



# APPLE & PEAR AUSTRALIA LIMITED

INDUSTRY REPORT 2006 – 2007

**Investing in your future**

# Research, development & marketing

Horticulture Australia Limited (HAL) is a national research, development and marketing organisation that works in partnership with the horticulture sector to invest in programs that provide benefit to Australian horticulture industries.

HAL invests almost \$80 million annually in projects in partnership with the horticulture sector. During the year HAL runs more than 1200 research, development and marketing projects covering a diversity of topics including: market access, market research, export marketing, domestic marketing, supply chain management, quality assurance, food safety, skills development, industry communication, biotechnology, biosecurity, breeding, plant health, pesticide regulation, agronomy, crop regulation, physiology, irrigation and sustainable practices.

HAL does not conduct research and development itself. It contracts organisations such as state departments of agriculture, universities and the CSIRO to undertake the work. HAL conducts some activities within the marketing program but also engages external suppliers to undertake marketing activities.

## ACROSS INDUSTRY PROGRAM

The apple and pear industry contributes funding towards an across industry program that addresses issues affecting all of horticulture. Details of the current program are listed below. A full report of the program can be found at [www.horticulture.com.au/industry/acrossindustry.asp](http://www.horticulture.com.au/industry/acrossindustry.asp)

## AUSTRALIAN GOVERNMENT PRIORITIES FOR RURAL RESEARCH AND DEVELOPMENT

As part of the Australian Government's commitment to rural research and development, horticulture industries can access matching Commonwealth funding through HAL for all research and development activities.

All R&D programs managed through HAL are driven by the strategic direction of horticulture industries and address the Australian Government's Priorities for Rural Research and Development. These Government priorities and a breakdown of the number of projects and the value of projects that address each priority are available in HAL's annual report. This can be accessed at [www.horticulture.com.au](http://www.horticulture.com.au).



These projects have been facilitated by HAL in partnership with Apple and Pear Australia Limited (APAL). Projects have been funded by the apple and pear levy and/or voluntary contributions from industry. The Australia Government provides matched funding for all HAL's R&D activities.

### HAL head office

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APPLE & PEAR INVESTMENT SUMMARY			
Year Ended 30 June 2007			
	Marketing 2006/2007	R&D 2006/2007	Combined 2006/2007
Funds available 1 July 2006	237,309	798,127	1,035,436
<b>INCOME</b>			
Levies Received	3,055,997	1,841,965	4,897,962
Commonwealth Contributions		1,305,609	1,305,609
Other Income	58,200	60,839	119,039
Total Income	3,114,197	3,208,413	6,322,610
Budget	3,231,645	3,584,579	6,816,224
Variance to Budget	-117,448	-376,166	-493,614
<b>PROGRAM INVESTMENT</b>			
Levy Programs	1,934,066	2,298,202	4,232,268
Service Delivery Programs by HAL	263,419	313,015	576,434
Across Industry Funding		26,659	26,659
Levy Collection Costs	104,725	59,292	164,017
Total Investment	2,302,210	2,697,168	4,999,378
Budget	3,463,758	3,437,487	6,901,245
Variance to Budget	1,161,548	740,319	1,901,867
Annual Surplus/Deficit	811,987	511,245	1,323,232
Funds available 30 June 2007	1,049,296	1,309,372	2,358,668

As an apple grower, do you get a good return from the 1.845 cents per kilogram that you pay as a levy?

Likewise as a pear grower, do you get a good return on the 2.099 cents per kilogram you pay as a levy?

Virtually all growers are aware that they pay a levy on their fruit at the first point of sale and most would be aware that the money is spent on promotion and research and development (R&D) programs, which are managed by Horticulture Australia Limited (HAL); and to provide funding for chemical residue testing performed by the National Residue Survey (NRS); and plant health programs carried out by Plant Health Australia (PHA).

But how exactly is the money spent and what return do you get on it? As with any investment we make, we like to see a significant return on investment. The government, which also invests in our industry via matching funds for the R&D program, is also vitally interested in the return we provide for the investment that it makes in our industry.

The aim of this report is to provide you with some of the details of where the levy money is spent and to try and give some idea of what return we are getting. It provides an update on progress of current projects to indicate where the potential benefits should flow to growers.

Giving details of the investment is the easy part. Calculating the value of the investment is much more difficult and often we have to revert to trying to imagine where we would be without those investments.

For example, part of your levy goes to financing the operation of Apple and Pear Australia Ltd. Quantifying the value of APAL is difficult, but imagine what our industry would be like if APAL was not fighting issues such as the Import Risk Assessment for New Zealand apples, not managing our Pink Lady™ Intellectual Property and not liaising with Horticulture Australia Ltd over how the marketing and research and development funding is managed.

APAL is also the peak industry body responsible for preparing and reviewing the industry strategic plan for growers across the country. It reviews that strategic plan annually and creates short-term goals for the industry within the overall strategic plan.

A significant outcome of this strategic planning process has been the Future Orchards 2012 project. The need for such a program was identified in a major review commissioned by APAL in 2005 and the application for one million dollars of funding from the Department of Agriculture, Forestry and Fisheries Industry Partnership Program was successfully finalised in 2006.

The Future Orchards 2012 will continue until June 2008 and planning is under way to extend the program beyond that date.

Importantly, the success of all that we do at APAL depends on it being highly relevant to our industry. To ensure that relevance, we need to continually receive feedback from growers. There are many opportunities for you to provide feedback. It can be done at the Future Orchards 2012 orchard walks, through your state representative on the APAL Board, through your state organisation or simply by contacting the APAL office via phone or email and letting us know your thoughts.

# Investing in your future

I believe we do get good value for our levy investments and I believe the government gets a good return on its investment. I also believe that in future, we need to get even more value from our investments and that will require the input from everyone in the industry: from growers, the supply chain, from researchers and the administrators.

As our industry is opened up to international competition, we will need to work smarter to stay in the game. I am confident that the quality of the people we have in the apple and pear industry would allow us to meet the competition. However success will only be guaranteed as long as everyone contributes.

