



# COASTAL FRUITGROWERS' NEWSLETTER

ISSN 1446-0513

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## No. 56 Autumn 2005

Dear Growers

Welcome to the Autumn edition, the first for the new year.

In this issue there is an article from Queensland on "Production Systems for Low Chill Stonefruit Growers". Stonefruit growers who receive the Low Chill Stonefruit Grower newsletter would have already seen this article.

There's also a summary of the final report on the Low Chill Variety Assessment on page 28.

For citrus growers a number of interesting articles on current and completed research projects are contained on pages 15 and 21.

Some good information on citrus postharvest fungicides is on page 17 and the use of iodine as a sanitiser on page 8.

If you are thinking of trialling any new products in your orchard then you should have a look at the article on assessing non-conventional products for some handy tips.

Happy reading.

***Sandra Hardy***



Coastal Fruitgrowers' Newsletter  
Edited by Sandra Hardy  
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Cathryn McMaster

*The information contained in this publication is based on knowledge and understanding at the time of writing. However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of NSW Department of Primary Industries or the user's independent adviser. Inclusion of an advertisement or sponsor's symbol in this publication does not necessarily imply endorsement of the product or sponsor by NSW Department of Primary Industries*

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LEADING IN AGRIBUSINESS





# Production Systems for Low-chill Stonefruit

R. J. Nissen, A. P. George and G. Waite, QLD  
Department of Primary Industries and Fisheries

*This article has been extracted from the Low Chill Stonefruit Grower No 6/04, December 2004.*

## Introduction

Consumer satisfaction and purchasing patterns are directly related to fruit quality variables, such as fruit sweetness and firmness, with orchard management practices directly affecting these variables (Crisosto et al. 1997, 2003). Compared with high-chill varieties, early-season, low-chill stonefruit cultivars generally have poorer fruit quality (George and Hieke, 1996). New, improved management practices are urgently needed to improve fruit size and quality of earlyseason low-chill cultivars. Key factors affecting fruit quality include: light interception, orchard design, tree training, control of vegetative growth, excessive crop loading, pest and disease control, irrigation and nutrition. Jackson (1980) and Palmer et al. (1992) showed that internal tree shading severely reduced yield and fruit quality and that stonefruit needed a minimum of 20% full sunlight for optimum fruit quality.

Fruit flies (Tephritidae) cause substantial losses in terms of both quantity and quality and are recognised worldwide in tropical and temperate climates as major pests of horticultural crops (Bellas 1996). Countries in South-East Asia experience pre-harvest fruit and vegetable losses as high as 40 to 100% (Drew 2001). Good control of fruit flies is therefore essential to increase profitability. In addition, consumers now prefer to purchase fruit and vegetables grown using environmentally friendly, reduced chemical usage systems. Due to increasing costs of production, new production systems are urgently needed to increase productivity and to improve economic viability.

## Orchard Design and Training Systems

Traditional, vase-trained stonefruit trees, planted at <400 trees per hectare are highly inefficient in intercepting light (Jackson, 1980; 1985).

Consequently, yields per hectare are low, ranging from 15 to 25 tonne. As light interception and productivity in orchards are highly correlated (Jackson, 1980; 1985), new orchard training

systems are designed to maximise the amount of light intercepted by tree canopy (Corelli and Sansavini, 1989). The best of these new designs is the Open Tatura training and trellising system (Van den Ende et al., 2001). Open Tatura trellis system planted at 2,222 tree per hectare. Compared with the traditional vase system, the Open Tatura system can produce double the cumulative yield during the first three years after planting and double the maximum yield (40 to 50 tonne per hectare), at full maturity (Van den Ende et al., 2001). The economic breakeven point is reduced from 12-17 years under the traditional vase system to 6-8 years for Open Tatura system. Besides tree design, light interception and yields can be increased through other management practices and these are discussed in the following sections.

## Crop Loading and Cultural Practices

There are many commonly used indices for estimating yield efficiency such as fruit number per tree circumference or butt cross sectional. Our studies (Menziez et al., 2002) have shown for stonefruit trees under the age of five years, fruit number per butt circumference or butt cross sectional are the most appropriate measure, but for trees older than five years, other measures such as fruit number per canopy surface area and canopy volume may be more appropriate. Cultural practises also affect estimations of yield efficiency, e.g. growth retardant, paclobutrazol, increases butt circumference. For low-chill stonefruit cultivars, we currently recommend leaving 2 fruit per centimetre of butt circumference, or alternatively, either 20 fruit per square metre of canopy surface area or 50 fruit per cubic meter of canopy volume (Menziez et al., 2002). Fruit sugar concentrations for low-chill stone fruit are low due to their short fruit development period (FDP). Menziez et al. (2002) showed that sugar concentrations of the fruit decrease by about 0.1o Brix for each increase of 10 fruit per tree. Menziez et al. (2002) showed that gross returns for low-chill stonefruit trees, planted at 800 tree/ha, increased slightly with increasing crop loads up to double that of commercially-accepted levels despite loss in fruit quality. At higher crop loading levels returns were reduced due to smaller, lower quality fruit and increased costs



associated with growing, harvesting and packaging. Their studies also showed that at crop load double the commercially-accepted level, trees went into biennial bearing due to a 30% reduction in starch accumulation during late autumn when reserves for next season's growth are normally accumulating.

### **Growth Control**

The growth retardant, paclobutrazol has been shown to increase average fruit weight by one to two size grades, tree yields by 25% and economic returns of low-chill stonefruit. The mode of action of paclobutrazol is to reduce competition between the fruit and vegetative growth (George and Hieke 1996). Paclobutrazol also advances fruit maturity by about 10 days, a major advantage for low-chill stonefruit cultivars where exceptionally high prices are paid for early-season fruit. George and Nissen (2002) and Menzies, et al. (2002) showed that paclobutrazol, when combined with additional nitrogen, significantly ( $P < 0.05$ ) increased Brix levels by about 10-15% and reduced the rates of fruit size reduction with increasing crop load. In some studies, paclobutrazol significantly increased ( $P < 0.05$ ) fruit firmnesses due to better uptake and accumulation of calcium and boron, presumably as a result of reduction of vegetative growth (Menzies, et al., 2002).

### **Irrigation**

George and Nissen (1992) found that regulated deficit irrigation (RDI) at critical periods during fruit development and after harvest of low-chill stonefruit cultivars could control excessive vegetative vigour without loss of yield or fruit quality. In South-East Asia, soil water deficits occur in at least 4 months in each year (dry season) with the dry season coinciding with the flowering and FDP. In eastern Australia, RDI is difficult to implement as summer rainfall coincides with the FDP. Glasshouse studies, using containergrown trees, showed that RDI could be effectively used for low-chill cultivars with short FDP (80-120 days) (George and Nissen, 2002, unpublished data). They found that mild to moderate soil water stress (up to -50 kPa) applied during Stage II of fruit growth, and up to 3 weeks prior to harvest increased fruit Brix by up to 20%. However, there are limits to how much soil moisture stress trees can stand without affecting yield. For example, on light clay soils in Thailand, drought (maximum soil water deficits of -

200 kPa), applied during FDP of lowchill stonefruit, reduced yield and fruit firmness by about 20%. Fruit sugar concentrations were increased by 2 to 3° Brix (Noppakoonwong et al., 2002). RDI may have a greater application to control excessive growth after harvest of vigorous low-chill cultivars and this aspect requires further investigation.

### **New Pest Control Measures**

The major pest of stonefruit in Australia and South-East Asia is fruit fly (Tephritidae). In Australia, cover sprays of persistent insecticides (fenthion and dimethoate) are used for control. In both Australia and South-East Asia, there has been a strong move to develop alternative treatments driven by consumer and environmental concerns to reduce pesticide usage and residues. Broad-spectrum insecticides are detrimental to beneficial insects and are therefore not compatible with Integrated Pest Management (IPM) programs. Various natural products such as neem oil and natural pyrethrum have been investigated as cover sprays but none has proven to be effective. Bait sprays are used as an alternative to cover sprays and are applied to a small part of the tree, such as the trunk or foliage and not the fruit. Fruit fly bait sprays consist of a combination of an insecticide e.g. chlorpyrifos, trichlorfon, malathion plus an attractant eg yeast autolysate. DPI&F researchers have assessed two new commercial bait formulations, which include protein attractant mixed with Spinosad (Dow AgroSciences) or fipronil (BASF) and thickening agents that prolong their effective life. These new "soft" insecticides are used at lower concentrations and have a lower mammalian toxicity the organophosphate insecticides currently registered for use in Australia. Spinosad is a microbially produced insecticide that has obtained organic certification in the USA. They are applied at lower rates, 5-7 L/ha compared to standard baits which are applied at 15-30L/ha (Lloyd et al., 2003a).

### **Surround™**

Other alternative pest control measures include the use of biopesticides and particle film technologies e.g. kaolinite (Surround™) (Glenn et al., 2002). Surround™ was developed in the USA for protecting crops from heat stress, sunburn and frost, but was found to improve photosynthesis, fruit set, fruit size and fruit colour due to transmission of diffuse light within the tree canopy (Glenn et al.,



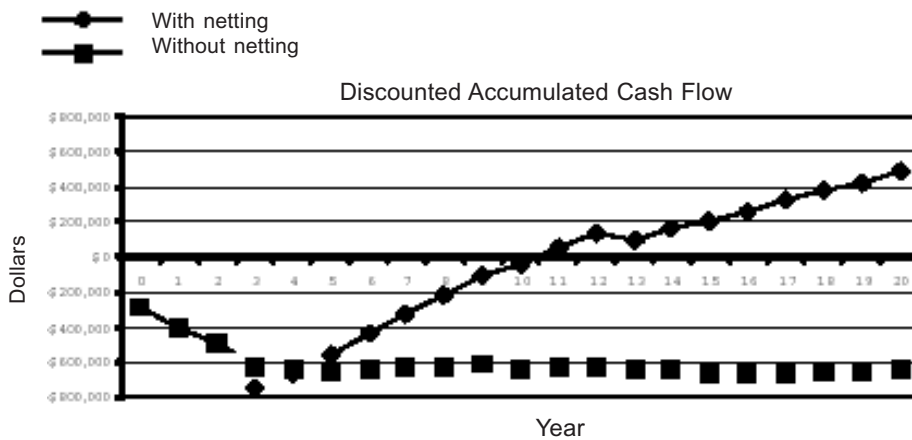
2002). ). Surround™ can deter insects via tiny particles attaching to the insect bodies, agitating and repelling them or coating the plant/fruit making it unsuitable for feeding and reproduction. Dufour (2001) and McBride (2000) found that kaolinite coats the trees in a reflective white coating making trees less recognizable as a host. In the USA, Surround™ was reported to control or suppress leafrollers, leafhoppers, mites, codling moth, plum curculio, apple sucker, stinkbugs, apple maggot and thrips. In Israel, Mazor and Erez (2004) showed that female Mediterranean fruit flies avoided landing on treated nectarine fruits giving a 100% protection. Similarly, Saour and Makee (2004) found kaolin film effectively controlled olive fruit fly (*Bactrocera oleae*) in olives where insecticide sprays of dimethoate failed. Surround™ is applied as a liquid spray, which dries, leaving a protective powdery film on the surfaces of leaves, stems, and fruit.

