the number of vehicles you allow onto the property. Use your own farm vehicles to transport visitors around the property.

### **Pests and weeds**

Pests and weeds can carry disease, cause production losses and increase management costs in crops. Regularly check your property for weed or pest infestations. Early detection of any pests or weeds will minimise the impact.

*Think about:*

- Insects – look out for flying, swarming insects etc. that could damage crops or bring disease in from other areas.

- Likely/unusual pests and weeds – know what pests and weeds are local to your area and make sure you know what to look out for. Report anything unusual to the Exotic Plant Pest Hotline 1800 084 881.
- Boundary fences – ensure boundary fences are secure so crops are protected from stray livestock or wild/feral animals.

- Property hygiene – remove or contain anything that is likely to attract pests to the property such as rubbish dumps, carcasses etc.

For more information on farm biosecurity measures go to [www.farmbiosecurity.com.au](http://www.farmbiosecurity.com.au)

## Stonefruit industry to start collecting national data

**Source: Low Chill Stonefruit Grower, No 4/10, August 2010**

Summerfruit Australia is developing a new online data collection system called InfoStone. The intention is to collect plantings and production data from stonefruit growers across Australia and then aggregate this data into reports to assist businesses and industry with decision making.

Stonefruit growers will be asked to contribute data to help build the national plantings and production profile of the industry. Initially information on the number of trees each grower has planted by fruit type, tree age and harvest time will be collected and correlated. On an annual basis, growers will also be asked to record an estimate of the volume of fruit they expect to produce and at the end of the season to provide updated information on actual yield.

Data collection systems similar to InfoStone are being used successfully by a number of other horticultural industries, including the avocado, citrus and macadamia industries.

The data provided by individual growers is confidential. Growers are provided with a username and password to access the system and ensure confidentiality. Individual data is aggregated into 'Industry Reports' and data related to individual businesses is not identifiable in these reports. Access to full Industry Reports is only available to those that contribute data in good faith.

John Moore, CEO of Summerfruit Australia, said "I am very enthusiastic about this project. InfoStone will collect important industry data that will open up

allot of strategic planning advantages for businesses in the industry. I encourage all growers to participate as it is important that the data is as accurate and complete as possible."

So that the industry can have confidence in the data generated, it is imperative that as many stonefruit growers as possible enter accurate data and update it on an annual basis. Like any data collection system, the information which it generates is only as good as the data that goes in. The more accurate and comprehensive the individual data which is supplied, the more accurate the aggregated industry reports will be.

The Industry Reports that are generated will assist growers and Summerfruit Australia in making better informed decisions about a range of management and marketing issues, which ultimately impact the profitability of industry. For example, when the data is complete, growers should be able to determine the volume of white nectarines that are expected to be harvested in a specific harvest window e.g. early October, and the age of the trees that are supplying this volume. This type of information can be invaluable to assisting growers in deciding which varieties to plant in the future to maximise returns.

Access to this technology is free for growers and there is no direct cost to growers to enter data or collect reports.

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## Flying-foxes and damage to fruit crops

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### ***Important information for NSW Commercial Fruit Growers***

The Department of Environment, Climate Change and Water has updated its policy and procedures for managing the impact of flying-foxes on commercial fruit crops.

As in previous seasons, the Department can issue licences to growers who demonstrate damage to their crops from flying-foxes, including the threatened grey headed flying fox.

Licences are issued to growers to harm a limited number of flying-foxes in accordance with strict conditions, including adherence to standard operating procedures for the conduct of shooting, humane disposal and recording of animals killed.

The Department has made available on its website all the necessary information to assist growers who are either seeking further information about flying-foxes, the policy, or are requiring an urgent licence. Go to [www.environment.nsw.gov.au/wildlifelicences/s120Licence.htm](http://www.environment.nsw.gov.au/wildlifelicences/s120Licence.htm)

This information is also available from your local Parks and Wildlife Office.

All licensed growers are advised that the Department undertakes random audits of properties to monitor compliance with its licence conditions. Instances of illegal shooting should be reported to your local National Parks and Wildlife Area Office or NSW Police Force.

The Department requests all growers who are concerned about the damage flying-foxes may cause to their commercial crops to implement netting where this is economically and logistically feasible. Netting has been identified as the most effective means of mitigating damage from flying-foxes and other animals such as birds.

**For further information or contact details of your local National Parks and Wildlife Area Office please call (free call) 1300 361 967.**

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## Research the key to open Taiwan market

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Source: *Agriculture Today*, September 2010.

After four years of research, verification, negotiation and, finally legislation, the Taiwan market is again open to Australian cherries, nectarines and peaches.

The key to this result has been the development of cold disinfestation protocols by the market access team at the Gosford Primary Industries Institute. The treatments involve 14 days storage at three degrees Centigrade or lower, which can be conducted during sea freight to Taiwan. This treatment kills all eggs and larvae of Australia's most serious horticultural pest, the Queensland fruit fly.

Up until 2006, Taiwan was a valuable market for Australian summer fruit and cherry growers, with exports of around \$30 million annually. However, concerns about Queensland fruit fly led to Taiwanese authorities banning exports until Australia provided data proving the pest was killed by cold storage. This led to significant loss of income for many growers and exporters and placed an extra burden on domestic market prices.

Resumption of exports to this multi-million dollar market comes after five years of technical negotiations and enormous effort by Biosecurity Australia, the Australian industries and Industry and Investment NSW fruit fly researchers.

The initial research demonstrated that cold storage killed all life stages of Queensland fruit fly. However, according to I and I NSW researcher, Dr Jenny Ekman, this was still not sufficient to convince the Taiwanese authorities.

“They wanted to see the process for themselves. As a result, quarantine officials came out from Taiwan to watch us repeat some of the work, verifying for themselves that it was effective against this important pest” she said.

Further trials are planned for the coming season to demonstrate that the same treatment is effective for plums.

# PEST ALERT: Be on the look out for MYRTLE RUST

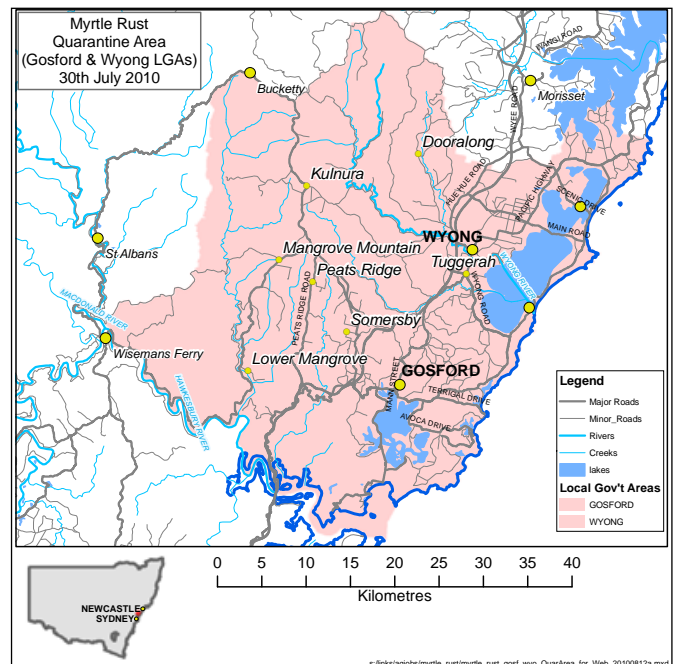
Myrtle Rust was first found on the NSW Central Coast in April 2010. It affects plants of the Myrtaceae family which includes many native species. The state has put in place measures to contain and eventually eradicate the fungus. The Gosford and Wyong Local Government Areas (LGAs) have been declared a Quarantine Area (from 23 July 2010), restricting the movement of susceptible plants and related material out of the area. Industry and the public are asked to learn how to recognise the fungus and report any suspected cases early, as well as practise good hygiene methods to restrict the spread of the fungus.

## Frequently Asked Questions

### What is Myrtle Rust?

Myrtle Rust (*Uredo rangelii*) is a newly described fungus that is closely related to the Eucalyptus/Guava rusts. These rusts are serious pathogens which affect plants belonging to the family Myrtaceae including many Australian natives like willow myrtle (*Agonis* sp.) bottle brush (*Callistemon* sp.) and Eucalyptus species.