Darral Ashton  
Chairman  
Apple and Pear Australia Ltd



## Contents

Research Development & Marketing	2
Investing In Your Future	3
Domestic Apple & Pear Campaign	4
Apple & Pear Industry Overview	6
Biosecurity & Market Access	8
Biotech & Breeding	12
Orchard Production Projects	18
Pests & Diseases	22
Apple, Pear & Cross Industry Projects	26

## Domestic apple & pear marketing campaign 2006

### APPLES – 'BITE ME!'

Michelle Toft - Portfolio Manager Domestic Marketing

In 2006, apples were number one! And whilst cyclone Larry certainly helped us to achieve this, a strong marketing campaign was key in driving sales.

The 2006 campaign for Australian Apples saw a new creative approach derived from consumer research.

#### TV

The program was delivered through a TV campaign on Channel 7. A 30 second commercial communicated the overall health benefits of apples (fibre, antioxidants, Vitamin C) whilst a 15 second commercial made a direct fibre/kilojoule claim in a comparison with muesli bars. Both commercials focused heavily on the hero – the apple, and were played to the backdrop of "I've got you under my skin" made famous by Ol' Blue Eyes, Frank Sinatra.

The commercials were strategically placed with programs with high reach and frequency and through a combination of determined negotiation and good luck, Australian Apples received over \$240,000 of extra value in terms of discounts and bonus spots.

The effectiveness of the TV campaign was tested by quantitative research conducted pre and post campaign. Growth for apples was recorded across all key measures, with a very strong lift (53%) in 'fruit preference' for apples and 34.7% of all respondents remembering the advertisement.

#### Point of Sale

Clean and simple point of sale was developed for Woolworths and Independent stores nationally. Based on the new creative "Bite Me!" double sided posters and varietal wobblers were developed and distributed to IGA and Independents. Woolworths received tailored point of sale featuring new season varieties and "Bite Me!" health messages.

With Coles operating a 'clean store policy', presence was achieved via participation in their Healthy Harold campaign. This ran in May 2006 and consisted of an apples wobbler being displayed nationally in 400 Cole's stores. 515 schools participated involving 100,000 students and a leaflet was mailed to 5.5 million households.

#### Sampling

Over 25,000 people sampled new season apples during April and May 2006 in a national campaign. 207 stores took part in the program, including Coles, Woolworths and Independents.

The focus of the sampling program was to educate consumers about new season varieties encouraging trial and subsequent purchase. "Bite Me!" posters and t-shirts were used and the sampling staff were trained to test the recall of the TV advertisement.

In total, 6,735kgs of apples were sold as a result of the sampling campaign. With no gift or added incentive to buy, our goal was to achieve an 11% conversion rate, and the actual rates ranged from 14% to 71%!

#### www.australianapples.com.au

A new consumer website went live in May 2006. Initially a first stage website, it communicated basic apples facts and health and nutritional information. It incorporated a "Bite Me!" flash animation to leverage the new creative, and the PR activity 'Up the Apples and Pears' was linked to the site in August. This website was then further developed in 2007.

#### Public Relations

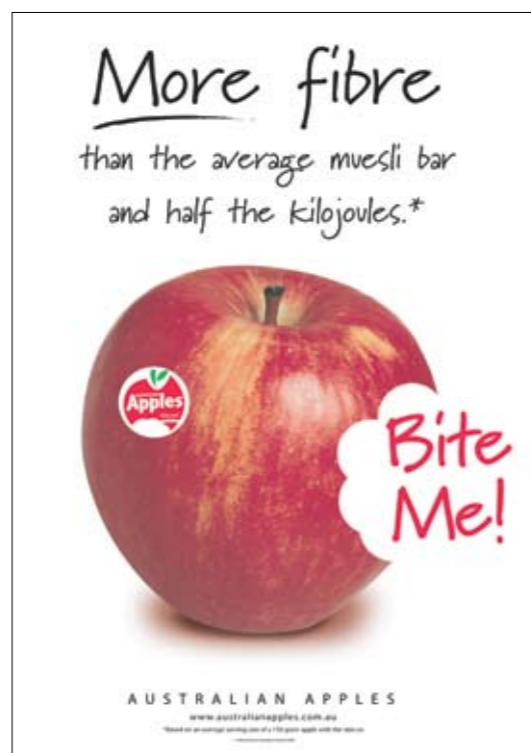
A public relations campaign focusing on the health benefits of apples was developed in 2006. Individual initiatives included a Health Report offering in-depth knowledge about the benefits of apples and Up the Apples and Pears, a collaboration that aimed to encourage the Australian public to take small easy steps (eat one extra piece of fruit per day and undertake some simple exercise habit) towards improving their lifestyle.

The media coverage gained for apples during 2006 reached 9 million consumers.

#### Analysis

Scan data from a major retailer was analysed to evaluate any correlation between marketing activity and sales uplifts. Key findings from the retail scan data analysis included:

- Apples gained share from the overall fruit category by growing their share of the range to 15.3% representing an increase of 1.6% from 2005;
- In value sales, the apple segment grew by + 4.3% on the previous year to date figures.
- In volume sales for YTD figures over the last two years, a 5.9% increase was experienced whilst the overall fruit category had in fact experienced a significant decline of -5.2%



## Domestic apple & pear marketing campaign 2006

### 2006 PEARS – THE LOW GI FRUIT

Michelle Toft - Portfolio Manager Domestic Marketing

The 2006 Australian Pears campaign built upon the tactical Packham Pears activity that ran in October / November 2005 and continued to highlight the low GI rating of Pears, and their importance in a healthy eating regime.

The creative concept was refined and a similar program of activity was implemented in 2006. The key focus was point of sale (POS), sampling with a gift with purchase and public relations.

#### Point of Sale

As with apples, point of sale was developed for Woolworths and Independent stores nationally. Based on the low GI message double sided posters and varietal wobblers were developed and distributed to IGA stores and independents retailers. Woolworths received tailored point of sale featuring the main domestic varieties.