Surround™ can be washed off by heavy rain and has to be reapplied; therefore its usefulness in high

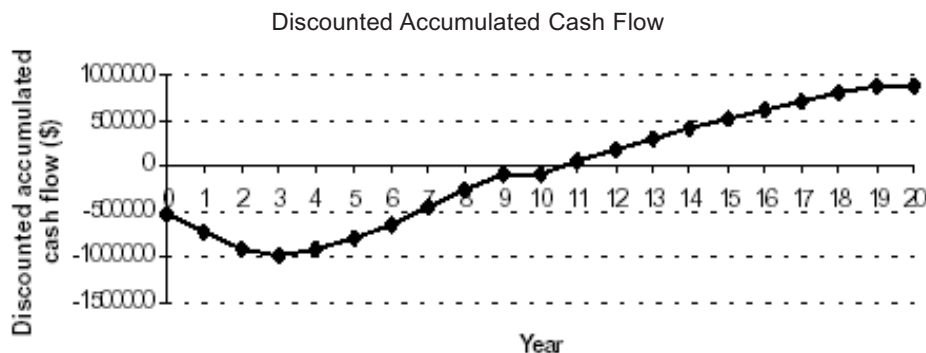
rainfall regions of Australia may be limited. In contrast, in South-East Asia, Surround™ may act as a highly effective protectant of temperate fruits because they develop and mature during the dry season.

### Physical Barriers

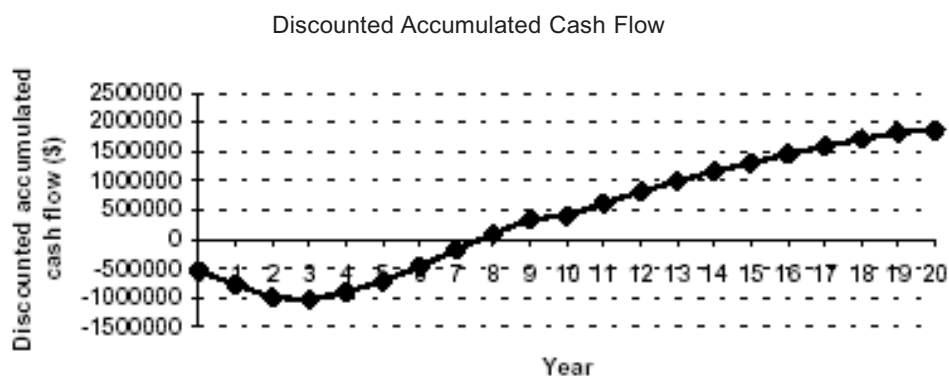
Physical barriers, that exclude pests, can also provide non-chemical control and are highly suitable for both conventional and organic production systems, reducing or eliminating pesticide usage. A small mesh net fabric can be used to fully enclose individual trees or an orchard. In Israel, Erez et al. (1993) demonstrated the feasibility of producing pesticide free fruit using net covered orchards. Recent trials by DPI & F researchers using a 2mm mesh net made from long lasting, translucent fibre, that minimizes shading, excluded a variety of insect pests including fruit fly, macadamia nut borer, fruit spotting bug, fruit piercing moth, and yellow peach moth (Lloyd et al., 2003). Exclusion netting involves a high initial capital cost, however conventional hail/bird/bat



**Figure 1. Discounted accumulated cash flow for a un-netted orchard vs an exclusion netted orchard trained to a tight open vase planted at 833 trees per hectare.**



**Figure 2. Discounted accumulated cash flow for an exclusion netted orchard trained to a palmette systems planted at 1111 trees per hectare**



**Figure 3. Discounted accumulated cash flow for an exclusion netted orchard trained to an Open Tatura systems planted at 2222 trees per hectare**

netting is already extensively used on stone fruit orchards. Two years of trials comparing exclusion netting (with no additional fruit fly treatment) to an adjacent block under conventional bird and bat net showed zero infestation in peaches under exclusion netting compared to a chemically treated bird and bat net block. Preliminary results have shown that exclusion netting can increase fruit quality, in particular, fruit sugar levels by 30% and yields by 10-15% (Lloyd et al., 2003). Fruit maturity is also advanced under exclusion netting by about 7-10 days due to higher heat units accumulated under the netting. Exclusion netted, open vase trained low-chill stonefruit trial trees with reflective mulch at Maroochy Research Station.

### **Economic Evaluation**

In Queensland, we conducted an economic evaluation of the new innovative training, netting and trellising systems for low-chill stonefruit and compared these with non-trellised and bat-netted, vase trained trees, which are currently the industry standard (Lloyd et al., 2003). Fixed, variable and capital costs were adjusted for each training system and a discounted accumulated cash flow generated. Our findings show that non-netted orchards are not viable (Lloyd et al., 2003). We found that increasing tree density greatly increased returns and reduced the breakeven point. The break-even point for trees trained to an Open Tatura system, under exclusion netting, was up to 6 years earlier than for vase- or palmette- trained trees, under birdnetting (Lloyd et al., 2003).

### **Conclusions**

For long-term viability, farmers must adopt new training and management technologies to increase their orchard productivity. We have demonstrated

that combinations of new netting and training systems eg exclusion netting and Open Tatura trellising systems, can significantly boost economic returns to the farmer and at the same time meet community expectation of delivering cleaner, greener fruit.

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## Publications - NSW DPI Newsletters

- ◆ The **Coastal Fruitgrowers Newsletter** is also available on the NSW DPI website at [www.agric.nsw.gov.au/reader/hort-coastal](http://www.agric.nsw.gov.au/reader/hort-coastal)
- ◆ **Fruitwise** is a quarterly newsletter with articles on stonefruit, apples, cherries and prunes. It is available on the NSW DPI website at [www.agric.nsw.gov.au/reader/fruitwise](http://www.agric.nsw.gov.au/reader/fruitwise)



# News in Brief

## ◆ HCCREMS Vegetation Survey and Mapping Project

Hunter and Central Coast Regional Environmental Management Strategy (HCCREMS) is an innovative and highly successful regional initiative being implemented by Councils in the Hunter and Central Coast. HCCREMS was developed to assist, support and resource local government to efficiently develop and implement regional environmental management programs.

A ten Year Plan was developed in late 2003 by Hunter Councils, Department of Environment and Conservation (DEC), Department of Infrastructure, Planning and Natural Resources (DIPNR) and the Hunter-Central Rivers Catchment Management Authority (HCRCMA - formerly the Hunter Catchment Management Trust). It proposes a long-term regional approach to vegetation management and data requirements.

The plan proposes dividing the Hunter Catchment into priority areas and mapping them in a sequential manner in order to provide the baseline data needed for regional landuse planning and management.

HCCREMS is currently involved in three vegetation mapping projects that have been funded by the Natural Heritage Trust. These are:

- Central Coast Vegetation Survey and Mapping
- Hunter Catchment Vegetation Mapping Planning and Management
- Gloucester Vegetation Mapping

If you own land in the Hunter and Central Coast that has been identified as having vegetation not previously surveyed, then you can help the project by allowing the Botanists to access your land and undertake vegetation surveys.

At the completion of the program, results of the vegetation survey will be provided to you for your own land management purposes. You can choose whether the information gathered from your property is available to other people or organisations.

As a landowner in the Hunter and Central Coast, you can participate in the program and obtain further

information from Angela McCauley, Biodiversity Program Coordinator on 02 4978 4020 or [bio@huntercouncils.com.au](mailto:bio@huntercouncils.com.au). Further information about HCCREMS is available at [www.hccrems.com.au](http://www.hccrems.com.au). 

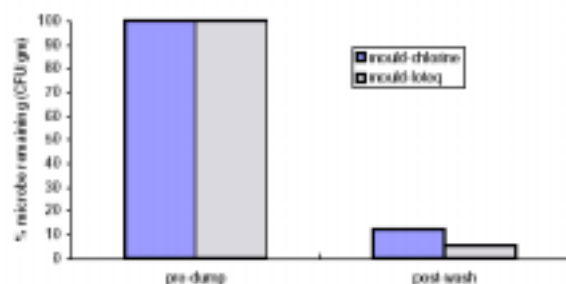
## ◆ Iodine and Iodoclean™: an alternative sanitiser

*Peter Taverner, SARDI*

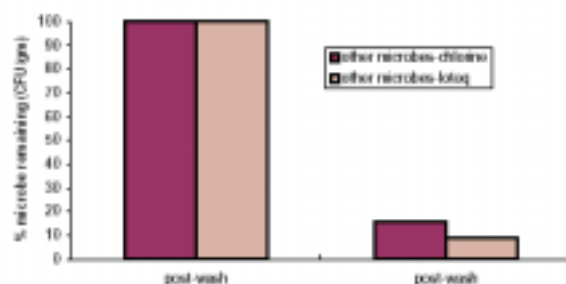
*Extracted from the Packer Newsletter Vol. 78, March 2005*

Ioteq Australia Pty Ltd has developed the Iodoclean™ system, an automated iodine sanitation system for fruit and vegetable washing. The system will automatically dose iodine, log system performance, and create a quality assurance certificate. Another benefit of the Iodoclean™ system is the constant removal of byproducts to maintain optimum levels of the active iodine in the wash tank.