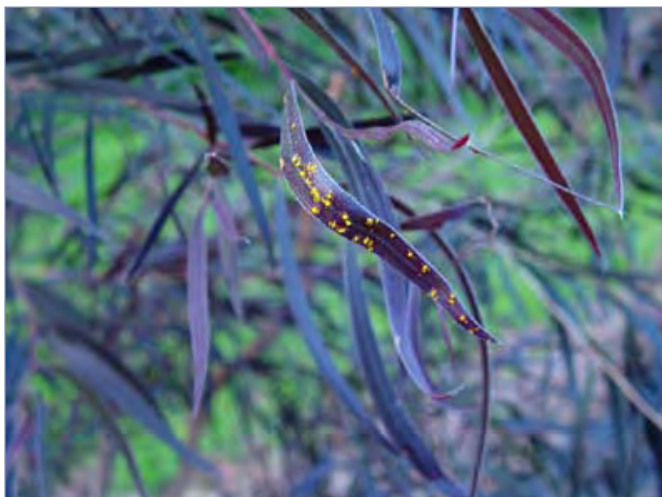
Myrtle Rust infects leaves of susceptible plants producing spore-filled lesions on young actively growing leaves and shoots, as well as fruits and sepals. Leaves may become buckled or twisted as a result of infection. On turpentine and callistemon rust lesions are purple in colour, with masses of bright yellow or orange-yellow spores. Older



Map 1. Quarantine area



Myrtle rust on turpentine  
Photo: Dr Angus Carnegie



Myrtle Rust on *Angonis flexuosa* (Willow Myrtle)  
Photo: Dr Angus Carnegie



Myrtle rust on turpentine  
Photo: Dr Angus Carnegie

lesions may contain dark brown spores. Severe rust disease in young trees may kill shoot tips, causing loss of leaders and a bushy habit.

Rust spores travel very long distances on the wind and may infect stands of susceptible plants many kilometres from the original infestation. Rust spores are also gathered and spread by bees. These are natural means of spread that are difficult to control. Humans can also easily spread Myrtle Rust in infested plant material including cut flowers and nursery stock, on clothing and dirty equipment including containers and pruning shears, and on contaminated timber products. Always practise good hygiene when working with native plants and general nursery stock.

### **What is the host range of Myrtle Rust?**

The full host range of Myrtle Rust is not known. Myrtle Rust has been found in Australia on ten species of cultivated plants including:

- *Agonis flexuosa* (willow myrtle) cv. 'Afterdark' and cv. 'Burgundy'
- *Tristania neriifolia* (water gum)
- *Syncarpia glomulifera* (turpentine)
- *Callistemon viminalis* (bottle brush)
- *Leptospermum rotundifolium* (tea tree)
- *Syzygium leumannii* x *Syzygium wilsonii* (lilly pilly)
- *Metrosideros collina* cv. Dwarf ('Tahiti')
- *Austromyrtus inophloia* cv. Aurora and Blushing Beauty (renamed to *Gossia inophloia*)
- *Syzygium jambos* (rose apple)
- *Rhodamnia rubescens* (scrub turpentine).

### **How can I help? What should I do if I suspect Myrtle Rust?**

If you see or suspect Myrtle Rust on any of these plants, call the **Exotic Plant Pest Hotline on 1800 084 881**. DO NOT move infested material as this can spread the disease.

### **How do I minimise the risk of spreading Myrtle Rust to my property?**

Good hygiene is vital when working with plants. Steps you can take in managing Myrtle Rust are:

- Become aware and familiar with the symptoms of Myrtle Rust.
- Undertake weekly monitoring/surveillance of host plants (commercial and property plants) for Myrtle Rust.
- Develop and practise good hygiene for people and equipment on the property.
- Provide a designated visitor area and opportunity to decontaminate workers, visitors, vehicles, raw material and equipment using disinfecting products and procedures. One example of what you can do is to change and launder clothing when entering or leaving another property.
- Use clean, pest-free and preferably certified nursery inputs, inspect inputs on arrival and monitor their performance before they are placed with your established nursery stock.
- Report anything unusual to the Exotic Plant Pest Hotline - 1800 084 881.

### ***I've heard that there is a Quarantine Area encompassing the Gosford and Wyong council areas.***

NSW has declared a Quarantine Area on the Gosford and Wyong Local Government Areas (LGAs) effective Friday 23 July 2010 on account of the presence of Myrtle Rust within these LGAs.

As a result, the movement of:

1. any host plant material, and
2. any covering, packaging, machinery, or thing which is carrying Myrtle Rust and which has been used in the culture, harvesting, or packing of host plant material,

out of the Quarantine Area is prohibited subject to the consignment meeting the required movement conditions as stipulated in the [notification](#).

### ***What does this mean for people in these council areas?***

**Businesses:** Businesses within the Quarantine Area can continue to trade as normal within the Quarantine Area. However, you must not move Myrtle Rust host plants, or host plant material including green waste out of the Quarantine Area unless you have either a Plant Health Certificate or a Plant Health Assurance Certificate.

Several states including Western Australia, Tasmania, Victoria and South Australia have now implemented movement conditions for cut flower and nursery stock from the family Myrtaceae (including associated machinery and equipment). Import conditions involve inspection and fungicide application and may require a plant health certificate as evidence of treatment and inspection. Please contact the destination State Quarantine Authority if you are intending to export material out of NSW. In NSW contact the Quarantine Domestic Hotline 1800 084 881.

Anyone interested in gaining accreditation should contact: Rob Bowman (Senior Inspector Regulatory) on 02 4588 2109 or Genevieve Leonard (Regulatory Officer) on 02 4939 8955 or Susanna Driessen (Plant Biosecurity Officer) on 02 6391 3575

**Private citizens:** Private citizens must not move Myrtle Rust host plants, including those purchased from

nurseries, host plant material including green waste, or equipment used to cultivate host plants out of the Quarantine Area. This is prohibited by law and penalties apply. However, it is OK to move healthy plants within the Quarantine Area.

**General:** It is not prohibited to move plants into the Quarantine Area from interstate or the greater part of NSW but you cannot move them back out without certification. It is prohibited to move dirty machinery and equipment (including vehicles) that has been used in the cultivation of Myrtle Rust host plants from within to outside of the Quarantine Area. Clean your equipment and machinery before moving out of the Quarantine Area!

**For more information, photos, quarantine details and updates go to <http://www.dpi.nsw.gov.au/biosecurity/plant/myrtle-rust>**

## Important notice – APVMA restricts horticultural and turf uses of carbendazim

### Source APVMA website

The Australian Pesticides and Veterinary Medicines Authority (APVMA) has been undertaking a review of the fungicide carbendazim. As part of this review it has been determined that the current label instructions for products containing carbendazim were inadequate.

The APVMA has restricted the number of crops and uses for which the fungicide carbendazim can be used and extended the health warnings on product labels. From July 2010 all carbendazim products can only be used in accordance with the instructions contained in this notice.

The decision to restrict horticultural and turf uses was taken after considering new scientific information which identified that maximum residues limits set for some food crops and potential public exposures to treated turf may not meet new health standards. Similarly, the APVMA has extended health warnings on carbendazim product labels on the basis of new scientific information which showed that exposure to high levels of carbendazim caused infertility in some male laboratory animals.

An outcome of the current decision is that carbendazim will no longer be approved for grapes, cucurbits (including melons), citrus fruits, custard apples, mangoes, pome fruits, stone fruits and turf. Amended instructions include the revised signal heading “Dangerous Poison” (carbendazim will be Schedule 7), and extension of the existing health warning to include male infertility in laboratory animals. The inclusion of carbendazim in Schedule 7 may impose greater requirements for training and record keeping on users of carbendazim products, depending on State/Territory legislation.

Page 39 of this newsletter contains the new instructions for Turf and Horticultural products containing carbendazim

The carbendazim review is continuing and there may be further changes proposed as part of the Preliminary Review Findings when they are published.

For more information go to the APVMA website at [www.apvma.gov.au](http://www.apvma.gov.au)

# Instructions for Turf and Horticultural Products Containing Carbendazim

**Please Note:**

The suspension action does not include withdrawal of the Maximum Residue Limits (MRLs) for any crops. Any decision to withdraw these MRLs will be made at a later stage (finalization of the review) and will take into account the potential storage time of produce treated in accordance with the label instructions at that time.

**READ THESE INSTRUCTIONS before using or otherwise handling the product.**

When using or otherwise handling the product, follow these instructions.