Australian Pears also supported the Coles Healthy Harold campaign, with a pear wobbler displayed nationally in 400 Cole's stores.

#### Sampling

The sampling program ran in 281 stores nationally, with a further 60 gyms being included in the program. The campaign began in June to coincide with the Packham season.

A pear slicer and tote bag containing educational information was given as a complimentary gift to any consumer who purchased 1kg of Australian Pears during the sampling sessions.

Thousands of Australian consumers sampled new season Packhams during this campaign. A total of 12,192 kgs of pears were sold during all sampling sessions, with conversion rates ranging from 31% to 62%.

#### Public Relations

Whilst pears featured in the joint initiative Up the Apples and Pears, the major activity within the public relations program was What makes you glow? The objective of this activity was to create awareness of the low GI properties of Australian Pears. Teresa Cutter, The Healthy Chef, developed healthy low GI recipes and acted as a spokesperson for the duration of the campaign.

The media coverage gained for apples during 2006 reached 5 million consumers.

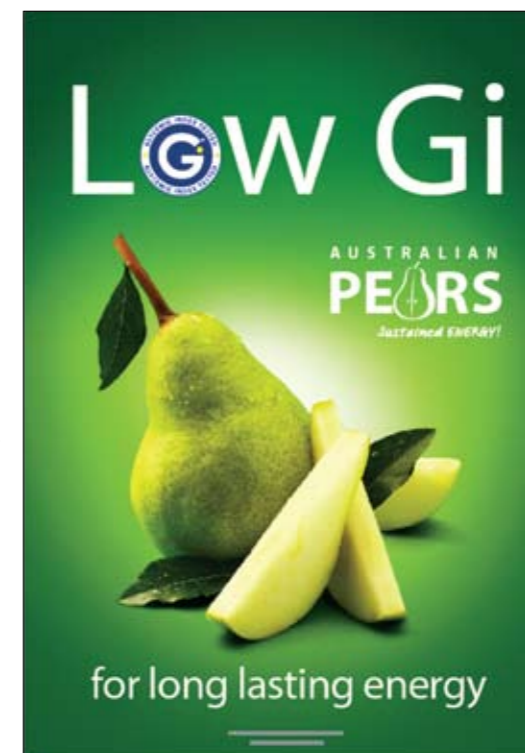
#### Analysis

Analysis of scan data from a major retailer was undertaken to track the retail performance of Australian pears. Overall they performed well in 2006:

- In value sales year to date (YTD) 2006 was \$19,331,000 dollars representing a +15.9% increase;
- In volume sales, YTD 2006 was 7,391,500 kilos representing a +11% increase;
- Looking at the period when marketing activity commenced and finished in terms of average weekly value & volume sales and comparing this to the average weekly figures over the whole 12 months there was a significant contrast. For example in NSW, the average weekly value sales figure over the last 52 weeks was approximately \$231,820. If one compares this to the average weekly value sales figure of circa \$305,160 since the commencement of the sampling campaign there was a 32% increase.

For more information please contact:

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# Apple & Pear Industry 06-07

# Apple & Pear Industry 06-07

## APPLE AND PEAR INDUSTRY: 2006/07 OVERVIEW

Brad Mills - Industry Services Manager, HAL



Like many other horticultural industries, the Apple and Pear industry has been significantly impacted by the ongoing drought. This exaggerated the impact of several severe frosts that hit Tasmania, Victoria and parts of NSW and South Australia causing significant losses.

2006/07 has been a busy year for both the apple and pear industry in general, and the Industry Advisory Committee (IAC). With key industry issues such as drought, frosts, import quarantine, market access and many other issues, it has been a hard year for growers.

A number of major events such as the Future Orchards 2012 (FO2012) project, potential imports of apples, continuing decline in export markets etc. have impacted on the industries priorities going forward.

In light of this, the IAC is reviewing several key strategic areas which incorporate a number of existing and potential new projects with the view to develop 3 key programs by identifying the current gaps and look at commissioning projects to suit. This is a major exercise for the industry and is a major change in approach. The 3 areas of review are:

1. Crop Production
2. Breeding & Biotechnology
3. Market Development/ Information

Some of the activities initiated to date include:

- Following on from the excellent work initiated with the FO2012 project, an Apple and Pear Orchard Productivity Development Review has been initiated to identify gaps in current orchard productivity activities not covered by FO2012 and/or existing projects that will assist in the aim of orchard productivity improvement
- An apple and pear strategic breeding review forum was held with Senior Managers from organisations currently involved in A&P funded breeding programs including, DAWA, DPI Qld., DPI Vic, DPI NSW and HortResearch (NZ). The view was to look at potential integration/ collaboration opportunities for breeding activities. A review committee was established and will report back shortly with further recommendations.
- Update to the Apple and Pear Marketing Plan for 2008-2010 years to include a stronger Buy Australian message is underway. Also we are looking at overall market information needs to ensure the industry can monitor/ be more informed about the market with respect to potential imports. Initial market research has been commissioned to gauge consumer perceptions of imported products and whether we are able to significantly influence buying behaviour in light of this

potential import competition. Also, a combined industry Foodservice Forum was conducted with the Apples and Pears, Vegetables, Avocados and Citrus industries looking at strategies for development of the increasing opportunities in the foodservice sector. A more targeted export marketing plan is also to be developed.

- Discussions regarding the Nashi and Apple and Pear industries collaboration/ joint program activities between the have occurred with agreement to initial 'trial marriage' approach to occur with joint involvement

These major reviews will provide a strong targeted approach to industry research, development and marketing activities over the next 5 years.

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## AP06053 DEVELOPMENT OF FO2012 WEBSITE AND DATABASE

Alma Reynolds - APAL

This project has the potential to provide great benefits to all Australian apple and pear growers. A visit to the new APAL website will immediately show the benefits of this investment as all visitors will see the improved, expanded and easier to use website, which is updated on a regular (at least weekly) basis.