In order to assess the efficacy of the Iodoclean™ system, three packingsheds were visited over a two week period in Sunraysia. On one occasion, the Ioteq system was temporarily placed in the packingline for assessment. This exercise was undertaken as part of a broader study to measure the background levels of microbes on fruit as they travelled through various processes in a citrus



Graph 1



Graph 2



# News in Brief

packingline. This is not a definitive study of the Ioteq system, but may provide a general indication of the effectiveness of the Ioteq system in a commercial citrus packingline.

The following points from this study can be made:

The primary reason for using sanitisers is to control microbes **in the water**, and reduce the risk of cross contamination. The Iodoclean™ system killed all viable spores suspended **in the water**. Packers often wish to know; ‘how well the line processes remove spores and microbes from the surface of fruit’. The graphs below compare an existing ‘chlorine system’ and the Ioteq system at one packingline.

Microbe levels on pre-dumped fruit were very different on the consecutive visits to packingsheds. The figures over the pre-dump columns represent the actual numbers of microbes (CFU) per gram of fruit. However, the graph bars were converted to percentage microbes remaining on fruit surfaces in an attempt to compensate for the initial differences in microbe numbers at pre-dump.

In general, washing processes vary considerably from one packingline to another, and their effectiveness relate to a combination of factors, such as the water pressure, method of application, dwell time and type of sanitiser. Graph 1 shows the percent reduction on mould spores, while Graph 2 indicates the differences in total microbe levels (including bacteria, yeast, etc) for ‘iodine’ and ‘chlorine’ treatment over the same packingline. Overall, this work suggests that the Iodoclean™ system has the potential to be as efficacious as existing sanitation practices under commercial conditions.

## ◆ Minor Use Reform

*Extracted from the APVMA Newsletter, December 2004.*

At the Minor Use Workshop held in November 2003, a Minor Use Taskforce to provide input into the minor use reform agenda was established. The Operational Issues Working Group is a sub-committee of the taskforce that looks at the operational issues surrounding minor use. Earlier in the year, this group agreed to review the permit renewal process and where possible, consolidate



renewals by active constituent. This review is currently progressing at the APVMA. The Working Group is also working on a project that has two major objectives:

- (a) Identification of useful and possible extrapolations based on registered use patterns and local regulatory standards/information, with a focus on identifying possible crop group approvals, and
- (b) Identification of minor uses that may be considered through access to internationally available reduced risk chemistry data.

The Working Group is also reviewing the “Guidelines for Determining Minor Uses”.

The APVMA is actively working on identifying further possible reforms to the overall framework governing availability of chemicals for Minor Use crops in Australia. More information about minor use activities can be found in Minor Use News at

[www.apvma.gov.au/minor\\_use/minor\\_use\\_news.shtml](http://www.apvma.gov.au/minor_use/minor_use_news.shtml)



## ◆ Chemical Reviews

*Kevin Bodnaruk*

*Extracted from Agchemical Update - January 2005*

The APVMA is actively pursuing a large number of chemical reviews. It is expected that many will progress through the next steps of the review process and hopefully be finalised over the next 6-12 months.

**Benomyl.** This review is being finalized following the voluntary cancellation of the Marvel® registration by the manufacturer. A phase-out period for use of existing product will be permitted until 6 December 2006. The question remaining now is whether the related compounds, carbendazim or thiophanate methyl, are likely to come under review in future.

**Fenthion.** Some aspects of the assessment of food uses to be conducted in conjunction with dimethoate, due to related issues and uses. This will not be completed in 2005. Assessment of non-food uses should be released for public comment in 2005.

**Dimethoate.** The review of dimethoate is under way with the APVMA currently assessing data. All



# News in Brief

locally available horticultural residue data was collated and submitted to the APVMA on behalf of the various industries. Of ongoing concern is the likely impact the review could have on Queensland fruit fly control and interstate quarantine and the movement of fresh produce. 🌿

## ◆ **Universal DNA Diagnostics for Australian Insect Pests**

NSW Department of Primary Industries has been awarded funding to develop a DNA-based diagnostic system for Australian agricultural pest insects and mites using 'DNA Barcoding' technology. This method will allow the rapid and accurate identification of almost any insect pest, regardless of developmental stage (egg, larva, pupa or adult) or geographic origin. The resulting database promises to have a profound impact on current practices in quarantine, integrated pest management, ecology and taxonomy. However, the whole enterprise is dependent on obtaining suitable specimens for initial characterisation.

Please assist with the development of universal DNA diagnostics for Australian insect pests by supplying specimens of all your 'favourite' pest species.

For further information please contact (or mail your specimens to):

Dr. Andrew Mitchell,  
Agricultural Scientific Collections Unit,  
Orange Agricultural Institute,  
NSW DPI, Forest Road Orange NSW 2800  
Phone: (02) 6391 3848  
E-mail: [andrew.mitchell@dpi.nsw.gov.au](mailto:andrew.mitchell@dpi.nsw.gov.au) 🌿

## ◆ **The Organics Directory Goes On-line**

*Extracted from Organic Update, February 2005*

A new service has started to help people find organic products. Catriona Macmillan of Heaven and Earth Systems has developed an on line directory that will enable consumers to search for organic products and services. It lists the all industry sectors including producers, growers, wholesalers, retailers, restaurants and manufacturers.

This is a free site, allowing users to go online and add information. The on-line service is still in its early days and potential users are being asked to have a look and provide feed back to ensure that a really useful site is developed. The new Organics Directory site can be found at:

[www.theorganicsdirectory.com.au](http://www.theorganicsdirectory.com.au) 🌿

## ◆ **National Summerfruit IPDM Manual Underway**



*Dr Shane Hetherington, NSW DPI,  
Orange*

*Extracted from Fruitwise, Summer 2004/05 No. 56*


The development of a National Integrated Pest and Disease Management (IPDM) strategy for summerfruit orchards is well under way.

During 2005 all orchardists who pay a levy to Summerfruit Australia Limited will receive a copy of the National IPDM Manual. The manual will provide information on how to control the nine most troublesome insect pests and the nine most troublesome diseases in an IPDM orchard. It will also contain information specific to your region, some general principals on establishing and maintaining an IPDM orchard and a section on management of birds in orchards.


The manual is the result of co-operation between Australian summerfruit orchardists, researchers and extension specialists. During the information gathering phase of the strategy, 66 peach orchardists, 65 nectarine orchardists, 50 plum orchardists and 31 apricot orchardists from around Australia were asked what their major pest and disease problems were. This series of interviews took place before and after the 2003/04 fruit season. Many of Australia's orchard regions were in the grip of a longrunning drought. The interviewees were asked to compensate for the possible reduction in pest and disease problems due to the drought by recalling their problems from up to 10 years ago. This information was then used to make sure that the manual contained the information which was most relevant to Australian orchardists.

The manual will provide the most up-to-date information on pest and disease management from

# News in Brief

Australia and overseas. A draft of the manual will be ready early in 2005. It's important to make sure that the manual contains practical advice which will be helpful to the industry. Orchardists have been involved in every stage of production and the draft will be sent out to a group of orchardists for their suggestions on how to improve it. 

## ◆ **Access to Avocados Australia Website**

In the first week of April all Avocado growers that have provided an email address to Avocados Australia (AAL) will receive their username and password. Avocado growers will have access to levy related issues such as Final R&D reports and Marketing up-dates. Avocados Australia members will have more extensive access to AAL information and other products. 

## ◆ **Australian Citrus Growers (ACG)**

### **ACG Board Changes**

Following the ACG Annual General Meeting in March the Board of Directors was confirmed as follows:

#### **Queensland**

Directors - Allen Jenkin and Kevin Parr

#### **New South Wales**

Directors - Peter Davidson and Bob Sjollema

#### **Victoria**

Directors - Neil Eagle and Kevin Cock

#### **South Australia**

Directors - Mark Chown and Kent Andrew

#### **Western Australia**

Director - Mark Scott

#### **Northern Territory**

Director - Tom Harris

The Board also elected its office bearers. Mr Mark Chown was elected President and Mr Kevin Cock was elected Vice- President.

#### **Pat Barkley Foundation**

The Pat Barkley Foundation was launched at the recent conference. This foundation will assist the Australian citrus industry to maintain access to

world class technical expertise, through the provision of travel grants for international travel to attend scientific meetings/workshops/short term training programs or to visit with world leading scientists overseas.

Successful applicants will be chosen according to specific criteria by a selection panel including Pat Barkley, ACG and HAL. The Foundation will endeavour to seek matching Australian government funding through HAL.

Donations are the only funding method and to kick things off, ACG Board has donated \$10,000 to the Foundation. Citrus organisations and companies are encouraged to make contributions. The first call for applicants will be made later this year for the 2006/07 financial year. 

## ◆ **New Varieties Out of Quarantine**

Four new citrus varieties were released from plant quarantine in late 2004 and a limited amount of budwood has recently arrived at Dareton for multiplication by Auscitrus and evaluation by NSW Department of Primary Industries. The mandarin types were recommended for introduction by Auscitrus to Australia, following a Vitor grower's tour to Spain and Morocco in 2002. The varieties are public access and do not carry any patent or plant breeder's rights protection.

**Primosole mandarin:** (known as Clemensole in Spain): An Italian hybrid of Miho Wase satsuma X Carvalhais mandarin which ripens very early (at beginning of October in Sicily, which is the equivalent of early April in Australia). It is very productive with maturity around 10 days before Okitsu satsuma. Primosole has a similar fruit size and flattened fruit shape as Okitsu satsuma.

The early maturity, easy peel characteristic and orange skin colour help to sell Primosole in Italy. Fruit taste is said to be bland, similar to a satsuma, but it is possible to improve the eating quality of satsumas with deficit water management.

Primosole is not grown or recommended in Spain because of cross pollination with clementines. It will pollinate clementines and be pollinated by



# News in Brief

clementines. The variety is seedless in isolation. Primosole is susceptible to wind and can defoliate. It is also susceptible to *Alternaria* fruit rot in Italy, due to growth cracks at the styler end, and is sensitive to sunburn.

**Sidi Aissa Clementine:** a Moroccan variety with good size and taste. Sidi Aissa is said to have the same maturity period as Nules clementine but have superior internal colour and flavour. The level of industry adoption of clementines, as a new citrus type for Australia, has been low. The reasons for this have been the difficulties experienced in their culture, being able to isolate plantings to ensure low seeded fruit and an Imperial dominated, local mandarin market.