Other than as specified below, the products must be used in accordance with the instructions on the label attached to the container. Where the instructions below are inconsistent with the label instructions, the instructions on this notice (below) must be followed.

**In all states and territories the following are new instructions for products containing carbendazim. All other label instructions continue to apply unless otherwise specified below.**

Signal heading (amended)

**DANGEROUS POISON**  
**KEEP OUT OF REACH OF CHILDREN**  
**READ SAFETY DIRECTIONS BEFORE OPENING OR USING**

Prohibited uses (includes all post-harvest uses on these crops)

**DO NOT** apply to turf, grapes, cucurbits (including melons), citrus fruit, custard apple, mango, pome fruit (apples or pears) or stone fruit (including cherries).

Storage statement (additional statement for S7)

**STORAGE AND DISPOSAL:** Store in a locked room or place away from children, animals, food, feedstuffs, seed and fertilisers.

Warning statement (all products)

**WARNING:** Contains carbendazim which causes birth defects and irreversible male infertility in laboratory animals. Avoid contact with carbendazim.

**SAFETY DIRECTIONS** (wetable powder formulations (all strengths) and soluble concentrates 500 g/L or less, greater than 80 g/L only)

- Harmful if inhaled or swallowed.
- Will irritate the eyes and skin.
- Do not inhale vapour or spray mist.
- When opening the container, preparing spray and using the prepared spray wear cotton overalls buttoned to the neck and wrist, a washable hat, elbow-length PVC gloves and a half facepiece respirator.
- After use and before eating, drinking or smoking, wash hands, arms and face thoroughly with soap and water.
- After each day's use, wash gloves and contaminated clothing

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# Culinary herb and spice levy proposal

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The Australian Herb and Spice Industry Association (AHSIA) is inviting all industry participants to consider and comment on a proposal to implement a statutory Research & Development (R&D) Levy for the Australian culinary herb & spice industry that will underpin the implementation of the Research and Development Strategy for the Australian Herb and Spice Industry 2006–2011. This is something that the industry has been discussing and planning since 2006.

In summary, the proposed R&D Levy is modelled on existing levy arrangements, and is an ad valorem figure of 0.5 % (ie half of one percent) of the value of the product at the first point sale, calculated as follows:

- Domestic Levy 0.5% of the gross sale value at first point of sale
- Export Charge 0.5% of the “free on board” (FOB) value

(This equates to 50 cents out of \$100 of produce sold, or 1 cent on a \$2 sale.)

The target commencement date for the proposed R&D Levy is 1st July 2011.

The proposed levy will be payable on all culinary herbs & spices whether fresh bunched with or without roots, sleeved, potted, processed or dried, produced and sold primarily for human consumption (\*except for parsley, shallots, chilli, which are currently subject to the vegetable levy and ginger which has a separate levy process underway. It is not intended to include medicinal herbs and spices, or Australian native plant industry products in this levy proposal.

Potted plants including herbs and spices are leviable nursery products, and as such are liable to pay a “pot levy”. Given potted herbs will also benefit from the research to be funded through the proposed herb and spice levy, it is envisaged that potted herbs and spices will be included in the coverage of the proposed herb and spice levy.

A full copy of the levy proposal discussion paper will be sent to all registered industry participants. If you have not received the discussion paper by direct mail you are urged to register your contact details with the AHSIA secretariat to ensure that you receive future



levy communications, including details of registration arrangements for the levy ballot.

Herb and spice industry participants are invited to make written submissions on the issues raised in the discussion paper either by post, fax or email. **Submissions must be received by close of business on Monday 29 November 2010.** Please address your submissions to:

Herb and Spice Levy Proposal  
C/- McFarlane Strategic Services  
33 Phillips St, Somerton Park SA 5044  
Fax (08) 8376 7048  
Email [peter@mc.com.au](mailto:peter@mc.com.au)

## **NSW information sessions**

Information sessions will be held during mid-October to mid-November to ensure potential levy payers have a first-hand opportunity to ask questions and learn more about the levy proposal.

- **Flemington - Monday 18 October** – 10.30 am at the West Sydney Club, Sydney Markets Plaza, Sydney Markets NSW 2129.
- **Richmond – Monday 18 October** – 3.00 pm, at the UWS – Hawkesbury – main entrance via Bourke St, “Poolside Function Centre” R6. Richmond, NSW 2753.
- **Coffs Harbour – Thursday 21 October** – 2.00 pm, at the NSW Department of Industry & Investment, District Office Conference Room, City Square, Coffs Harbour, NSW 2450.
- **Wollongbar - Friday 22 October** – 2.00 pm at the Agricultural Research Station, Hudson Room, Bruxner Hwy, Wollongbar, NSW 2477.

For further information on the levy proposal, consultation process and levy ballot, please visit the AHSIA website: <http://web.ahsia.org.au>

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# Export market development grants

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Source: [www.austrade.gov.au](http://www.austrade.gov.au)

The Export Market Development Grants (EMDG) scheme is a key Australian Government financial assistance program for aspiring and current exporters. Administered by Austrade, the scheme supports a wide range of industry sectors and products, including inbound tourism and the export of intellectual property and know-how outside Australia.

The EMDG scheme:

- encourages small and medium sized Australian businesses to develop export markets
- reimburses up to 50 per cent of expenses incurred on eligible export promotion activities, above a \$10,000 threshold
- provides up to eight grants to each eligible applicant.

To access the scheme for the first time, businesses need to have spent \$10,000 over two years on eligible export marketing expenses.

**Applications for the 2009–2010 grant year close on 30 November 2010.**

## ***Who can apply?***

Any Australian individual, partnership, company, association, co-operative, statutory corporation or trust that has carried on export promotion activities during the year for which they wish to apply for an export grant.

To be eligible, the business must have:

- income of not more than \$50 million in the grant year
- incurred at least \$10,000 of eligible export expenses under the scheme (first-time applicants can combine two years expenses)
- principal status for the export business (some exceptions apply, eg. event promoters).

The business also must have promoted one of the following:

- the export of goods and most services
- inbound tourism

- the export of intellectual property and know-how
- conferences and events held in Australia.

Under Austrade's Export Market Development Grants (EMDG) scheme, certain organisations and groups, who would not otherwise be eligible to apply for a grant under the general provisions of the EMDG Act can obtain approved status to enable them to apply for a grant in their own right. The three categories of approved status available include approval as an Approved Body, a Joint Venture and a Trading House.

First-time applicants are required to satisfy grant entry requirements, which includes providing financial statements and some information that explains your business and your product or service.

## ***What is an eligible product?***

To qualify for an EMDG grant, your business must have:

- promoted your product for export

and your product must be one of the following:

- a good made in Australia
- a good made outside Australia where Australia will derive a significant net benefit from its sale overseas
- all services except those specified as ineligible in the EMDG Regulations
- a tourism service (including accommodation, passenger transport or tours)
- a conference or event held in Australia
- an intellectual property right that mainly resulted from work done in Australia
- a trademark that was owned, assigned or first used in Australia
- know-how that mainly resulted from work done in Australia.

**For more information go to [www.austrade.gov.au/default.aspx?FolderID=1356](http://www.austrade.gov.au/default.aspx?FolderID=1356)**

## **Funding for farm succession planning**

Source: SA Citrus Board Newsletter, 5/5/10

The Federal Government has provided \$2.43 million to help older farmers hand their farms to the next generation. The money will be allocated to the Rural Financial Counselling Service (RFCS), where counsellors have been asked to make succession planning their key focus. The money has been allocated on a recommendation from last year's drought review, which found that many farmers found it hard to face issues such as succession. According to RFCS figures, more than a quarter of farmers that counsellors worked with in the past nine months were over 60 years old, and more than a half of those did not have succession plans.

## **15 million drums and counting**

The drumMUSTER program continues to provide an effective recycling service to all Australian agricultural chemical users. The national program has been accepting farm chemical drums for recycling for ten years now. With the 15 millionth drum recently recycled in Victoria, and 14 millionth in Western Australia, support for the program has been steadily growing. DrumMUSTER is an industry-run initiative managed by Agsafe Ltd and funded by a levy on the sale of agricultural and veterinary chemical drums.

You can find your local collection point contact by going to [www.drummuster.com.au](http://www.drummuster.com.au)

## **Award pay rate tool**

Source: SA Citrus Board Newsletter, 25/8/10

Employees operating under the Horticultural Award 2010 or other modern awards, have been reminded that pay rates for many employees changed on 1 July 2010.