Block Information sample available on APAL website

Block Summary - VC01		
<b>Block Description - <a href="#">View detailed Block Description</a></b>		
Block Name	Victoria East #01	
Location	East, VIC	
Variety	Gala	
Rootstock	Ott3	
Density (trees/ha)	3333	
Soil Type	Clay Loam	
Replanted?	Yes	
Year Planted/Grafted	2004	
Irrigation Type		
Establishment Cost	\$27115/ha	
Crop Type	Apple	
Notes		
<b>Block Profit Information</b>		
No Block Profit data is currently available for this block		
<b>Block Costs - <a href="#">View detailed Block Costs</a></b>		
Cost Type		\$/ha
Ground preparation for replanting		\$600
Fumigation		\$3500
Trees		\$14815
Planting		\$1500
Trellis		\$4500
Irrigation		\$2200
Tree tying labour (year 1)		\$280
Tree tying materials (year 1)		\$100
Tree tying labour (year 2)		\$280
Tree tying materials (year 2)		\$100
<b>Photos and TRV/TCA Growth Information</b>		
Date	TRV (m3/ha)	TCA (cm2)
September 2006	9500	7.56
March 2007		

This website is our window to the world and it is clear that this investment has provided such an obvious and immediate pay-off. The second part of this significant investment is linked directly to the Future Orchards 2012 project. Funds have been provided to manage and post the information on the project's monitoring blocks to the website in the 'members only' section.

All apple and pear growers have been sent a user name and password to enter the members only site and anyone who has lost theirs or is having trouble entering the site should contact APAL.

In this section Australian apple and pear growers can see details of more than 100 monitoring blocks from around the country. Each block is identified by a code, but the code only indicates the state in which it is located, it does not identify the individual grower.

The information stored about all blocks includes a full description of the block, profit information, the costs of establishing the block and the costs of inputs over the last year, the measured tree row volume of the block and the average trunk cross sectional area of the block. Also there are photos of a typical tree and a typical row within the block.

This data collection will continue to grow as the project moves forward. It is a valuable tool available for the use of all growers. Use it to compare your 'best' blocks with others around the country, use it measure the comparative performance of your 'worst' blocks. Find out how others plan and implement inputs to their blocks and find out if greater inputs in some areas are reflected in better yields or better packouts.

This collection of information is a very powerful tool and it will only improve as more data is added. Visit today and see what you think. [www.apal.org.au](http://www.apal.org.au)

## AP06042 LEADERSHIP DEVELOPMENT: YOUNG GROWER SCHOLARSHIPS

Alma Reynolds - APAL

As part of an overall push to recognize leadership and achievement in the Australian apple and pear industry and to encourage younger industry participants to become involved in industry activities, APAL applied for funds to provide an award each year to the Young Grower of the Year.

In September 2006 each state association was contacted with a request to put forward nominees for the inaugural award. Each nominee was interviewed informally and the interview responses considered by the APAL Board. The APAL Board used the information about each candidate to make a short list and a panel of Board representatives then conducted more formal interviews.

The first YGY was announced at the 2007 APAL conference and all nominees were also recognized at the conference. The award for the YGY comprises a certificate and a fully paid place on the next APAL overseas study tour.

In September 2007, APAL will again call for nominees for this award. For the 2008 award, states will again be requested to put forward nominees but an advertisement in the Australian Fruitgrower magazine will also call for nominees from all industry participants. This project is in line with the Australian Apple & Pear Strategic Plan.



Matthew Lenne - APAL Young Grower of the Year

# Biosecurity & Market Access

HG03070  
 DEVELOPMENT AND IMPLEMENTATION OF INDUSTRY BIOSECURITY PLANS  
 Mr Rodney Turner - Plant Health Australia

This project crossed a range of horticulture industries including apples and pears and provided funds for Plant Health Australia (PHA) to work with industries to create individual industry biosecurity plans.

The Apple and Pear Industry Biosecurity Plan was prepared by Plant Health Australia over a period of two years utilising inputs from a range of specialist scientists, growers, industry and APAL representatives.

The plan includes an overview of the exotic pests and diseases likely to threaten Australian apple and pear orchards, methods of risk mitigation, surveillance, on-orchard biosecurity and hygiene, contingency plans, response management arrangements, awareness material and fact sheets for each of the identified highest risk pests and diseases.

In the near future APAL, in conjunction with PHA, is planning to undertake a new research and development project to implement the areas of its own responsibility as outlined in the plan. This will include providing awareness materials, information sessions for growers,

signage design and a pro forma orchard biosecurity plan.

The final Apple and Pear Industry Biosecurity Plan was launched at the APAL conference in August 2006 and it is available on disc from APAL's Shepparton office. For a copy contact Alma Reynolds on 03 5825 2355 or by email at [ism@apal.org.au](mailto:ism@apal.org.au).

The plans and other material are also available from the Plant Health Australia website, <http://www.planthealthaustralia.com.au/index.asp> and then go to 'members'.

This project was funded by Plant Health Australia & Dept of Agriculture, Forestry & Fisheries