**Orogrande Clementine:** a Spanish mutation of Nules Clementine that blooms at the same time as Nules but can be harvested 5 days earlier.

Orogrande fruit contains more fibre and juice than Nules and is also less prone to sunburn as fruit is produced within the tree canopy. Orogrande is said to be suited to areas with hot summers and mild winters such as the Murcia region of Spain.

**Nagami cumquat:** Nagami cumquat was imported by Auscitrus because the existing Nagami cumquat line in Australia has Citrus Leaf Blotch Virus, which causes a yellow ring at the bud-union on *P. trifoliata* and its hybrids. Any bud line infected with this virus poses a crosscontamination threat to other trees in a nursery situation.

The Nagami imported by Auscitrus is free of virus's and viroids, and will be maintained as a high health status line in the budwood scheme. Budwood of the virus free Nagami should be available in small quantities in Autumn 2006.

*Auscitrus provides premium budwood (of a high health status) of a range of citrus varieties. The following tables list the varieties available.*

Oranges				Mandarins		
Navels	Valencia	Common	Blood	Other	Clementines	Satsuma
Atwood Cara Cara Fisher Fukumoto Lanes Late Leng Navelate Navelina 7.5 (Spain) Navelina 315 (Italy) Ryan Washington	Benyenda Delta (seedless) Keenan Midnight (seedless) Seedless (M <sup>c</sup> Mahon)	Hamlin Joppa Natal Parramatta Parson Brown Pera (Limeira) Pera (Olimpia) Pineapple Salustiana White Siletta	Arnold Harvard Maltese Ruby	Anana - Apireno Avana - Tardivo Daisy Ellendale Emperor Encore Fallglo Fortune Fremont Hickson Imperial Kara Lake Emperor Murcott Nova Pixie Sunburst Topaz W. Murcott Afourer	Caffin Clementard Corsica 1 Corsica 2 Fina Marisol Nules Oroval	Clausellina Miho Okitsu Silverhill

Lemons	Grapefruit	Other	Pummelo
Eureka Eureka - Allen Fino Lisbon - Limoneira 8A Lisbon (Prior) Meyer (806) Verna Villa Franca Yen Ben	Cant Star Ruby Flame Henderson Marsh Ray Ruby Rio Red Star Ruby (California) Thompson Pink (Eagle) Wheeny	Bergamot - Castagnaro Calamondin Fingered citron Kaffir lime (Malaya) Kaffir lime (Nathanael) Lemonade Nagami cumquat (oval) Meiwa cumquat (round) Variegated cumquat	Nam Roi
			<b>Tangelo</b>
			Minneola Seminole
			<b>Lime</b>
			Tahiti



# Biocontrol Project to Reduce Borer Damage in Prune Trees

**Sue Marte, District Horticulturist, NSW Department of Primary Industries, Young.**

Fruit-tree borer (*Maroga melanostigma* Wallengren) is a native pest of many trees, both native and ornamental, including *prunus* species. Although most pests which bore into fruit trees are called fruit tree borers, this pest should not be confused with other wood borers such as the longicorn beetle.

The damage caused by this pest has been noted since the mid 1800s. Typical damage can occur on all parts of the tree and is recognisable by the frass which the pest leaves behind as it feeds. The moth, which is found throughout Australia, is satiny white with a characteristic black dot in the middle of its forewings. In the Young district, it is active from late November to early February. The moth lays its eggs on the bark of the tree. As the larvae hatch they begin feeding in a manner which can ring bark the tree. By the third instar, they begin to bore into the tree. Their tunnels can be quite extensive and can cause severe structural damage. There are no chemicals currently registered for its control. Growers wanting to control this pest clear away the frass and infiltrate the tunnel beneath with a thin wire, piercing the larva to kill it. Although this is a highly successful control, it is not very practical for a commercial operation.

When a pecan orchard in Moree, NSW was having problems controlling this same pest, they found a native species of *Trichogramma* which was partial to *Maroga* eggs.

*Trichogramma* are a minute parasitoid wasp, which lay its eggs inside pest eggs. When the *Trichogramma* eggs hatch, they feed on the developing larva, killing the host, and adult wasps then emerge from the egg and continue to parasitise other eggs.

The Australian prune industry has the potential to produce 5,000 tonnes of dried product a year. This represents about 2% of worldwide production and translates to about \$20 million per annum for the Australian economy. Conservative estimates put borer damage at reducing production by 5% in a tree. When up to 50% of trees in an orchard can be affected, this equates to a significant loss of production, and therefore income, for an orchardist.

The Australian Prune Industry Association (APIA) is supporting a three year project, funded by APIA, HAL and NSW DPI. The project is looking at biological control options for control of *M. melanostigma*.

In the first year (2004), studies were undertaken to increase knowledge about the pest and its lifecycle, and the trial design was implemented. Three orchards were chosen in the Young district, with four blocks of approximately 200 trees each surveyed. Any damage to a tree was noted within the four blocks.

During this past season (2<sup>nd</sup> year), biological control releases were made using *Trichogramma carverae*, at a recommended rate of 120,000 wasps/hectare. These were made in two each of the four blocks on the three orchards. Two releases were made, one week apart. The other two blocks had no releases and will act as controls.

During winter 2005, all trees again will be surveyed for damage. Changes to damage levels should indicate effectiveness of the *Trichogramma* releases. Also during this winter, entomopathogenic nematodes will be assessed as to their suitability as a biocontrol during the larval stages of the fruit-tree borer's lifecycle.

It is important for Australian produce to maintain its 'clean & green' image. Using biological controls instead of pesticides is only one of the benefits to be gained. 🌿



***Maroga melanostigma***



**Typical fruit-tree borer damage**

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# Australian Citrus Growers Conference Report

**Sandra Hardy, Acting Technical Specialist (Citrus), NSW Department of Primary Industries, Gosford.**

The 57<sup>th</sup> Annual Australian Citrus Growers Conference was held in conjunction with the Australian Fruit Juice Association at Coolumb, Queensland in early March. Following the conference the venue moved to Bundaberg with a tour of two citrus properties and a series of presentations on currently funded research projects.

## Research Presentations

**Delivering Improved Genetics for Commercial Citrus Production.** (Projects CT04007 & CT 03025)

**Malcolm Smith, QLD Department of Primary Industries.**

The aim of this work is to improve existing varieties and not create new ones. With scion varieties they are focussing on mandarin varieties for the subtropics. With the rootstock research they are evaluating some new combinations for a range of citrus varieties.

Scion research:

Using conventional hybridisation 270 hybrids have now been selected and planted in a high security area. One third of these hybrids are now producing fruit. Mutation breeding has produced two low seeded Murcott varieties which are undergoing commercial evaluation in Queensland. Triploid breeding has produced 3000 varieties which have been planted out in a field evaluation block.

Rootstock research:

One aim of this work is to find rootstocks for early season mandarin production. The trial consists of four mandarin varieties (Imperial, Nova, Fallglo and DeNules) on 10 rootstocks. Five years of data (2001-2004) have been collected so far. Some early observations include the potential of Benton citrange as a mandarin rootstock with good yields and low granulation.

A Eureka lemon rootstock trial has 28 rootstocks being evaluated. The first harvest will commence in 2005 and focus on assessment of fruit quality, yield and tree vigour. There is also an Imperial mandarin rootstock trial planted in 2004, with 33 rootstocks being evaluated.

**Rind Quality Project** (Project CT 01029)

**Ken Bevington, NSW Department of Primary Industries.**

This project has 3 parts, "on-farm" influences on rind quality, the physiology of rind breakdown and post harvest handling issues on rind quality. Seven different types of rind injury on navels have been identified from this project. The project aims to also identify the key cultural practices which influence rind quality.

Some early observations include the influence of rootstock on the incidence of rind breakdown, with *P. trifoliata* having the least incidence and Rough lemon the most. There is also an irrigation interaction with rootstocks, with less breakdown in drier conditions. There also appears to be some variety differences.

The effect of gibberellic acid (GA) sprays also has a positive effect on reducing the incidence of rind breakdown. GA sprays are typically applied in summer when fruit are 30-50mm in size, in autumn at colour break or in early winter near full colour break. GA sprays do increase rind firmness and using an early and late spray has a cumulative effect. The effects of GA on rind colour development are substantial with the April/May application (about a 3 week delay) but there is no effect from the early application in January. However the January application significantly increased rind firmness.

Seasonal effects such as the total heat sum appear important in rind breakdown, with South Africa using this as an important indicator for possible rind breakdown issues.

**A Systems Approach to the Control of Black Spot** (Project CT 03005)

**Pauline Wyatt QLD Department of Primary Industries**

This project was initiated in order to gain access to the USA market which requires freedom from Black spot and Fruit fly. Current control strategies while providing good control of Black spot are not accepted by the USA. The current spray program is based on the application of two copper sprays (half strength) at 10% and 75% flowering, followed by

three mancozeb sprays 5 weeks apart to cover the 20 week incubation period.

Three orchards in the Central Burnett area of Queensland are being used in the trial. Black spot spores develop only on fallen leaves on the orchard floor. The trial is assessing ways in which to break the disease cycle, such as selective hand pruning, the use of under tree mulches, preharvest and postharvest fungicide application and inspection.

The position of fruit on the tree and its potential for black spot development is also being assessed. So far there appears to be no difference between fruit on the inside or outside of the canopy, however fruit on the sunniest sides of the trees (northern and western sides) tend to have more black spot.

### **Farm Visits**

The first farm visited was Abbotsleigh which has been recently purchased with the aim of bringing it back into full production following a few years of neglect. The property has 14,000 lemons, 14,000 Murcotts, 6000 Imperials, 6000 Hicksons and 5000

Navelina oranges and a 6M dollar packing shed. Trees range in age from 7-14 years and in the last 12 months 42,000 trees have been pruned. The mandarins are on Troyer citrange rootstock and the lemons on Rough lemon and Benton citrange. The orchard uses C probes for monitoring irrigation, the source of which is the Burnett river. Specific challenges have included the control of brown spot on the Murcott mandarins and the control of rats, a result of the property being in old cane country. Lemons start picking on Australia Day with a 75-90% packout. Soon after harvest the lemons are then hedged and hand pruned.