Transitional arrangements in most modern awards give employees and employers time to adjust to the change, by allowing new pay rates to be phased in over a period of four years, until the modern award rates apply 1 July 2014.

Fair Work Australia has an online tool called Pay Check, for those growers wishing to confirm what their pay rates should be. The site is <http://www.fairwork.gov.au/pay/payroll-check/pages/what-is-payroll-check.aspx>

## **Biogold International to manage M7 navel**

Biogold International (BGI) have secured the rights to manage the M7 navel for the owners of the variety, Chislett Developments Australia.



*The M7 navel*

The M7 navel is an exceptional early navel with internal quality performance that is 30% better than the current stable of varieties under world – wide production.

Commercialisation of the variety will commence in Spain, USA, Australia, New Zealand, South Africa and Chile over the next few years as plant material emerges from quarantine.

The M7 is set to change the face of early navel consumption around the world as consumers are able to purchase fruit that has the pedigree of mid and late season fruit taste but at the beginning of the season.

The variety will be managed as a limited hectare offering to discerning navel producers of the world.

Further details at [www.biogold.co.za](http://www.biogold.co.za)

## Australia extends digital pest-detection network to Asia

Source: CRC Plant Biosecurity media release, 10/8/10.

Australia's digital pest-detection network is expanding to neighbouring Asian nations to identify and combat invasive insects and diseases that threaten Australia's agricultural industries and markets before they arrive.

A network of more than 30 camera-connected microscopes linked to a public internet-based image library is already part of the arsenal being deployed to meet Australia's biosecurity challenges. This includes remote districts like Kununurra in Western Australia, which would otherwise have limited access to the expertise required to identify new plant pests and diseases.

The digital diagnostic technology and procedures developed by the Cooperative Research Centre (CRC) for National Plant Biosecurity have now been extended to East Timor, Thailand, Laos, Malaysia and Vietnam to enhance their diagnostic capability and contribute to Australia's 'pre-border' surveillance.

Plant pathologist Dr Gary Kong is leading the CRC's digital diagnostic project and says the increasing volume of international trade and people movement are placing greater pressure on our quarantine systems. "At the same time the pool of expertise to diagnose new incursions is shrinking. Digital tools are helping us to do more with less and increasing access to information that improves our capacity to identify new pests and disease and respond more quickly."

## Auscitrus 2009–2010 budwood season



Source: Auscitrus Newsletter, Autumn 2010

Bud sales for 2009–2010 improved slightly from 2008–2009 sales, at 511,733 buds for Spring and Summer/Autumn combined. As can be seen in the chart below overall sales are still down from previous averages. The average was boosted in 2002–2005 by strong sales during the North West NSW juicing development, which also coincided with large corporate developments in Southern growing regions.

Current sales were predicted to be significantly lower than actual, so the budwood scheme is running ahead of budget at present.

The top ten sellers were mostly the same as in previous years, with the traditional varieties remaining popular

| Item Name                   | Total  |
|-----------------------------|--------|
| Navel Washington            | 55 795 |
| Mandarin Imperial           | 53 300 |
| Valencia Keenan             | 50 340 |
| Lime Tahiti                 | 46 475 |
| Lemon Eureka (Taylor 3402)  | 46040  |
| Navel Late Lane             | 30925  |
| Mandarin Emperor            | 27250  |
| Lemon Meyer (806)           | 21892  |
| Valencia Seedless McMahon   | 16280  |
| Mandarin W. Murcott Afourer | 14520  |

## NSW Farmers report



Source: hortupdate, August 2010

NSW Farmers Horticulture Committee held their Annual General Meeting and Conference in July in Sydney. It was attended by 55 delegates and guests who heard from a number of informative and thought-provoking speakers and also discussed current and emerging issues.

The AGM and Conference is the major policy forming event for the Association's Horticulture Members during the year. The theme of this year's conference was 'Sustaining Horticulture' with a focus on presentations addressing topics that will contribute to the future sustainability of horticulture in NSW and Australia.

The Conference was opened by Mr John Lloyd, CEO Horticulture Australia Limited. He had the positive message that horticulture is one of Australia's most rapidly growing agricultural industries and could soon be it biggest agricultural industry due to its rapid growth.

Horticulture has many good news stories and messages. Some of these highlighted by Mr Lloyd include that it is a major contributor to regional development, has significant untapped domestic demand and export potential and its outputs assist the community to live healthier, happier, longer and more productive lives.

Other speakers were: Ms Lynne Wilkinson (CEO, AUSBUY); Professor Bill Bellotti (University of Western Sydney); Gerard McEvelly (E3 International and Horticulture Supply Chain Services); Ian James (Industry Data Economic Analysis); and Graeme Ratford. Topics covered included: food security; soil carbon; climate change; business sustainability; the value of horticulture; food labeling; market access; and water metering.

Some comments about the presentations by delegates included: "I learned from the presentations"; "Each presenter gave me something to take away and think about"; "I was buoyed by learning the importance of horticulture to Australia"; "There is a need for horticulturists nationally to come together on issues of common interest and concern".

The Horticulture Conference was proudly sponsored by Syngenta, Kleenheat Gas, WFI, PrimeSuper, NAB and Mitsubishi Motors.

## 2010–2011 Horticulture Committee Representatives

**Central West** – Peter Darley (Chairman, Agriculture Chemicals Committee Representative)

**Riverina** – Geoff Moar (Vice Chairman, Executive Council Representative)

**Riverina Highlands** – Barney Hyams (Exotic Disease Committee Representative)

**Western Rivers** – Jeff McSpedden (Executive Council Representative)

**Northern** – John Cade

**Mid North Coast** – Chris Nelson

**Hunter/Hawkesbury** – Fred Haskins

For more information on NSW Farmers and how to join go to <http://www.nswfarmers.org.au/> or phone the Member Service Centre on 1300 794 000.

## Fruit spotting bug targeted

Source: June 2010 edition of *Agriculture Today*.

The most damaging pest of sub-tropical horticultural crops – fruit spotting bug – is the target of a combined initiative to develop a multi-pronged, environmentally-friendly control program.

Fruit spotting bug affects a range of coastal horticultural crops from macadamias to avocados and lychees, causing

millions of dollars in crop damage each year. Now, a group of local horticultural industries have banded together to develop a proposal to fund a major new research program with The Department of Industry & Investment (I&I) NSW entomologists at Alstonville.



'We have been looking at a holistic approach to managing fruit spotting bugs through biological control, improved pest monitoring using lures and traps, companion planting and 'soft' sprays. There are some very promising signs that we can reduce the use of chemical sprays significantly and achieve a sustainable long-term control with this new approach,' said I&I NSW entomologist, Dr Ruth Huwer.

The Australian Macadamia Society, local farmer group, PestWeb, and Horticulture Australia Limited (HAL) have helped to launch the initiative. Researchers from NSW, Queensland and Northern Territory Primary Industries, CSIRO and commercial pest management consultants and biocontrol providers are also participating in development of the proposal.

Ms Huwer said a fly which parasitises fruit spotting bug nymphs and adults is a potential biological control, as are egg parasitoids. Both of these potential bio-controls require further research, particularly to see if they can be mass-reared for commercial release into orchards. Pheromone compounds which lure the pest to traps in the field could also play an important role. New 'soft' pesticides can be screened for the effectiveness as well. Field traps such as the ornamental hedge, *Murraya paniculata*, are favourable sites for fruit spotting bugs where the pest can be monitored and controlled. The success of the strategy will rely heavily on a suitable monitoring strategy so growers know the level of the (bug) population in their orchard and the threshold above which treatment is necessary. All these options provide avenues for improvement in the control of fruit spotting bug and the reduction in sprays.'

For more information contact Dr Ruth Huwer, Alstoneville, (02) 6626 2400, [ruth.huwer@industry.nsw.gov.au](mailto:ruth.huwer@industry.nsw.gov.au)

# Registered chemicals for use in commercial citrus crops in NSW

Prepared by Sandra Hardy, I&I NSW, Gosford.

The following tables on pages ??? list the current registered chemicals for use in *commercial citrus orchards* for post-harvest treatment (Table 1); to enhance fruit quality and size (Table 2); control pests (Table 3); and control diseases (Table 4). Chemical names have been used because there are too many products to list. This information has been sourced from Infopest, July 2010.