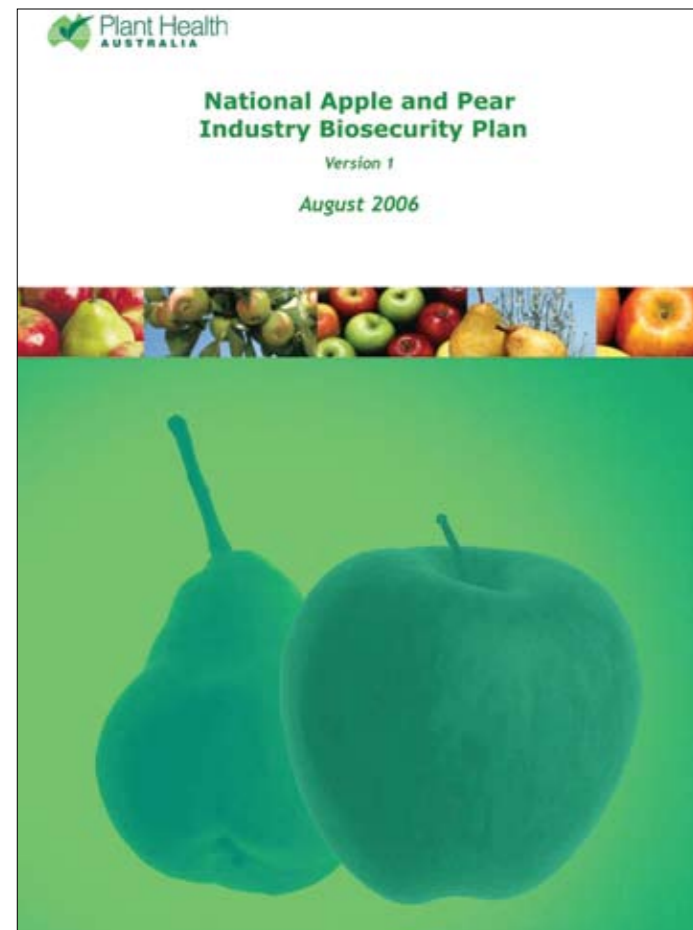
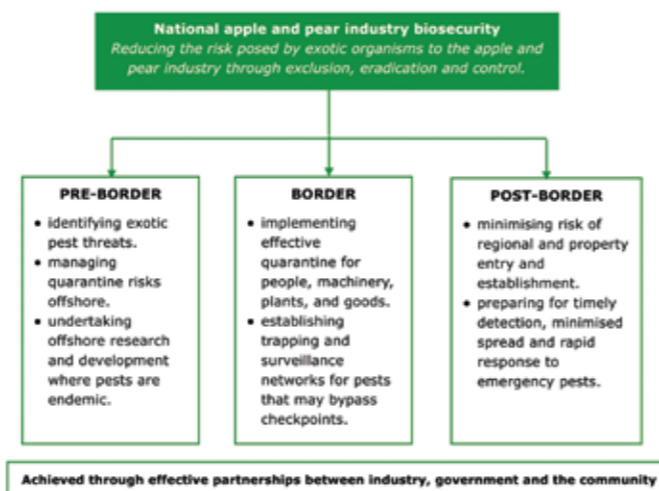


Figure 3 Industry biosecurity: a shared responsibility



With the assistance of Apple and Pear Australia Limited (APAL), an Industry Biosecurity Group (IBG), coordinated by PHA, was formed to work on the development of a national biosecurity plan for the apple and pear industry. The IBG includes representatives from apple and pear industry associations in each relevant state and territory, as well as representatives from relevant state/territory agriculture agencies, the Australian Government, and PHA.

# Biosecurity & Market Access

MT06032  
 ENHANCED BIOSECURITY RISK ANALYSIS TOOLS  
 Dr David Cook - CRC for National Plant Biosecurity

Invasive species risk management is a notoriously uncertain business, and in planning biosecurity investments, industries need confidence in the planning process. The current system depends on expert opinion over a number of questions, yet it is well known that opinion is susceptible to framing, context dependence and motivational bias which can corrupt the prioritisation process.

Growers make their business decisions on the basis of multiple factors. The Enhanced Biosecurity Risk Analysis Tools project aims to quantify invasive species risks and to find ways in which they can be combined so that species can be prioritised.

The methodology we are continuing to develop is designed to better deal with these issues and to give the pome fruit industry better confidence in their preparedness and investments.

We are utilising economic based assessments, likelihood pathways and methods that look at competing demands on resources and competing values and preferences to reach decisions. Economists have yet to have a substantial influence on the way in which policy responses to pest incursions are formed and implemented. This is due to a variety of reasons, including overly-simplistic modelling approaches, inadequate data to make predictions and test models, and a failure to communicate results effectively.

However, the situation is gradually changing. As the science community's understanding of pests and diseases improves, so too does our understanding of the public and private benefits of their management. This makes for a fertile environment in which economists can be effectively used to direct government and private protection funds to appropriate uses.

The analytical approach we use blends a population diffusion model of pest spread with economic parameters to establish an organism's potential invasion impact. This is the damage the pest would be expected to do if it were to enter and become naturalised in a region. This information provides policy-makers with an upper limit for response funding in the event of an actual outbreak.

It must also be recognised that there are so many uncertain variables which have an influence on invasion impact in the real world that we must keep in mind what our models can and can not do. By definition, a model is a simplification of reality, and to assume we can perfectly model something as complex as a biosecurity system is simply unrealistic. In addition to the quantitative information models can provide, there is a range of additional information that can help to understand potential invasive species impacts, including local knowledge of the system being invaded and expert scientific knowledge of the invader.

The project blends both quantitative bioeconomic modelling techniques with a Deliberative Multi-Criteria Evaluation (DMCE) approach to supporting diverse decision-making groups whose problems involve numerous and conflicting evaluations. It therefore addresses the need to develop knowledge to underpin risk analysis and to develop new approaches to risk analysis.

Apple maggot



The project has been up and running for approximately twelve months, and this time has largely been spent refining the methodology to be used. Two peer-reviewed scientific papers have recently been published in which both the bioeconomic models and DMCE models are articulated (see Cook et al. (in press) and Cook and Proctor (2007), copies available on request). The project will run for a total of three years, and is currently moving into a phase of detail invasive species impact case studies. For more information please contact Dr David Cook at CSIRO Entomology (tel. (02) 6246 4093, email: [david.c.cook@csiro.au](mailto:david.c.cook@csiro.au)).

Photos sourced from the DAFF website, <http://www.daff.gov.au/animal-plant-health/pests-diseases-weeds/plant/horticulture#pome>.

References Cited  
 Cook, D.C. and Proctor, W.L. 2007. "Assessing the threat of exotic plant pests." *Ecological Economics* 63(2-3): 594-604.  
 Cook, D.C., Thomas, M.B., Cunningham, S.A., Anderson, D.L. and De Barro, P.J. in press. "Predicting the economic impact of an invasive species on an ecosystem service." *Ecological Applications*.