The second property visited was McLennans and the focus of this visit was to look at the specially built farm machinery used for the Imperial and Murcott mandarins. One such machine was a type of thinning machine used to take off the sunburnt fruit on the tops of Imperial and Murcott trees (up to 5m high) when they are >40mm in size. Stationary fingers on a moving drum are used to remove the fruit, as the fruit come into contact with the fingers. 🍌



*Lemons on the packing line at the Abbotsleigh packing shed.*



*This thinning machine is used to remove sunburnt fruit on the tops of mandarins at McLennans orchard.*



*A mulching machine at McLennans orchard.*



*A hedging machine at McLennans orchard.*

# Registered Fungicides for Citrus Postharvest – What’s Out There?

Nancy Cunningham, SARDI

Extracted from *Packer Newsletter*, Vol. 77, Jan 2005

In this article, I will outline the main chemical actives registered and used in citrus postharvest and their effectiveness against several citrus pathogens (Table 1 gives a summary of their effectiveness against latent infections as well as major wound pathogens).

## Main Fungicide Groups

### Group A – Benzimidazole

Active constituents include thiabendazole (TBZ), benomyl and carbendazim.

#### Trade Names

Thiabendazole: Tecto90®, Tecto 500 SC®

Carbendazim: Bavistan®, SpinFlo®, Goldazim®

*Formulations:* Wettable powders, Suspension concentrates, Emulsifiable concentrates.

Thiabendazole was one of the first of a ‘new batch’ of chemical fungicides in the benzimidazole group whose properties were first noted in the 1960’s. It is very effective against *penicillium* moulds of citrus. It is useful in large tanks and bulk dips where frequent disposal is inconvenient and is compatible with a wide range of sanitisers. Resistance to thiabendazole is now common in some countries. However, Australia has good management practices that aid against resistance issues.

Fungicidal activity of carbendazim was first reported by Hampel and Löcher in 1973 (Tomlin, 1995) and introduced by BASF (now AgrEvo) and Dupont in 1974. The product is widely used by the citrus industry and is effective against *Penicillium* moulds and some stem end rots. Carbendazim is a break down product of both benomyl and thiophanate-methyl and MRL testing by importing countries can mistake carbendazim for these products.

Benzimidazole fungicides can be unstable in highly alkaline environments so may not be suitable when mixing with wax, although in other countries such as South Africa TBZ is mixed with wax but usually in the presence of another fungicide.

### Group C – DMI – Imidazole

Active constituents include imazalil.

#### Trade Names

Imazalil: Fungiflor®, Magnate®, DeccoZil®, Fungazil®, Imazagard®.

*Formulations:* Wettable powders, Emulsifiable concentrates.

The active imazalil in commercial form has been around since the late 1970’s, and was first reported to have fungicidal properties against pathogens of citrus at the 1977 Citriculture conference by Laville et al (Tomlin, 1995).

Imazalil is generally used in line as a flood or CDA (control droplet application). It is very stable at higher pH’s, which can make some formulations compatible with wax (refer to the label of particular fungicide formulation to verify this application method). Imazalil gives good protection against *Penicillium* sp. It is especially good at inhibiting the formation of spores. One of the main advantages of Imazalil use in Australia is that it is likely to control mould strains resistant to TBZ and carbendazim. Some formulations of imazalil are not compatible with other fungicides such as those containing TBZ. Studies in the USA have shown that when imazalil is heated it can provide increased efficacy against some *penicillium* moulds (Smilinick et al, 1997).

### Group X: unspecified – Guanidine

Active constituent: Guazatine

#### Trade Names

Panoctine® liquid fungicide (Aventis), Nufarm Panoctine®, Campbell’s Zanoctine®

*Formulations:* Water-soluble liquid.

Fungicidal activities first published in 1968 and fungicide produced by Rhone-Poulenc. Fungicides containing Guazatine are very effective in the control of infections from *penicillium* and sour rot especially when applied within 24 hours of harvest. Guazatine is not as effective at controlling sporulating *penicillium* spores as other fungicide groups and is rapidly decomposed in highly alkaline environments. Guazatine can be used most effectively as a bulk dip when fruit first come into the packingshed. A second in line fungicide is then needed – preferably one with a different active, to

counteract any resistance issues and to provide longer-term protection.

### **Ungrouped chemicals**

Active constituent: Sodium Ortho-phenylphenate (SOPP)

#### *Trade Names*

Preventol®ON fungicide, Brycote®

*Formulation:* Wettable powder.

SOPP's fungicidal properties were first reported in 1936. Unlike the newer chemical fungicides it needs to be applied to the fruit before fungal infection has grown beyond the initial wound (Eckert and Eaks, 1989). It also needs to be maintained in its highly alkaline state for greatest effectiveness. Lower pH of SOPP has been known to adversely damage the skin of fruit. The main activity of SOPP comes from direct contact with fungal spores on fruit or in solution and as a residue on fruit surfaces. Due to its widespread antimicrobial effects (it works on a wider range of

pathogens than most chemical fungicides) it has seen resurgence in the USA where resistance is a problem. However it is not widely used in the citrus industry in Australia apart from Queensland and is currently only registered as a control for blue mould (*penicillium italicum*).

### **Using fungicides on export fruit**

We frequently get asked by citrus packers can I use fungicide X if I'm exporting to country Y? To answer this is difficult, because the MRL's (minimum residue limits) for any importing country are constantly under review. Historically each country has set up a list of MRL standards, which regulate how imported produce can be chemically treated. In recent times in an attempt to standardize MRL's throughout the world, WHO (World Health Organization) and FOA (Food and Agriculture Authority) set up the Codex Alimentarius Commission to deal with food safety issues and ensure fair practises in the food trade. Codex

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provides standards that defer to general MRL's for fungicides mentioned in this article. However, this is a voluntary standard and many countries are yet to review and change to the Codex standard. Packers need to ensure that they are correctly informed about the market place and on regulations for export fruit. Citrus boards, importers/exporters and government departments can all give assistance in obtaining this information. It will also pay for packers to check with more than one regulatory source to confirm that their choice of fungicide is appropriate.

Currently the Australian Citrus Growers website has a citrus export MRL listing which can be accessed on their website at [www.australiancitrusgrowers.com](http://www.australiancitrusgrowers.com)

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**Table 1: Effectiveness of chemical actives against stem end rots and major wound pathogens of citrus (based on tables and information found in Timmer et al (2000) and Eckert and Eaks (1989).**

Chemical active	Stem End Rots		Wound Pathogens		
			Green and Blue mould ( <i>Penicillium</i> spp)		Sour rot ( <i>Geotrichum candidum</i> )
	Diplodia	Alternaria	Infection	Sporulation	
Thiabendazole (TBZ)	✓✓	×	✓✓	✓✓	×
Benomyl	✓✓	×	✓✓	✓✓	×
Carbendazim	✓✓	×	✓✓	✓✓	×
Imazalil	✓	✓	✓✓	✓✓	×
Guazatine	✓	×	✓	×	✓✓

✓ Moderately to very effective  
 ✓✓ Very effective  
 × Not effective

## Recommendations for good decay control

- Ensure any holding tanks or surfaces are clean before mixing fungicides.
- Use clean water when mixing fungicides – or if using river water, dose with a sanitiser (remember to monitor pH and adjust if necessary if using a pH sensitive sanitiser) and leave overnight before mixing fungicide.
- Treat fruit with a fungicide as soon as possible after harvest. This is especially important if there is a delay between arrival and processing through the packingline. The usual time frame is within 24 hours of infection; otherwise mould can develop to far for fungicides to have an effect.
- When using more than one fungicide in the packingline – apply fungicides from two different activity groups. This ensures that fruit has been adequately protected and can aid against the formation of resistant spores.
- Some packers mix fungicides with two different actives together however some combinations are not compatible. If possible do not mix fungicides together.
- Ensure that when applying fungicide in dips/drenches or inline, fruit has adequate coverage – either by applying over brushes (for inline) or checking that dwell time is around the 30 seconds (recommended by most manufacturers).
- Fungicide application in wax can give a reduction in decay control efficacy so ensure that fruit is adequately covered; use this as a second application of fungicide.
- Keep equipment in good condition by regular cleaning and maintenance.
- Monitor concentrations and ‘top up’ using double strength fungicide. This is usually adequate to maintain concentration however regular analysis is also useful in determining whether topping up procedures are working.



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# Citrus Research : Final Report Summaries

## Field and Post Harvest Control of Snails in Citrus (Project CT00040)

*Angela Lush, SA Research & Development Institute.*

One of the key export markets for the Australian citrus industry is the USA. Several issues threaten access to this market, with one of them being the interception of foreign invertebrates.

*Microxeromagna armillata*, the small brown snail, has been intercepted on shipments of Australian export navels by USDA quarantine authorities. USDA declared *M. armillata* an actionable species, which means that further snail detections on Australian export fruit, could threaten market access.

This project aimed to provide citrus growers with more information on the biology, ecology and control of *M. armillata* and tools to minimise the risk of fruit contamination.

Research in this project has found that:

- *M. armillata* has a high reproductive rate and can lay eggs from early autumn to spring. Juveniles can grow to maturity in just three months and begin reproducing in laboratory conditions. These juveniles can survive without food and water for at least 10 months. *M. armillata* can reproduce by self-fertilisation.
- *M. armillata* is found at higher densities in the leaf litter under the tree than the sod between rows.
- During autumn and winter snail numbers on the tree trunks were low, and no snails were found in the outer canopy.
- Snails were more likely to be found on fallen fruit than on fruit in the canopy during harvest.
- The risk of snail contamination of fruit picked in spring is much higher than in autumn and winter. In spring, high numbers of snails were found on the tree trunks and snails were found in the outer canopy region.
- Metaldehyde and methiocarb based baits were effective against *M. armillata* in semi-field conditions with the most consistent results achieved in autumn.

- Copper bands can prevent snail movement into the tree canopy for up to two years, although efficacy depended on band type.

Key recommendations for citrus growers exporting Navels to the USA include;

- Skirt trees so that fruit never touches the ground.
- Never harvest fallen fruit.
- Monitor for snail activity prior to application of snail baits.
- Baits should be applied in autumn when snails are active. Killing adult *M. armillata* before they begin breeding will help to keep the population under control and reduce movement into the tree canopy.