The tables are not comprehensive in that they do not list chemicals or use patterns for grapefruit or general categories such as orchards or fruit trees.

These tables do not contain all the information which appears on a product label or permit. **ALWAYS READ THE PRODUCT LABEL OR PERMIT.**

In Australian citrus orchards an integrated approach to pest and disease control is well established. Integrated Pest Management or IPM relies on using a range of control options to keep pests below economically damaging levels. These control options include biological, cultural and chemical control strategies. Managing pests or diseases in your orchard involves:

- correct identification of the pest/disease
- some understanding of the life cycle of and conditions favouring the pest/disease

- regular monitoring of the trees (leaves, fruits etc) for both pests and predators;
- correct choice and timing of the control.

By the early strategic use of a control measure, be it chemical or biological, a potential major pest problem may be avoided.

In order to maintain a healthy balance of beneficial insects in your orchard avoid the use of broad spectrum chemicals that can be toxic to these good insects.

## Key to Abbreviations in Tables

NA = Not Applicable

NS = Not Stated

✓ = Registered for use on this crop

**Bolded entries** are new since the Spring 2007 edition of this newsletter.

Australian Pesticides & Veterinary Medicines Authority (APVMA) permits are normally issued for only a limited time. Therefore persons wishing to use a chemical in a manner approved under permit must obtain a copy of the relevant permit from the APVMA and must read and comply with all the details, conditions and limitations on the permit. Go to the APVMA website at [www.apvma.gov.au](http://www.apvma.gov.au)

## Infopest



**Infopest Agvet DVD** – \$210.20 (annual subscription 3 DVDs/year) or \$105.10 – single copies.

The Infopest Agvet DVD is a computerised database of all nationally registered agricultural and veterinary chemical products for control of diseases and pests (insect, feral and weed) in a wide range of **crops and livestock**.

**Infopest MSDS CD** – \$104.00 (annual subscription 3 CDs/DVDs year) or \$46.70 – single copies. Infopest MSDS is a compilation of Agricultural and Veterinary (Agvet) Material Safety Data Sheets (MSDS).

**Infopest Agvet and MSDS DVD** – \$314.20 (annual subscription 3 DVDs/year) or \$151.80 for single copies. Combines the Agvet and MSDS information.

### How to Order

Contact Infopest on (07) 3239 3967, website: [www.dpi.qld.gov.au/infopest](http://www.dpi.qld.gov.au/infopest) or <mailto:infopest@deedi.qld.gov.au>

| <b>Pest/Disease/Other</b> | <b>Active Constituent in Product</b>          | <b>Withholding Period (WHP) days</b> | <b>Citrus</b> | <b>Oranges</b> | <b>Mandarins</b> | <b>Lemons</b> |
|---------------------------|---|--------------------------------------|---------------|----------------|------------------|---------------|
| Bactericide               | iodine  | NA                                   | ✓             | ✓              | ✓                | ✓ and limes   |
| Blue Mould                | guazatine                                     | NA                                   | ✓             |                |                  |               |
|                           | imazalil                                      | NA                                   | ✓             |                |                  |               |
|                           | imazalil sulfate                              | NA                                   | ✓             |                |                  |               |
|                           | SOPP  | NA                                   | ✓             |                |                  |               |
|                           | thiabendazole                                 | NA                                   | ✓             |                |                  |               |
| Colour Retention          | 2,4-D-dma                                     | NA                                   | ✓             |                |                  |               |
| Fungi                     | iodine  | NA                                   | ✓             | ✓              | ✓                | ✓ and limes   |
| Green Mould               | guazatine                                     | NA                                   | ✓             |                |                  |               |
|                           | imazalil                                      | NA                                   | ✓             |                |                  |               |
|                           | imazalil sulfate                              | NA                                   | ✓             |                |                  |               |
|                           | thiabendazole                                 | NA                                   | ✓             |                |                  |               |
| Lightbrown apple moth     | <b>liquid hydrocarbons (Permit 11009)</b>     | <b>NA</b>                            | ✓             |                |                  |               |
|                           | <b>spinosad</b>                               | <b>NA</b>                            |               | ✓              | ✓                | ✓ and limes   |
| Qld Fruit Fly             | dimethoate<br><b>(APVMA Permit No. 12074)</b> | <b>NA</b>                            | ✓             |                |                  |               |
| Sour Rot                  | guazatine                                     | NA                                   | ✓             |                |                  |               |
| Stem-end rot              | thiabendazole                                 | NA                                   | ✓             |                |                  |               |

|                               | <b>Active Constituent in Product</b> | <b>Withholding Period (WHP) days</b> | <b>Citrus</b> | <b>Oranges</b> | <b>Mandarins</b> | <b>Lemons</b> |
|-------------------------------|--------------------------------------|--------------------------------------|---------------|----------------|------------------|---------------|
| Adhesion control              | lauryl alcohol ethoxylate            | NS                                   |               | ✓              | ✓                | ✓ + limes     |
| Colour Improvement            | 2,4-D as dma + GA                    | NA                                   |               | ✓              | ✓                |               |
| Creasing reduction            | gibberellic acid                     | NA                                   |               | ✓              |                  |               |
| Drop Prevention/<br>Reduction | 2,4-D-dma                            | NA                                   |               | ✓              | ✓                |               |
| Quality Improvement           | gibberellic acid (GA)                | 56                                   |               | ✓              |                  | ✓             |
| Rind quality<br>maintenance   | 2,4-D-dma + GA                       | NA                                   |               | ✓              | ✓                |               |
|                               | gibberellic acid                     | NA                                   |               | ✓              | ✓                | ✓             |
| <b>Size increase</b>          | <b>dichlorprop-P</b>                 | <b>NA</b>                            | ✓             |                | ✓                |               |
| Thinning                      | ethephon                             | NA                                   |               | ✓              | ✓                |               |
|                               | giberellic acid (Ralex®)             | NA                                   |               | ✓              | ✓                |               |
| Other                         |                                      |                                      |               |                |                  |               |
| Spray additive                | vegetable oil                        | NA                                   | ✓             |                |                  |               |
|                               | alkyl polyglycol ether               | NA                                   | ✓             |                |                  |               |
|                               | lauryl alcohol ethoxylate            | NA                                   |               | ✓              | ✓                | ✓ + limes     |
|                               | <b>trisilozane ethoxylate</b>        | <b>NA</b>                            | ✓             |                |                  |               |
| Spreader                      | lauryl alcohol ethoxylate            | NA                                   |               | ✓              | ✓                | ✓ + limes     |
|                               | alkyl polyglycol ether               | NA                                   | ✓             |                |                  |               |
|                               | <b>trisilozane ethoxylate</b>        | <b>NA</b>                            | ✓             |                |                  |               |