European gypsy moth larva

# Biosecurity & Market Access

## MARKET ACCESS R&D FOR APPLES & PEARS AN OVERVIEW

The apple and pear industry has committed an amount of \$900,000 over three years to support the Horticulture Industry's Market Access Strategic R&D Plan which aims to ensure international market access for Australian horticultural products.

Key areas of the plan are disinfestation and alternatives, and fruit fly management and control and include:

### Pre and post-harvest

- The need to improve the effectiveness of the sterile insect technique for Queensland fruit fly and Mediterranean fruit fly
- The need to improve the effectiveness of current fruit fly trapping
- The need for a quick and reliable method for accurately identifying all species of fly, especially at the larval stage.
- The need to increase the effectiveness of activities to prevent incursions of fruit fly into areas where they are not present.

### Disinfestation

- The need to improve on current practices for the use of methyl bromide and to identify and develop alternative fumigants and disinfestation techniques against the possible loss of methyl bromide.
- The need to identify new commercially viable fresh produce disinfestation treatments and technologies for negotiation and adoption by our trading partners.



Apple cage investigation

## The Apple and Pear Projects

Fruit fly area freedom is vital for market access. Since 1990 it has been managed through codes of practice under national and international agreements.

### HG06040

#### OPTIMAL IRRADIATION PROCEDURES FOR STERILISATION OF QUEENSLAND FRUIT FLIES.

**Philip Taylor, Macquarie University**

One means of controlling of fruit fly is to use the Sterile Insect Technique (SIT), where millions of flies are reared, sterilised with gamma radiation, and then released into the field. The sterile flies mate with the wild population and disrupt their reproduction.

Similar programs with other fruit flies have been highly effective overseas, and a similar program has contributed to the eradication of Q-flies from West Australia, but there are growing concerns about the reliability of SIT in the existing Fruit Fly Exclusion Zone.

This project will develop a 'best practice' guide for the irradiation of Queensland fruit fly pupae.

### AP06006

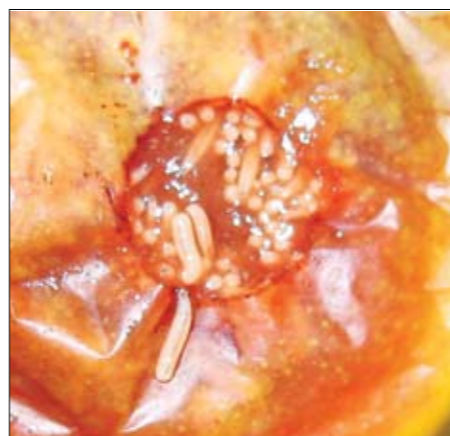
#### ALTERNATIVE FRUIT FLY MANAGEMENT FOR MARKET ACCESS FOR APPLES

**John Hargreaves, QDPI&F**

It is possible that both pre-harvest and post-harvest treatments using dimethoate may be lost or severely restricted in the near future and this would have serious impact on the apple industry in Queensland. An alternative technique is to protein bait to reduce pesticide use for fruit fly control.

The project aims to obtain quantitative data to show that protecting apples with a standardised program of protein bait sprays followed by post harvest inspection can provide an acceptable level of phytosanitary security to replace the current use of dimethoate for interstate market access.

Pear with maggots



### AP06047

#### COLD TREATMENT OF APPLES, PEARS, & NASHI AGAINST QUEENSLAND FRUIT FLY FOR ACCESS TO TAIWAN.

**Peter Leach, QDPI&F**

This project aims to develop quarantine cold treatments at 1 and 3 degrees C for apples, pears, and nashi to Taiwan. The project will develop data that supports cold disinfestation and fumigation treatments to mitigate the risk posed by Queensland fruit fly in apples, pears, and nashi fruit intended for export.

The research will be carried out in accordance with Japanese standards and will be the basis for advice to the Taiwanese Quarantine Advisory Committee (and to other countries' quarantine authorities as required) to support changes to quarantine requirements for Q-fly commodities.



Queensland Fruit fly

# Biosecurity & Market Access

Fruit logistica display Berlin 6th - 8th February 2007

## APPLE AND PEAR EXPORT Wayne Prowse - Portfolio Manager Export Marketing HAL

Australian horticultural exports were valued at approx \$800.5 million in 2006 being some 12% of total production however, exports of Australian apples and pears are seriously contracting and in 2006 were 6,754 and 4,450 tonnes respectively. The leading destinations were UK for apples and New Zealand for Pears.

Export development is a strategic goal for the horticultural industry and the apple and pear industry has been and still is a significant part of the growth plan. The three key pillars for horticultural export development plans are Market Access, Market Development and Market Promotion all with the single focus to enhance the market environment to assist trade.

Market Access involves opening markets for trade that are currently restricted or closed to Australian apples and pears on tariff or quarantine grounds. Market access negotiations are at government to government levels and HAL works closely with our government departments (Biosecurity Australia and AQIS) to negotiate access for horticultural products. The market access priorities for apples and pear are:

China	Improvement of import conditions (Tas apples)
China	New Access for mainland apples
China	New Access for Pears
Taiwan	Change to MOU conditions (mainland apples)
India	Access for carnauba wax coated apples
Japan	Access for all apple varieties (Tas)

Market Development programs support exporters of apples and pears in markets that are open to Australia yet the volumes are small and a higher level of promotion is warranted to create raised awareness of Australian apples and pears among customers for the long term benefit of the industry. At this critical time the support for both promotion and retail training by Australia is beneficial to building long term growth

Examples of market development programs are for the Australian Pink Lady TM apples in the UK and the Australian Pear promotion programs in Western Canada. The strategic industry (levy) program supports retailers with catalogue advertising, in-store tasting and



point of sale material to promote the Australian products in these markets with growth potential.

Market Promotion of Australian apples and pears is based on their renown for a superior taste and colour as the unique selling proposition in markets dominated by the varieties from Chile, Argentina, South Africa and even USA (Washington) during our production season.