## Management of Internal Dryness of Imperial Mandarin (Project CT03029)

*Garry Fullelove, QLD Department of Primary Industries and Fisheries*

A one-year preliminary investigation into the definition, field management, and grading technologies to sort for "internal dryness" of Imperial Mandarins was undertaken during the 2003/04 season. "Internal Dryness" of Imperial mandarins is an internal fruit disorder that expresses itself as a lack of the high juice levels and orange flesh colour usually found in Imperial mandarins. The fruit segments are dry, chewy and tasteless when consumed. The disorder is impossible to grade for using current shed technologies. Fruit size and shape show a poor relationship to the incidence of "internal dryness".

Results showed that the 2003/04 season was exceptionally good for the low incidence of the disorder with trees producing on average over 95% of good quality edible fruit.

This study further showed that the position of the fruit on the tree has little influence on its juice levels. Some relationship to soil potassium levels was found and will be investigated further.

The non-invasive assessment technologies of ultrasound, X-rays, computed tomography (CT) scans, nuclear magnetic resonance (NMR) and near infra-

red (NIR) spectroscopy were trialled for their ability to detect the incidence of "internal dryness". NMR imaging and CT scanning proved capable but are not technologies that lend themselves to be deployed in citrus packing sheds and operated in real time. NIR still offers the better in-shed, real-time non-invasive assessment for this disorder with improvements showing a greater degree of accuracy in grading out affected fruit.

Electron microscope studies and chemical analysis of fruit segments indicate that this disorder is essentially "granulation", an internal fruit disorder described in the literature that affects a range of

other citrus fruits. Granulation of citrus fruit was first described in 1934 in the USA. Overseas studies indicate that the incidence of "granulation" is not well understood but can be related to orchard location, soil type, rootstock, crop nutrition, climate and tree vigour. Trials to investigate various orchard management options for Imperial mandarins that may influence the incidence of "internal dryness" were largely unsuccessful due to the low incidence of the disorder this season.

**For more information refer to the final report available from Horticulture Australia.**



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# Reworking Citrus – the Health Risks

**Pat Barkley**

*(This article was originally published in the Australian Citrus News, April 1995).*

Topworking of established citrus trees to a different species, variety or cultivar is sometimes necessary to meet changed market demands.

The tree to be top-worked must be vigorous and free from virus and fungal diseases. Both rootstock and any interstock must be compatible with the proposed new topstock. A weak tree will not be made healthy and productive merely by topworking it to another variety.

## **Reworking Valencia or Navel Oranges**

Reworking Valencia and Washington navel orange trees to new varieties was studied at the Horticultural Research Station at Narara in the 1960's by J E Cox. In the trial the following varieties were used for re-working onto Valencia and Washington navel orange trees:

**Oranges** – Washington Navel, Leng Navel, Bellamy Navel, Thomson Navel, Valencia, Shamouti, White Siletta, Joppa, Homosassa, Paterson;

**Mandarins** – Ellendale, Imperial, Clementine, Muscio, Silverhill, Satsuma, Kara, Emperor, Beauty of Glen Retreat, Hickson, Seminole tangelo;

**Lemons** – Eureka (old line and nucellar selections), Lisbon (old line and nucellar selections), Villa Franca (nucellar selection), Meyer;

**Grapefruit** – Marsh, Thompson, Ruby, Wheeny;

**Other varieties** – Smooth Seville, Rough Seville, West Indian lime.

All the orange and mandarin varieties grew successfully. Some of the mandarins, namely Satsuma, Kara, Emperor, Beauty and Hickson, grew rather slowly in the first year, but produced more rapid growth later.

Of the lemon varieties, only Meyer gave a satisfactory result. Eureka, Lisbon and Villa Franca were all unsatisfactory, both when old lines and nucellar selections were used. These three varieties failed completely on some trees, whilst on other trees, an occasional bud produced strong, normal growth. In more recent years, I have seen nursery or

young (3-4 year old) Valencia trees reworked to Eureka lemon, again with mixed success. Generally lemon grafts are unsuccessful or are very yellow initially and slow to grow, but may eventually form a tree. The reason for these mixed responses is due to the strains of citrus tristeza virus present in the original orange tree and in the lemon scion wood.

Tristeza decline is primarily a disease of orange or mandarin trees on sour orange (Seville) stocks that is transmitted by grafting or by the black citrus aphid. The virus (CTV) exists as mild and severe strains. In Australia CTV occurs in almost every citrus tree and causes wood pitting (especially in grapefruit). Some species like lemon show a hypersensitive reaction (seedling yellows) to the CTV strains which occur in oranges and mandarins. The CTV complex differs in different species and the species differ in their susceptibility to the components that make up the whole virus complex. It is this variability in CTV strains in the original variety and in the topwork variety that is responsible for the variable and often disastrous response when oranges are topworked to lemons.

In the Narara trials, the grapefruit varieties (March, Thompson, Ruby) grew successfully. However these varieties are susceptible to stem pitting and if the original tree carried strains of tristeza (symptomless) which are responsible for stem pitting in grapefruit, the longer term results could be unsatisfactory.

## **Reworking Lemons**

In most cases it has not been satisfactory to topwork lemon trees to other varieties. A lemon trunk which has been subject to shellbark or collar rot will in time seriously affect the vitality of the new top. While the chance of success in topworking nucellar lemons is greater (due to the absence of shellbark) it is still considered questionable practice, and should only be used to rework young, vigorous lemons to a new or better line of lemon.

## **Reworking Grapefruit**

It is not generally recommended that grapefruit are reworked to orange or mandarin varieties, because CTV strains in the rework variety may affect the grapefruit interstock. The response is likely to be variable.

Marsh or Thompson grapefruits should only be reworked to the newer red fleshed grapefruit if the original trees were grown from pre-immunised budwood from the Australian Citrus Propagation Association Inc. (Auscitrus) and show no symptoms of tristeza stem pitting (ie. trunk pitting, lopsided and small fruit, or decline in one or more branches). Red grapefruit are generally more susceptible to tristeza stem pitting than white fleshed varieties.

### Reworking by Grafting to the Rootstock

Some of the problems with tristeza can be overcome by completely removing the scion ie. cutting off trees to below the bud-union. *P. trifoliata* and Troyer citrange rootstocks are highly resistant, if not immune, to most strains of tristeza virus. Consequently their reworking to CTV-sensitive varieties eg. Lisbon lemons and grapefruit, poses no problem. Eureka lemons however are incompatible with *P. trifoliata* and citrange and develop a yellow

ring at the bud-union. Rough lemon and sweet orange rootstocks will replicate most CTV strains.

### Use Virus-Tested Budwood for Reworking Trees

Topworking has been widely used to quickly capitalise on any budsports or new varieties with promising attributes. This practice has not been without its problems and has sometimes resulted in the multiple infection of trees with viruses. In Australia, this is now relatively uncommon, due largely to the availability of virus tested budwood from Auscitrus.

Selection of budwood or graftwood for the new top is very important. Ideally this wood should be obtained from Auscitrus or from trees known to have been propagated from budwood supplied by Auscitrus. Failing this, trees should be selected that are visually healthy and are on trifoliate orange or citrange rootstock.

**Table 1. Summary of the Health Risks in Reworking Citrus**

Tree to be topworked		Mode of grafting	Grafting wood			
Scion	Rootstock		Orange	Mandarin	Grapefruit	Lemon
Valencia or Navel	<i>P. trifoliata</i> , citrange	into scion	S <sub>1</sub>	S <sub>1</sub>	NR	NR
Valencia or Navel	RL, sweet orange	into scion	S	S	NR	NR
Valencia or Navel	<i>P. trifoliata</i> , citrange	into rootstock	S <sub>1</sub>	S <sub>1</sub>	S <sub>1</sub>	S <sub>1</sub>
Valencia or Navel	RL, sweet orange	into rootstock (scion completely removed)	S	S <sub>2</sub>	NR	NR
Mandarin	<i>P. trifoliata</i> , citrange	into scion	S <sub>1</sub>	S <sub>1</sub>	NR	NR
Mandarin	<i>P. trifoliata</i> , citrange	into rootstock (scion completely removed)	S <sub>1</sub>	S <sub>1</sub>	S <sub>1</sub>	S <sub>1</sub>
Mandarin	RL, sweet orange	into scion	S	S	NR	NR
Mandarin	RL, sweet orange	into rootstock (scion completely removed)	S	S <sub>2</sub>	NR	NR
Grapefruit (with stem pitting)	<i>P. trifoliata</i> , citrange	into scion	NR	NR	NR	NR
Grapefruit (with stem pitting)	<i>P. trifoliata</i>	into rootstock (scion completely removed)	S <sub>1</sub>	S <sub>1</sub>	S <sub>1</sub>	S <sub>1</sub>
Grapefruit (with stem pitting)	<i>P. trifoliata</i> , citrange	into scion	NR	NR	S*	NR

NR = not recommended; S = satisfactory; S<sub>1</sub> = satisfactory only if grafting wood is free of exocortis and tatter leaf virus; S<sub>2</sub> = do not rework Rough lemon (RL) to Ellendale, Satsume or Imperial. S\* = for certain varieties - see text



# Assessment and Use of Non-Conventional Products

*Greg Reid, Soils Advisory Officer, NSW Department of Primary Industries, Wollongbah.*

## Product Information

If you find a product that you think could be useful, find out as much as you can about it and ensure that it will work on your particular crop, on your soil type and in your climate. Be wary of products not supplied with the following information:

**Contents or ingredients:** Analysis details are evidence of quality assurance in the preparation of a product. Any product with secret ingredients should be treated as suspect and a risk to your customers. Products sold as fertilisers are required by law to quote NPK content. Lead should be less than 100mg/kg, cadmium less than 10mg/kg and mercury less than 5mg/kg. Remember that organic fertilisers tend to be applied at much heavier rates and high levels of other metals such as copper and zinc can be a concern over time.

**Storage conditions:** Products containing active microbes, enzymes or organic compounds can degrade easily. High temperatures, sunlight and airborne spores can shorten the already limited shelf life these products.

**Application rates:** Many factors affect the persistence of microbes in the field, including heat, rainfall, soil pH, organic matter and agricultural chemicals. Instructions for correct application methods, rates and conditions are vital. The required frequency of application can help you estimate the cost efficiency of the product.