| <b>Pest</b>                                  | <b>Active Ingredient</b>  | <b>Withholding Period (WHP) days</b>  | <b>Citrus</b>                        | <b>Oranges</b>  | <b>Mandarins</b>                  | <b>Lemons</b> | <b>Limes</b> |
|--|---|---|--------------------------------------|---|-----------------------------------|---------------|--------------|
| Aphids                                       | Azinphos-methyl dimethoate  | 14<br>7   | ✓<br>✓                               | ✓   | ✓                                 | ✓             | ✓            |
| <b>Australian Plague Locust</b>              | <b>maldison (permit 11843)</b>  | <b>3</b>  | ✓                                    |   |                                   |               |              |
| Black (Brown Olive) Scale                    | Azinphos-methyl <b>pyriproxyfen</b>   | 14<br><b>7</b>  | ✓<br>✓                               |   |                                   |               |              |
| Black Citrus aphid                           | maldison<br>pirimicarb<br>parathion-methyl<br>imidacloprid  | 3<br>2<br>14<br>140 days  | ✓<br>✓<br>✓                          | ✓   |                                   | ✓             |              |
| Broad Mite                                   | abamectin   | 7   | ✓                                    |   |                                   |               |              |
| Bronze Orange Bug                            | dimethoate<br>maldison  | 7<br>3  | ✓<br>✓                               | ✓   | ✓                                 | ✓             | ✓            |
| Brown Citrus Rust Mite                       | abamectin<br>sulfur<br>wetable sulfur<br>zineb<br>mancozeb<br>petroleum oil   | 7<br>0-1 on some products<br>1<br>7<br>NA<br>1  | ✓<br>✓<br>✓<br>✓<br>✓<br>✓           |   |                                   |               |              |
| Budworms (Heliothis)                         | spinosad  | NA  | ✓                                    | ✓   | ✓                                 | ✓             | ✓            |
| Bugs   | dimethoate  | 7   | ✓                                    | ✓   | ✓                                 | ✓             | ✓            |
| Citrophilous Mealybug                        | aldicarb *<br><br>buprofezin  | 182<br><br>28   | <br><br>✓                            | ✓* non trifoliata rootstocks<br>✓   | ✓* non trifoliata rootstocks<br>✓ | ✓             | ✓            |
| Citrus Bud Mite                              | sulfur<br>mancozeb<br>wetable sulfur  | 0-1 on some products<br>NA<br>1   | ✓<br>✓<br>✓                          |   |                                   |               |              |
| Citrus Butterflies (leafeating caterpillars) | maldison<br>carbaryl  | 3<br>3  | ✓<br>✓                               |   |                                   |               |              |
| Citrus Flat Bunch Mite                       | abamectin   | 7   | ✓                                    |   |                                   |               |              |
| Citrus Leafeating weevil                     | bifenthrin  | NA  | ✓                                    |   |                                   |               |              |
| Citrus Leafminer                             | diazinon<br>permethrin<br>petroleum oil<br>aldicarb *<br>paraffinic oil<br>spinosad<br>imidacloprid<br><b>botanical oil</b> | 14<br>NA non bearing trees only<br>1<br>NA non bearing trees only<br>1<br>NA<br>140 days<br><b>NA</b> | ✓<br>✓<br>✓<br>✓<br>✓<br>✓<br>✓<br>✓ | ✓   | ✓                                 | ✓             | ✓            |
| Citrus Mealybug                              | buprofezin<br><b>spirotetramat</b><br><b>methiocarb</b>   | 28<br><b>21</b><br><b>42</b>  | ✓<br>✓                               | ✓<br>✓  | ✓                                 | ✓             | ✓            |
| Citrus Nematode                              | aldicarb *<br>cadusafos   | 182<br>NA   | ✓                                    | ✓   | ✓                                 |               |              |
| Citrus Red Mite                              | abamectine +<br>clofentezine or<br>amitraz (minor use<br>permit <b>10873</b> )<br>petroleum oil                             | NA<br><br>1   | ✓<br><br>✓                           | Quarantine treatment only for the movement of trees and budwood outside the counties of Northumberland and Cumberland |                                   |               |              |

**Table 3: PESTS (continued)**

| Pest                        | Active Ingredient                           | Withholding Period (WHP) days | Citrus | Oranges                    | Mandarins                  | Lemons | Limes |
|-----------------------------|---|-------------------------------|--------|----------------------------|----------------------------|--------|-------|
| Citrus Rust (Maori) Mite    | abamectin                                   | 7                             | ✓      |                            |                            |        |       |
|                             | lime sulfur                                 | NA                            | ✓      | ✓                          | ✓                          | ✓      |       |
|                             | propineb                                    | 7                             | ✓      |                            |                            |        |       |
|                             | sulfur                                      | 0-1 on some products          | ✓      |                            |                            |        |       |
|                             | wettable sulfur                             | 1                             | ✓      |                            |                            |        |       |
|                             | zineb                                       | 7                             | ✓      |                            |                            |        |       |
|                             | mancozeb                                    | NA                            | ✓      |                            |                            |        |       |
|                             | petroleum oil                               | 1                             | ✓      |                            |                            |        |       |
| Common garden snail         | iron-EDTA complex                           | NA                            | ✓      |                            |                            |        |       |
|                             | <b>spirotetramat</b><br><b>methiocarb</b>   | <b>21</b><br><b>42</b>        | ✓      | ✓                          |                            |        |       |
| Corn earworm                | spinosad                                    | NA                            | ✓      | ✓                          | ✓                          | ✓      | ✓     |
| Fruit Flies                 | maldison                                    | 3                             | ✓      |                            |                            |        |       |
| Fullers Rose Weevil         | carbaryl                                    | 3                             | ✓      |                            |                            |        |       |
|                             | gamma-cyhalothrin                           | 28                            |        | ✓                          |                            | ✓      |       |
|                             | lambda-cyhalothrin                          | 28                            |        | ✓                          |                            | ✓      |       |
| Greenhouse thrips           | pyrethrin                                   | NA                            | ✓      |                            |                            |        |       |
| Jassids                     | buprofezin                                  | 28                            | ✓      | ✓                          | ✓                          | ✓      | ✓     |
| <b>Kellys citrus thrips</b> | <b>thianethoxam</b><br><b>spirotetramat</b> | <b>49</b><br><b>21</b>        | ✓<br>✓ |                            |                            |        |       |
| Leafroller caterpillars     | azinphos-methyl                             | 14                            | ✓      |                            |                            |        |       |
| Lightbrown Apple Moth       | tebufenozide                                | 1                             | ✓      |                            |                            |        |       |
|                             | carbaryl                                    | 3                             | ✓      |                            |                            |        |       |
|                             | methomyl                                    | 2                             | ✓      |                            |                            |        |       |
|                             | parathion-methyl                            | 14                            | ✓      |                            |                            |        |       |
|                             | spinosad                                    | NA                            | ✓      | ✓                          | ✓                          | ✓      | ✓     |
|                             | methoxyfenozide                             | 1                             | ✓      |                            |                            |        |       |
| Longtailed Mealybug         | parathion-methyl                            | 14                            | ✓      |                            |                            |        |       |
|                             | aldicarb *                                  | 182                           |        | ✓ non trifoliata rootstock | ✓ non trifoliata rootstock |        |       |
|                             | buprofezin                                  | 28                            | ✓      | ✓                          | ✓                          | ✓      | ✓     |
| Mediterranean Fruit Fly     | dimethoate                                  | 7                             | ✓      | ✓                          | ✓                          | ✓      | ✓     |
| Native Budworm              | spinosad                                    | NA                            | ✓      | ✓                          | ✓                          | ✓      | ✓     |
| Nematodes                   | fenamiphos                                  | NA                            | ✓      |                            |                            |        |       |
| Orange Fruit Borer          | carbaryl                                    | 3                             | ✓      |                            |                            |        |       |
| Pink Wax Scale              | carbaryl                                    | 3                             | ✓      |                            |                            |        |       |
|                             | maldison                                    | 3                             | ✓      |                            |                            |        |       |
|                             | petroleum oil                               | 1                             | ✓      |                            |                            |        |       |
|                             | paraffinic oil                              | 1                             | ✓      |                            |                            |        |       |
|                             | imidacloprid                                | 140 days                      | ✓      |                            |                            |        |       |
|                             | <b>spirotetramat</b>                        | <b>21</b>                     | ✓      |                            |                            |        |       |
|                             |   |                               |        |                            |                            |        |       |
| Pointed (conical) snail     | iron-EDTA complex                           | NA                            | ✓      |                            |                            |        |       |
| Red Scale                   | azinphos methyl                             | 14                            | ✓      |                            |                            |        |       |
|                             | buprofezin                                  | 28                            | ✓      | ✓                          | ✓                          | ✓      | ✓     |
|                             | chlorpyrifos                                | 14                            | ✓      |                            |                            |        |       |
|                             | maldison                                    | 3                             | ✓      |                            |                            |        |       |
|                             | methidathion                                | 21                            | ✓      |                            |                            |        |       |
|                             | omethoate                                   | 7                             | ✓      |                            |                            |        |       |
|                             | paraffinic oil                              | 1                             | ✓      |                            |                            |        |       |
|                             | parathion-methyl                            | 14                            | ✓      |                            |                            |        |       |
|                             | petroleum oil                               | 1                             | ✓      |                            |                            |        |       |
|                             | imidacloprid                                | 140 days                      | ✓      |                            |                            |        |       |
|                             | <b>spirotetromat</b>                        | <b>21</b>                     | ✓      |                            |                            |        |       |
|                             | <b>pyriproxyfen</b>                         | <b>7</b>                      | ✓      |                            |                            |        |       |