Promoting Australian apples and pears in major world exhibitions has helped raise their profile and show world buyers that Australia is a producer of high quality apples and pears. HAL, presenting as Australia Fresh, has managed stands at three exhibitions for the wider horticulture industry including apples and pears. The exhibitions were

Fruit Logistica (Berlin 6-8 February), which is the world's largest fresh produce exhibition with 45,000 visitors from 100 countries.

Gulfoods (Dubai 21-24 February) and HOFEX (Hong Kong 16-18 May) where apples and pears were featured as part of HAL's Australia Fresh stand.



Fruit logistica display Berlin 6th - 8th February 2007

# Biotech & Breeding

## APO1006 DEVELOPING SYSTEMS FOR ORGANIC AND LOW INPUT APPLE PRODUCTION

Dr Simon Middleton - QLD Department of Primary Industries of Fisheries

Apple scab (colloquially known in Australia as apple black spot) caused by the fungus *Venturia inaequalis*, is a major disease of apples in Australia and throughout the world. Apple varieties resistant to apple scab have been bred and developed in the Department of Primary Industries and Fisheries, Queensland (DPI&F) apple breeding program, and several show promise as high quality apples with the potential to be grown in both organic and non-organic systems.

One of these varieties is 'RS103-130', which matures mid-season (six to eight weeks after 'Royal Gala'), has exceptional shelf-life and is juicy with a sweet, low-acid and mild flavour. As part of this project, 'RS103-



Harvesting scab-resistant 'RS103-130' apples from a V-trellis system



Four-year-old trees of a scab-resistant apple planted at 3333 trees/ha

'130' was selected for a commercial planting to determine strategies for successful organic production of new Australian scab-resistant apples. Organically produced apples offer one option for growers seeking higher returns, and practical production systems need to be developed to help satisfy increasing consumer demand for organic produce.

'RS103-130' was successfully grown organically for four seasons in the Stanthorpe district of southern Queensland, where up to 12 primary infection periods for apple scab can occur during the spring and early summer. This region is one of the more marginal apple growing areas of Australia, characterised by sandy soils and a warm, summer rainfall climate. With appropriate strategies now developed to organically produce 'RS103-130' apples in Queensland, it is highly likely that this can also be achieved in other apple growing regions of Australia which contend with fewer environmental, pest and disease pressures.

Australia's first crop of organically grown 'RS103-130' scab resistant apples was produced in March 2006, as part of this project. Some of these apples were marketed through an organic wholesaler in Sydney, receiving an average price of \$37 for first grade and \$32 for second grade fruit per 12 kg two-layer carton. Customer feedback was excellent and the apples sold quickly. Returns in 2007 were even higher, and up to \$60 per 12 kg two-layer carton.

The robustness of the scab resistance of 'RS103-130' has been demonstrated in the field, with no apple scab occurring on trees or fruit of 'RS103-130' despite the presence of apple scab on 'Galaxy' trees planted as a commercial standard within the organic block.

A second, ongoing component of the project consists of replicated high density planting system trials for four scab-resistant apple selections, including 'RS103-130'. These are planted at Applethorpe Research Station (ARS), and include evaluation of a range of rootstocks (M.9, Ottawa 3, M.26, MM.102, MM.106) and tree densities (1666 - 5925 trees/hectare). The oldest trees were in their fifth leaf in 2006/2007. Early yields and packouts have been excellent, and yields are expected to further improve significantly as the trees reach their full bearing potential. Of particular promise is that fruit size of 'RS103-130' averages 200 g or higher in most systems, despite heavy crop loads.

In a comparison of soil characteristics beneath sugar cane mulch in the organic orchard, and in the herbicide strip beneath conventionally-managed trees in an adjacent block of apples, biological activity was greater, soil temperature was reduced, and water infiltration increased 40-fold beneath the sugar cane mulch. The improved infiltration is particularly important, as much of the rainfall received in apple growing regions of Australia occurs as high intensity storms. The potential effects of soil management strategies on soil health, water use efficiency and managing drought requires further investigation, and is applicable to both organic and conventional systems of apple production.

An organic apple production guide has been produced which details strategies for successful organic production of scab-resistant apples in Australia. It was developed using the results of trials conducted in this project, and incorporation of the principles outlined in the National Standard for Organic and Bio-Dynamic Produce.

# Biotech & Breeding

## AP02018 LONG DISTANCE RESISTANCE: A NOVEL AND INNOVATIVE APPROACH TO IMPROVE POME FRUIT.

Dr Gowri Maheswaran - VIC Department of Primary Industries, Prof. M. A. Anderson, Department of Biochemistry, La Trobe University, Dr E. Johnson, Department of Biochemistry, La Trobe University, Ms Mahilini Ponnampalam, Primary Industries Research Victoria, Department of Primary Industries, Victoria

Designer apple rootstock protects itself and any scion from insect pests. The rootstock of a grafted apple tree plays an important role in controlling the growth, development and fruiting of the scion. This project aims to design an apple tree with the non-transgenic scion grafted on transgenic rootstock, which has the capability of transmitting the desirable characters across the graft union.

Communication between the stock and the scion of a grafted tree operates through the vascular system, which is the conduit connecting the two cultivars through the graft union.

Recent discoveries have revealed a novel role for phloem, which is one of the two types of tissue present in the vascular system, in terms of the transport and delivering of information to distantly located organs. This provides a unique opportunity to investigate long distance transport of macromolecules from the rootstock into the scion of a fruit tree, through both the vascular system, and from cells of surrounding tissues into the vascular system.

The current work aims to capitalise on the long distance transport mechanism by transforming rootstocks in such a way that the pest control product will be transferred into the phloem for transport into the scion through the graft union.

Most pest control agents are proteins, compounds that are not readily translocated in the phloem without the action of a "carrier molecule". Investigation into the translocation of pest or disease controlling protein from the site of synthesis and into phloem

tissue for upward translocation using a carrier molecule is under way.