**Safety instructions:** Even 'natural' preparations can involve certain risks for users. Concentrates can have high levels of natural toxins and microbial products may involve some chance of infection or allergy reactions. Under Occupational Health and Safety legislation, handling instructions are required to minimise risk to the user and it is important to follow these directions.

**Withholding Period:** Preparations applied directly to food will represent some degree of safety risk. A withholding period is your assurance that this risk has been assessed. For example, some compost teas can contain human disease microbes.

## How to trial new products

The idea of a field trial is to determine whether a new treatment for a problem makes a difference. Sounds easy. In fact it is too easy. As you know, no two seasons are the same, no two fields are the same, even two trees of the same variety in the same orchard will perform differently. There are so many differences that the trick is to work out what difference was really due to your new treatment.

The first two steps below are essential however a really reliable trial will include all four steps.

**Control:** It is no good just treating one area and thinking any change is due to your treatment. The change could just as likely be due to good rain, fewer pests or last years rotation. If you compare a treated area simultaneously with an untreated area then the difference is much more likely to be due to your treatment. The untreated area is called the control. Both areas should be as similar as possible, same crop, same soil, same slope, same management etc. The control can be your current practice.

**Measure:** Visual assessment is notoriously unreliable. Not only does visual assessment introduce the chance of bias it can also overlook economically important differences. A difference of 10% can easily be missed but this can mean more than \$1000/ha in some crops.

Decide what you are going to measure, plant height, grain size, fruit sugar, or harvest weight. If a product or technique is worth using then it is worth measuring, even if that means separately harvesting a few smaller areas.

**Replicate:** Though it is easier and more convenient just to treat one area, there is still a lot of variation between fields. One area may be benefiting from a windbreak, a higher water table or fewer weeds. It is much better to divide a field into several strips or rows that suit your machinery. The first strip receives the treatment, the next one doesn't, forming a pair. Two pairs are the minimum and accuracy improves with every extra pair. You might be able to team up with some other growers who want to trial the same product. As long as the results are measured then the numbers can be pooled to give a much more confident result.

**Randomise:** Ideally the treated and control areas should be in pairs scattered randomly over a field. This is because there is variation within fields. Trees may do better at the bottom of a slope due to better ground water. One side of a field maybe more sheltered. Soils are often shallower toward a crest.

Randomising is difficult to work with and generally only scientists have the time for it but the results give a better idea how the treatment will perform overall.

If you follow these guidelines for a field trial and find that the treated areas generally out perform the controls then you can be pretty confident that the product is working. You will also be able to work out whether it is going to be cost effective. However, don't extrapolate too much from this.

Ideally, a field trial should be carried out over several years to take into account long term effects and the influence of different seasons. Different crops or even crop varieties may respond oppositely and of course what works on one soil may not work on another. Even so the work you have done is valuable, and not just to you. Keep records of what you did, when and any changes you noticed. Remember, cost savings can be just as important as yield. Involve your local DPI officer so he can pass on the results to where they can be pooled and made available to others.

### **The differences between certified and registered products**

New products can be assessed by an organic farming organisation and certified for use. Generally this is an assurance to consumers that the product contains no synthetic chemicals that will persist in the food. Certified does not mean the product is guaranteed to work, nor is it a guarantee that it is harmless. It is up to the user to ensure personal safety, to avoid any damage to the crop or the land, and to ensure that no biological hazards or natural toxins are passed on to the consumer.

Registered products are those which have been assessed by the national regulatory authority, now called the Australian Pesticides and Veterinary Medicines Authority. Any product which affects the physiology of a plant, influences pests, diseases or other agricultural chemicals should be registered before being sold in Australia. Registration requires

that sufficient scientific data is supplied so the authority is convinced that the product is effective, safe to use, and not an unacceptable risk to the environment or trade. Safe use manuals have to be supplied to the authority which requires strict labelling so that the user has all the essential information about the product claims, its quality, conditions of use, storage guidelines, toxicity and withholding period. See the Australian Pesticides & Veterinary Medicines Authority website at [www.apvma.gov.au](http://www.apvma.gov.au). Unfortunately, the high standards of scientific proof required for registration make the process slow and expensive.

Fertilisers are generally not required to be registered. However the NSW Fertilisers Act 1988 requires that the proportions of nutrients in the fertiliser are listed and that it may not contain more than 100mg Lead/kg, 10mg Cadmium/kg or 5mg Mercury/kg. A Fertiliser is defined in the Act as any product purporting to supply nutrients directly or indirectly to plants. Liming materials are required to meet standards for neutralising value and fineness. Composts, vermicast and green mulches are excluded by the act and instead fall under Australian Standard 4454: Composts, soil conditioners and mulches.

Some products are both registered and certified and clearly these would be the ideal for organic farming. On the other hand, many unregistered products have minimal standards of user information and unproven claims of effectiveness. Particular care must be taken that food safety is maintained. Farmers are liable for the incorrect use of registered products and so carry some responsibility for the use of unregistered products regardless of their claims.



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# Low Chill Stone Fruit Varietal Assessment

*P Wilk, District Horticulturalist, NSW Department of Primary Industries, Alstonville*

## Technical Summary extracted from Final Report of Project SF02002

The Australian Low Chill Stone fruit industry was based on varieties imported from the University of Gainesville, Florida USA breeding program in the late 1970's and 80's.

The production and planting of low chill stone fruit on the north coast of NSW the Sydney Basin and in areas of southern Queensland boomed in the 1980's and early 1990's due to the high returns growers received for early season fruit (Nissen et al., 2000). The main types of low chill stone fruit include nectarines, peaches and plums, which are sold on the domestic markets, beginning in September and ending in November.

Within the domestic market, the main competition is for early September fruit.

Flordaprince peach is the earliest harvested stone fruit, which despite market rejection is still being planted due to the high prices growers are receiving for new season fruit. There is no earlier variety available at present.

The production of high quality, early season fruit is also of great importance for the national stone fruit industry and sets the scene for the rest of the season. Consumers will cease purchasing stone fruit if they have had an unfavourable experience with poor, early season fruit.

In recent years, a combination of reduced prices, increased production costs and consumer dissatisfaction with variable fruit quality has resulted in a reduction of grower numbers.

Production costs for low chill stone fruit are 30-50% higher than other stone fruit due to lower yields, higher incidence of insect and disease, excessive fruit set and tree vigour.

The varieties being tested in the current project are from private commercial importations by ANFIC, or low chill stone fruit breeding programs supplied by Phytonova and the

Queensland Department of Primary Industries and Fisheries at Nambour. All varieties supplied and tested were grafted onto both Okinawa and Nemasun (coastal peach) rootstocks for comparison.

The project aim was to identify varieties of peach, nectarine and plums that were superior in quality, management and production to existing early, mid and late season varieties.

Varieties that may be deemed acceptable must show little or no seed splitting or cracking and preferably bacterial spot and gummosis resistant. Varieties that may be acceptable in terms of quality will need to be harvested no later than mid November (peaches and nectarines) and late November for plums to avoid competition from early fruit from other production areas. A number of other quality characteristics such as sugar and acid content, colour, yield, shape and flesh quality were also assessed in the variety trial.

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Beneficial soil microflora, when present in sufficient numbers and diversity, will assist in the breaking the disease cycle. Unfortunately the biology in many of our soils has been depleted, and there simply aren't adequate populations left to do this important work.

By resuscitating soil biology we can increase competition for disease causing organisms, help you improve soil structure and aerobicity, increase moisture infiltration & retention and gradually, reduce the use and reliance on fertilizers and chemicals.

A great place to start is by applying a diverse beneficial biology to fruit crops as they go into dormancy, a thorough spray of the trees, litter and soil will have huge benefits by reducing pressure next season.

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All varieties were assessed at 5% and 50% flowering to calculate fruit development period (days from full flowering to harvest).

Chill hours were also calculated for the site and averaged at 350-500 hours. Due to the differences in chilling requirements of new varieties, further testing under different microclimates is needed.

In these variety trials it was found that of the trees and fruit being assessed over three to five seasons the following varieties showed promise. It should be noted that some varieties have been assessed over the five seasons while others may have only had one or two seasons testing.

1. UF Gold (Fla. 90-24c) yellow non melting flesh peach
2. Q 17-20 yellow non-melting flesh peach
3. UWS 94-7 NW early white flesh nectarine
4. Sunsnow (Fla. 83-5nw) late white flesh nectarine
5. UWS 97-2B P1 late blood plum
6. Q 22-50 white non-melting fleshed nectarine
7. Q 11-11 white non-melting flesh nectarine
8. Q 21-8 yellow non-melting flesh nectarine



## ChemClear®

Avcare (the National Association for Crop Production and Animal Health), the Veterinary Manufacturers and Distributors Association (VMDA), and the National Farmers' Federation (NFF) together with Agsafe have implemented a new chemical waste disposal program ChemClear® for the safe management of unwanted rural chemicals.

Many unwanted chemicals have accumulated in the community, in particular on rural properties. The safe management of these surplus chemicals is a concern for all property owners or managers, including recent land purchasers who may have limited knowledge and information about the chemicals that remained present on their property after purchase.

### The objectives of ChemClear®:

- minimise the generation of unwanted rural chemicals;
- minimise the accumulation of unwanted rural chemicals and any associated risks of impact to the environment, public health and trade;
- provide for a collection and disposal service for rural chemicals;
- provide a management system for unwanted registered rural chemicals which is:
  - effective in achieving a high rate of participation of waste holders;

- accessible by all users who may hold those chemicals; and
- provided at lowest possible cost.

**ChemClear® encourages any holder of unwanted rural chemical to register a notification of their interest in the collection and disposal of their chemical by utilising the booking site link on the website at [www.chemclear.com.au](http://www.chemclear.com.au) or by calling 1800 008 182 from any region of Australia.**

The following is a guideline for the collection of Group 1 and Group 2 classified chemicals:

### Group 1 Chemicals to be collected at no charge:

- are sold only by member companies of Avcare or VMDA ;
- are registered agricultural and veterinary products<sup>1</sup> or products whose registration or permit ceased since the last ChemCollect or ChemClear® collection<sup>2</sup>;
- are in the original non returnable rigid metal, plastic or cardboard container;
- are identifiably labeled with the original manufacturer's label, or other permanent and clear identification (which includes the product and manufacturer's name and an indication of the date of manufacture/expiry date);
- are not the subject of any other practical routine return program operated by the manufacturer



and/or distributors for the product in its original container;

- are not part of a special regulatory or voluntary phase-out campaign agreed to between the APVMA (NRA) and the manufacturer(s);
- are not the subject of any recall or phase-out as a requirement of the APVMA, where the deadline has expired; and
- are not held by Distributors as unwanted inventory<sup>3</sup>.