| <b>Table 3: PESTS (continued)</b> |   |  |                                   |                       |                                  |                                  |              |
|-----------------------------------|---|--|-----------------------------------|-----------------------|----------------------------------|----------------------------------|--------------|
| <b>Pest</b>                       | <b>Active Ingredient</b>  | <b>Withholding Period (WHP) days</b>   | <b>Citrus</b>                     | <b>Oranges</b>        | <b>Mandarins</b>                 | <b>Lemons</b>                    | <b>Limes</b> |
| Rutherglen Bug                    | maldison  | 3  | ✓                                 |                       |                                  |                                  |              |
| Scale insects                     | parathion-methyl  | 14   |                                   | ✓                     | ✓                                | ✓                                |              |
| Purple (Mussel) Scale             | maldison<br><b>spirotetramat</b>                                  | 3<br><b>21</b>   | ✓<br>✓                            |                       |                                  |                                  |              |
| Qld Fruit Fly                     | chlorpyrifos + yeast hydrolysate or yeast autolysate              | 14 (Bait spray only)   | ✓                                 | ✓                     | ✓                                | ✓                                | ✓            |
|                                   | dimethoate (don't use on Meyer lemons, seville oranges, cumquats) | 7  | ✓                                 | ✓                     | ✓                                | ✓                                | ✓            |
|                                   | fenthion  | 7  | ✓                                 |                       |                                  |                                  |              |
| Spined Citrus Bug                 | carbaryl  | 3  | ✓                                 |                       |                                  |                                  |              |
|                                   | diazinon  | 14   | ✓                                 |                       |                                  |                                  |              |
|                                   | maldison  | 3  | ✓                                 |                       |                                  |                                  |              |
|                                   | endosulfan  | 3  | ✓                                 | ✓                     | ✓                                | ✓                                |              |
| Slugs                             | methiocarb  | 42   | ✓                                 |                       |                                  |                                  |              |
| Small citrus butterfly            | parathion-methyl  | 14   | ✓                                 |                       |                                  |                                  |              |
| Snails                            | copper complex silicate salts + copper complex                    | 1<br>NA  | ✓<br>✓                            |                       |                                  |                                  |              |
|                                   | Soft Brown Scale  | aziphos-methyl<br>maldison<br>aldicarb<br>parathion-methyl<br><b>spirotetramat</b> | 14<br>3<br>182<br>14<br><b>21</b> | ✓<br>✓<br>✓<br>✓<br>✓ | ✓ non trifoliata rootstocks only | ✓ non trifoliata rootstocks only |              |
| Stubby Root Nematode              | cadusafos   | NA   | ✓                                 |                       |                                  |                                  |              |
| Thrips                            | dimethoate  | 7  | ✓                                 | ✓                     | ✓                                | ✓                                | ✓            |
|                                   | maldison  | 3  | ✓                                 |                       |                                  |                                  |              |
| Treehoppers                       | maldison  | 3  |                                   |                       |                                  |                                  |              |
| <b>Trunk/stem canker</b>          | <b>cuprous oxide</b>  | <b>1</b>   | ✓                                 |                       |                                  |                                  |              |
|                                   | <b>copper ammonium acetate</b>                                    | <b>1</b>   | ✓                                 |                       |                                  |                                  |              |
| Vineyard Snail                    | iron-EDTA complex   | NA   | ✓                                 |                       |                                  |                                  |              |
| <b>White Bradybaena Snail</b>     | <b>methiocarb</b>   | <b>42</b>  | ✓                                 |                       |                                  |                                  |              |
| White Italian Snail               | iron-EDTA complex   | NA   | ✓                                 |                       |                                  |                                  |              |
| White Louse Scale                 | buprofezin  | 28   | ✓                                 | ✓                     | ✓                                | ✓                                | ✓            |
|                                   | lime sulfur   | NS   | ✓                                 | ✓                     | ✓                                | ✓                                |              |
|                                   | sulfur  | 0-1 on some products   | ✓                                 |                       |                                  |                                  |              |
|                                   | wettable sulfur   | 1  | ✓                                 |                       |                                  |                                  |              |
|                                   | <b>spirotetramat</b>  | <b>21</b>  | ✓                                 |                       |                                  |                                  |              |
|                                   | <b>buprofezin</b>   | <b>28</b>  | ✓                                 | ✓                     | ✓                                | ✓                                | ✓            |
| White Wax Scale                   | aziphos methyl  | 14   | ✓                                 |                       |                                  |                                  |              |
|                                   | carbaryl  | 3  | ✓                                 |                       |                                  |                                  |              |
|                                   | methidathion  | 21   | ✓                                 |                       |                                  |                                  |              |
|                                   | paraffinic oil  | 1  | ✓                                 |                       |                                  |                                  |              |
|                                   | petroleum oil   | 1  | ✓                                 |                       |                                  |                                  |              |
|                                   | Wingless Grasshopper  | chlorpyrifos<br>dimethoate   | 14<br>7                           | ✓<br>✓                | ✓                                | ✓                                | ✓            |
| Yellow Peach Moth                 | carbaryl  | 3  | ✓                                 |                       |                                  |                                  |              |

**Table 4: DISEASES**

| Disease                       | Active Constituent in Product      | Withholding period (WHP) days | Citrus | Oranges | Mandarins | Lemons |
|-------------------------------|------------------------------------|-------------------------------|--------|---------|-----------|--------|
| Black Spot                    | <b>copper ammonium complex</b>     | <b>1</b>                      | ✓      |         |           |        |
|                               | copper sulfate (tribasic)          | 1                             | ✓      | ✓       |           |        |
|                               | copper ammonium acetate            | 1                             | ✓      |         |           |        |
|                               | copper hydroxide                   | 1                             | ✓      |         |           |        |
|                               | copper oxychloride                 | 1                             | ✓      |         |           |        |
|                               | cuprous oxide                      | 0-14                          | ✓      |         |           |        |
|                               | mancozeb                           | 7                             | ✓      |         |           |        |
|                               | propineb                           | 7                             | ✓      |         |           |        |
|                               | zineb                              | NA                            | ✓      |         |           |        |
|                               | copper hydroxide + mancozeb        | 1                             | ✓      |         |           |        |
|                               | paraffinic oil                     | 1                             | ✓      |         |           |        |
|                               | petroleum oil                      | 1                             | ✓      |         |           |        |
| Brown spot                    | copper oxychloride                 | 1                             |        |         | ✓         |        |
|                               | <b>copper as cuprous oxide</b>     | <b>1</b>                      |        |         | ✓         |        |
| Melanose                      | copper ammonium acetate            | 1                             | ✓      |         |           |        |
|                               | copper oxychloride                 | 1                             | ✓      |         |           |        |
|                               | copper hydroxide                   | 1                             | ✓      |         |           |        |
|                               | cuprous oxide                      | 1                             | ✓      |         |           |        |
|                               | sulfur                             | 0                             | ✓      |         |           |        |
| copper sulfate (tribasic)     | 1                                  | ✓                             |        | ✓       |           |        |
| Phytophthora Brown rot        | copper oxychloride                 | 1                             | ✓      |         |           |        |
|                               | cuprous oxide                      | 1                             | ✓      |         |           |        |
| Phytophthora Collar rot       | copper hydroxide                   | 1                             | ✓      |         |           |        |
|                               | phosphorus acid                    | 0                             | ✓      |         |           |        |
|                               | copper sulfate (tribasic)          | 1                             | ✓      |         |           |        |
| Phytophthora Stem Rot         | cuprous oxide                      | 1                             | ✓      |         |           |        |
| Phytophthora root/ Collar rot | phosphorous acid                   | NA                            | ✓      |         |           |        |
|                               | copper hydroxide                   | 1                             | ✓      |         |           |        |
| Scab                          | copper sulfate (tribasic)          | 1                             |        |         |           | ✓      |
|                               | copper oxychloride                 | 1                             | ✓      |         |           |        |
|                               | cuprous oxide                      | 1                             | ✓      |         |           |        |
|                               | copper hydroxide                   | 1                             |        |         |           | ✓      |
|                               | copper ammonium acetate or complex | 1                             | ✓      |         |           |        |
| Septoria Spot                 | copper oxychloride                 | 1                             | ✓      |         |           |        |
|                               | cuprous oxide                      | 1                             | ✓      |         |           |        |
| Sooty Blotch                  | copper ammonium acetate or complex | 1                             | ✓      |         |           |        |
|                               | copper oxychloride                 | 1                             | ✓      |         |           |        |
|                               | copper sulfate (tribasic)          | 1                             | ✓      |         | ✓         |        |
|                               | copper hydroxide                   | 1                             | ✓      |         |           |        |
|                               | cuprous oxide                      | 1                             | ✓      |         |           |        |
| <b>Trunk/stem canker</b>      | <b>cuprous oxide</b>               | <b>1</b>                      | ✓      |         |           |        |
|                               | <b>copper ammonium acetate</b>     | <b>1</b>                      | ✓      |         |           |        |

# Registered chemicals for use in commercial avocado crops in NSW

Prepared by Sandra Hardy, I&I NSW, Gosford.

Source: Infopest, July 2010.

These tables are not comprehensive as they do not list chemicals or use patterns for general categories such as orchards or fruit trees. Chemical Registrations change continually. Always read and follow the directions on the product label. (NA = Not Applicable). Bolded entries are new since the Spring 2007 edition of this newsletter.

| DISEASES              |                                       |                          |
|-----------------------|---------------------------------------|--------------------------|
| Use                   | Active Ingredient                     | Withholding period (WHP) |
| Anthracnose           | Azoxystrobin                          | 7                        |
|                       | Copper oxychloride                    | 1                        |
|                       | Copper hydroxide                      | 1                        |
|                       | Cuprous oxide Cu <sub>2</sub> O       | 1                        |
|                       | Copper as Ammonium acetate or complex | 1                        |
|                       | Copper Sulfate (tribasic)             | 1                        |
| Cercospora spot       | Copper as ammonium acetate or complex | 1                        |
| Phytophthora root rot | Phosphorous acid                      | NA                       |
|                       | Fosetyl as aluminium salt             | 1                        |
|                       | Metalaxyl-M                           | 7                        |
| Phytophthora stem rot | Copper as cuprous oxide               | 1                        |
| Sooty blotch          | Copper as ammonium acetate or complex | 1                        |
| Stem end rot          | Azoxystrobin                          | 7                        |
| Trunk and stem canker | Copper hydroxide                      | 1                        |
|                       | Copper as ammonium acetate or complex | 1                        |
|                       | Copper as cuprous oxide               | 1                        |
|                       | Copper sulfate (tribasic)             | 1                        |

| POSTHARVEST  |                             |                          |
|--|-----------------------------|--------------------------|
| Use  | Active Ingredient           | Withholding period (WHP) |
| Acidity maintenance  | 1-methylcyclopropene        | NA                       |
| Ageing/ripening delay  | 1-methylcyclopropene        | NA                       |
| Anthracnose  | Prochloraz                  | NA                       |
| Bactericide  | Iodine                      | NA                       |
| Chilling injury control  | 1-methylcyclopropene        | NA                       |
| Ethylene (protection from)                                       | 1-methylcyclopropene        | NA                       |
| Firmness quality improvement/<br>maintenance freshness retention | 1-methylcyclopropene        | NA                       |
| Fungi  | Iodine                      | NA                       |
| Mealiness reduction  | 1-methylcyclopropene        | NA                       |
| Mediterranean fruit fly  | Dimethoate                  | NA                       |
| Qld fruit fly  | Dimethoate                  | NA                       |
| <b>Respiration reduction</b>                                     | <b>1-methylcyclopropene</b> | <b>NA</b>                |
| Stem end rot   | Prochloraz                  | NA                       |

| <b>PESTS</b>                  |   |                                 |
|-------------------------------|---|---------------------------------|
| <b>Use</b>                    | <b>Active ingredient</b>                              | <b>Withholding period (WHP)</b> |
| Avocado leafroller            | dichlorvos<br>spinosad<br><b>methoxyfenozide</b>      | 7<br>NA<br><b>14</b>            |
| Banana spotting bug           | endosulfan  | 14                              |
| Ectropis looper               | spinosad  | NA                              |
| Flower eating caterpillars    | spinosad  | NA                              |
| Fruit flies                   | fenthion  | 7                               |
| Fruit spotting bug            | endosulfan<br>beta-cyfluthrin<br>trichlorfon          | 14<br>7<br>2                    |
| Greenhouse thrips             | pyrethrin   | NA                              |
| Hairy leaf-eating caterpillar | chlorpyrifos  | 7                               |
| Ivy leafroller caterpillar    | chlorpyrifos<br>dichlorvos<br>spinosad                | 7<br>7<br>NA                    |
| Lantania scale                | chlorpyrifos  | 7                               |
| Leafroller moths              | spinosad  | NA                              |
| Loopers                       | spinosad  | NA                              |
| Qld fruit fly                 | chlorpyrifos<br><b>dimethoate</b>                     | 7<br><b>7</b>                   |
| Red banded thrips             | spinosad  | NA                              |
| Red shouldered leaf beetle    | endosulfan<br>carbaryl<br>chlorpyrifos<br>trichlorfon | 14<br>3<br>7<br>2               |
| Scale insects                 | petroleum oil<br>paraffinic oil                       | 1<br>1                          |
| Six-spotted mite              | fenbutafin oxide                                      | 14                              |
| Sorghum head caterpillar      | spinosad  | NA                              |
| Tea red spider mite           | fenbutafin oxide                                      | 14                              |
| Yellow peach moth             | endosulfan<br>spinosad                                | 14<br>NA                        |

| <b>OTHER</b>                           |                               |                                 |
|--|-------------------------------|---------------------------------|
| <b>Use</b>                             | <b>Active Ingredient</b>      | <b>Withholding period (WHP)</b> |
| Fruit shape improvement                | uniconazole-P                 | 14                              |
| Size increase                          | uniconazole-P                 | 14                              |
| <b>Spray additive/spreader sticker</b> | <b>trisiloxane ethoxylate</b> | <b>NA</b>                       |
| Vegetative growth control              | uniconazole-P                 | 14                              |

# What's on

**19–21 October 2010 – Australian National Field Days, Borenore**

**4–9 September 2011 – World Avocado Congress**

The VII World Avocado Congress 2011 will be held in Cairns, Australia from the 4–9 September 2011. An event held every four years, the Congress is a rare opportunity for the world-wide avocado industry to come together to share and learn everything there is to know about avocados.

The VII World Avocado Congress 2011 website can be found at [www.worldavocadocongress2011.com](http://www.worldavocadocongress2011.com). This website is a resource for potential delegates, exhibitors and sponsors of the Congress to register their interest and receive up-to-date information about Congress activities, view the preliminary schedule, and access general information about Australia and Cairns.

## Websites

### **Australian Bureau of Statistics**

<http://www.abs.gov.au>

The Australian Bureau of Statistics provides a wide range of statistics relevant to agricultural industries. The agricultural censuses and surveys collect data on area and production of crops, livestock numbers, livestock products and land management. The ABS Environment and Agriculture section also collects information relating to livestock slaughtering, wool receivals, wheat grain usage and statistics on agriculture related natural resource management practices.

These statistics serve a wide variety of individuals and organisations in both government and private industry. The information is used by commonwealth and state governments for planning, budgeting and policy making. Farmer organisations and other producer associations use the data to support submissions to government and to better represent their members. Agriculture service companies also use ABS data in their planning to better meet the needs of their clients in the farming community

## What's new in I&I publications

Available from the Industry & Investment NSW website at [www.industry.nsw.gov.au](http://www.industry.nsw.gov.au)

- ***Citrus gall wasp (Primefact 1010)***
- ***Citrus maturity testing (Primefact 980)***
- ***Fungus gnat management in greenhouse crops (Primefact 1006)***
- ***Growing Australian native finger lines (Primefact 979)***
- ***Myrtle rust (Primefact 1017)***
- ***On-farm hygiene and sanitation for greenhouse (Primefact 1005)***
- ***Strawberry fertiliser guide (Primefact 941)***
- ***Western flower thrips (Primefact 1049)***

## THE COASTAL FRUITGROWERS' NEWSLETTER

The Coastal Fruitgrowers' Newsletter is produced by Industry & Investment NSW and distributed electronically, 2-4 times a year.

The quarterly Coastal Fruitgrowers Newsletter was first published in 1991 and circulated to all NSW coastal fruit growers.

In 2008, after 70 issues, the Newsletter went totally electronic and is now only distributed by email. The Newsletter is also available at <http://www.dpi.nsw.gov.au/aboutus/resources/periodicals/newsletters/coastal-fruitgrowers>

### CONTRIBUTIONS

Letters and stories from commercial growers and industry personnel always welcome.

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