#### **Group 2 Chemicals are:**

- agricultural and veterinary chemicals whose registration has expired more than two years ago, including organochlorine and arsenical insecticides, and

- farm chemical products of non-Avcare or VMDA members companies that are either currently registered or whose registration or permit ceased since the last collection.

#### **How do ChemClear® and drumMUSTER differ?**

The ChemClear® program's objective is to encourage the return for collection and disposal of any unwanted rural chemicals. Any chemical 200ml and above will be accepted under the ChemClear® program.

Any unwanted Group 1 chemical with less than 200ml remaining will be required to be triple or pressure rinsed and returned free of visible residue through the existing **drumMUSTER** program.



## **Noxious Weeds**

### **What is a noxious weed?**

In NSW, noxious weeds are plants that have been declared under the Noxious Weeds Act 1993 by the Minister for Primary Industries. Weeds with the potential to impact on agriculture, or animal or human health or damage the environment are potential candidates for declaration as noxious weeds.

Where a plant is declared noxious it is assigned a 'control category', which specifies the actions required for that plant. The Act gives the council power to require occupiers of land to control noxious weeds. If an occupier fails to do so, the council has the power to enter the land and to carry out the control work. The council can also issue a penalty notice or take prosecution action for offences under the Act.

### **Summary of noxious weeds control categories**

The *Noxious Weeds Act 1993* in New South Wales categorises declared weeds into four groups. A different level of control is required for each group of noxious weeds. The following is a summary of NSW noxious weed control categories.

**W1** - The presence of the weed must be notified to the local council. The weed must be fully and continuously suppressed and destroyed.

**W2** - The weed must be fully and continuously suppressed and destroyed.

**W3** - The weed must be prevented from spreading and its numbers and distribution reduced.

**W4** - The action specified in the declaration may be more or less stringent, and more specific, than the action required under the other control categories.

### **W1 weeds**

One of the most important categories requires action to prevent entry or initiate immediate containment, is the W1 category. Weeds in this group are also known as notifiable weeds. W1 weeds are high priority weeds, which have the potential to create significant damage to the environment, agriculture or human health if not controlled immediately.

A current list of weeds declared under the Noxious Weeds Act in the W1 category can be obtained from the department's website [www.agric.nsw.gov.au/noxweed](http://www.agric.nsw.gov.au/noxweed)

### **Procedures for reporting and control of W1 weeds**

The Noxious Weeds Act establishes that occupiers of land, including public authorities, are responsible for the detection, reporting and control of W1 weeds on land under their control.



The Act requires the presence of a W1 noxious weed to be notified to the Local Control Authority within three days of its discovery and the weed must be fully and continuously suppressed and destroyed. In addition, the weed must not be sold or distributed anywhere in NSW, even if it is not declared W1 in a particular local control authority.

There are fourteen noxious weeds that are declared W1 for the whole of NSW. These include:

<b>Common name</b>	<b>Scientific name</b>
Black knapweed	<i>Centaurea nigra</i>
Broomrape	<i>Orobanche spp.</i>
Hawkweed	<i>Hieracium spp.</i>
Horsetail	<i>Equisetum spp.</i>
Karoo thorn	<i>Acacia karroo</i>
Kochia	<i>Kochia scoparia</i>
Lagarosiphon	<i>Lagarosiphon major</i>
Mexican feather grass	<i>Nassella tenuissima syn Stipa tenuissima</i>
Miconia	<i>Miconia spp.</i>
Parthenium weed	<i>Parthenium hysterophorus</i>
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>
Siam weed	<i>Chromolaena odorata</i>
Spotted knapweed	<i>Centaurea maculosa</i>
Water lettuce	<i>Pistia stratiotes</i>
<b>Notifiable in Hawkesbury/Gosford/Wyong</b>	
Alligator weed	<i>Alternanthera philoxeroides</i>

### **Control of noxious weeds on private property**

Occupiers of private land are required to control noxious weeds according to the control categories for their area. Where any occupier fails to control weeds on their land, the council may issue a notice for the control of the weed.

### **Control of noxious weeds on public land**

Councils and public authorities are required to control noxious weeds on land under their control.

### **The role of councils in noxious weed declarations**

Weeds are declared according to LCA boundaries. Control categories are also applied in this manner and specify the action that must be taken in respect to the weed. Councils are able to apply for new declarations or to change the control category of declared weeds.

## **Alligator Weed**

Alligator weed *Alternanthera philoxeroides* is a potentially devastating aquatic and terrestrial weed affecting waterways, poorly drained and flood plain areas. It is listed as a Weed of National Significance and is notifiable in a number of areas in NSW. It is a native of South America and a major problem in south-eastern United States, China, New Zealand, Burma, Thailand, Indonesia and India.



*Alligator weed has silvery-white flowers borne on short stalks during mid-summer*

Alligator weed has extremely vigorous growth and a high tolerance to normal control measures. This makes it a major threat to wetlands, river and irrigation systems. It is one of the highest priority weeds for detection and management, with a significant amount of money spent on its control across the state.

Alligator Weed is present in NSW at a number of locations. It was first recorded near Newcastle in 1946 and dense infestations now occur in the lower Hunter Valley. Significant infestations also occur in the Sydney basin and at Barren Box Swamp, near Griffith. Alligator weed has not reached its potential range in NSW, and is capable of devastating the environment and agriculture if allowed to do so.

In November 1998 it was found for the first time as an aquatic infestation in northern NSW at Bangalow in Byron Creek, in the Richmond River catchment. Alligator weed has a great potential to spread to all the floodplain catchments in NSW. Alligator weed can cause photosensitisation in livestock, usually cattle, This may or may not involve liver damage. Poisoning has so far only been reported in Australia and New Zealand. Outbreaks of poisoning are both uncommon and unpredictable and may require ingestion of both Alligator weed and some secondary factor (CA Bourke 2003). 🌿

## What's new in publications

### ◆ Horticulture Statistics Handbook

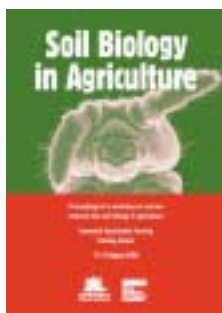
The Horticulture Statistics Handbook 2004 is now available on the HAL website at [www.horticulture.com.au/industry/overview\\_horticulture.asp](http://www.horticulture.com.au/industry/overview_horticulture.asp)

### ◆ Citrus Maximum Residue Limits (MRLs) Jan 05

The updated citrus MRLs are now available on the ACG website: [www.australiancitrusgrowers.com](http://www.australiancitrusgrowers.com)

### ◆ Soil biology in agriculture Workshop Proceedings, Tamworth, 11-12 August 2004

This publication contains the proceedings of a workshop on current research into soil biology in agriculture, which was held at the Tamworth Sustainable Farming Training Centre on 11–12 August 2004.



The presentations made at the workshop are organised in the document under the following main headings:

- Overview of soil biology and effects on health and productivity of agricultural soils.
- The impact of management practices on soil biology.
- Development, use and efficacy of soil biological products in agriculture.

To download a copy go to [www.agric.nsw.gov.au/reader/soil-biology/soil-biology-proceedings-sp.htm](http://www.agric.nsw.gov.au/reader/soil-biology/soil-biology-proceedings-sp.htm)

### ◆ Guidelines for Environmental Management in Horticulture

Horticulture for Tomorrow has produced an 85 page document "Guidelines for Environmental Assurance in Australian Horticulture".

For a copy go to [www.horticulturefortomorrow.com.au/documents/GuidelinesFINAL.pdf](http://www.horticulturefortomorrow.com.au/documents/GuidelinesFINAL.pdf)

### ◆ Which thrips is that? A guide to the key species damaging stone and pome fruit in NSW

This new six page fold out colour brochure outlines the key thrips species, their identification, and the damage they cause. Copies can be obtained from the NSW DPI website at [www.agric.nsw.gov.au/reader/what-thrips-is-that-series](http://www.agric.nsw.gov.au/reader/what-thrips-is-that-series) or contact your local district horticulturist for a copy.

## Websites

- ◆ **The Citrus Growers** website has lots of information on the Australian citrus industry including statistics, marketing information, research reports, factsheets, events and seasonal updates.

Go to [www.australiancitrusgrowers.com](http://www.australiancitrusgrowers.com)

- ◆ **Auscitrus** The Australian Citrus Propagation Association now has its own website. You can download order forms for budwood and seed and also subscribe to their newsletter. Go to [www.auscitrus.com.au](http://www.auscitrus.com.au)

- ◆ **Seasonal Work Australia**

[www.seasonalwork.com.au](http://www.seasonalwork.com.au) is a job-search website that links job-seekers directly to seasonal and casual work opportunities around Australia. The site actively targets working travellers including overseas backpackers.

Phone 07 5598 4603 for more information.

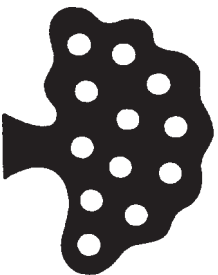
## What's on

- ◆ **Australia-New Zealand Avocado Growers Conference. Tauranga, New Zealand 20-22 September 2005**

The theme of the conference is "Profit Together". There is an exciting line up of international and national speakers who will present our latest knowledge and understanding of important issues relevant to successful avocado production.

As space is limited to 500 delegates please register early to ensure your attendance. For more information go to [www.avocado.org.au](http://www.avocado.org.au)

Print Post Approved  
PP255003/00759



# COASTAL FRUITGROWERS' NEWSLETTER

The Coastal Fruitgrowers' Newsletter is a quarterly publication distributed in Spring, Summer, Autumn & Winter. It is available free to all commercial fruit growers in the Sydney Basin, Central Coast, Hunter Valley, South Coast & North Coast areas.

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