The efficacy of a carrier molecule in delivering a marker protein into the phloem of transgenic apple rootstock and the detection of the product in the non-transgenic scion grafted on transgenic apple rootstock has been explored. An effective phloem delivery system has been successfully established and the engineered product has been detected in the non-transgenic parts of the grafted apple plant.

Research is under way to optimise delivery of the pest or disease control factor to the grafted non-transgenic scion. In the longer term, the modification of rootstocks offers greater potential to the apple and pear industries than scion modification, provided that transgenic rootstocks can transfer the molecule to scions. An additional advantage of this approach is that the modification of only a few rootstocks is required to confer benefit to many different scion varieties. This research could provide a novel technique for management of insect pests of pome fruit that is more marketable to growers and consumers than transforming the scion itself.

Funding Sources: HAL Commonwealth, APAL levy and Department of Primary Industries, Victoria.

Figure 2 A, B, C & D. Non-transgenic M26 grafted on transgenic rootstock.

Figure 1. Transgenic rootstock M26 showing localisation of the marker protein GFP in vascular tissue of leaf and stem.

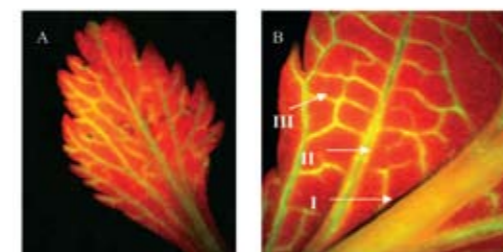


Figure 1A & B. Transgenic apple leaf showing yellowish-green GFP protein in vascular tissue types I, II and III.

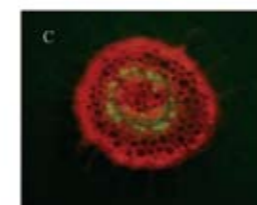


Figure 1C. Transgenic apple stem showing yellowish-green GFP protein in vascular tissue.

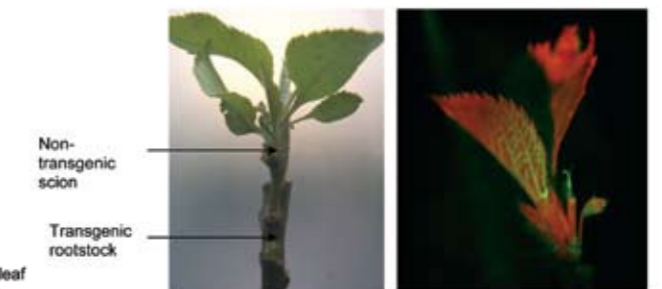


Figure 2A. Successfully grafted non-transgenic scion on transgenic stock under glass house conditions.

Figure 2B. Arrow showing yellowish-green GFP protein fluorescence in leaf of non-transgenic scion grafted on transgenic rootstock.



Figure 2C. Successfully grafted non-transgenic scion on transgenic stock under tissue culture conditions.

Figure 2D. Arrow showing the flow of yellowish-green GFP from transgenic rootstock into the non-transgenic scion.

# Biotech & Breeding

## APO3018 & AP05017 IMPROVING THE QUALITY OF APPLE & PEAR PLANTING MATERIAL IN AUSTRALIA

Garry Langford - General Manager Australian Pome Fruit Improvement Program Ltd

### APFIP Mission:

That APFIP certified rootstocks and nursery trees become the industry first choice for orchard plantings. To deliver independent variety/rootstock information to all parts of the Australian fruit tree industry. To promote and further enhance prompt and secure access to new varieties and rootstocks through efficient post entry quarantine protocols."

The projects AP03018 and AP05017 are aimed at the mission described above, focused on pears and apples respectively.

A survey of key Australian pome fruit growing districts for exotic and endemic pathogens (F. E. Constable, P. A. Joyce and B. C. Rodoni) was completed in January 2005. The survey was completed as part of HAL project AP01030 and in conjunction with APFIP. This survey also detailed



Jonagold with ring russet caused by virus



Mosaic virus symptoms on a young nursery tree

the incidence of the endemic viruses, apple mosaic (ApMV), apple stem pitting (ASPV), apple stem grooving (ASGV) & apple chlorotic leaf spot (ACLSV). These viruses are considered latent but do have a significant economic impact on the productivity of apple and pear trees. Samples were collected from every major growing area in Australia with a total of 173 trees sampled and tested. 163 samples (94.2 per cent) were found to be infected with one or more of these viruses leaving only 10 (5.8 per cent) samples uninfected, with half of these 10 being seedling controls that were virus free.

Australian research completed in 1988 by Les Penrose et al showed that these viruses have as significant impact on orchard yields. The extent of the presence of these viruses in our industry means that yields are being reduced. APFIP has registered a certification trademark to be used with certified planting material. APFIP Certified rootstocks and nursery trees will meet three criteria: they are virus tested negative for the viruses listed above, are true to type and meet minimum nursery tree standards. The trademark symbol below will be displayed on nursery tree and rootstock tags to indicate that they are certified.

© Registered certification trademark of APFIP

APFIP has licensed the use of the trademark to seven nursery businesses to date (listed on the APFIP website or available by contacting the APFIP office) and will almost certainly license more users in the future. The current licensees represent approximately 65 per cent of Australian apple & pear nursery tree production. These nurseries produced a total of 80,000 M.26 rootstocks in 2007 with production set to double over the next four years. Certified M.9 will be available from 2009. The quince rootstocks A, BA.29 and C are being distributed to certification licensees this winter with commercial production expected to be available from 2009. APFIP is encouraging variety owners to enter their varieties into the certification system so that they are available to growers in a certified state. APFIP has established a range of industry standard varieties in a certified state these include the apples: Cripps Pink, Cripps Red, Granny Smith, Golden Delicious, Red Delicious the early Fuji Fiero cv; and the pears: Packhams Triumph, Williams and Burre Hardy.

Funding Source APAL levy funds

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# Biotech & Breeding

## APO4004 (CONT. AP96019 & AP00007) BREEDING WOOLLY APHID RESISTANT DWARFING APPLE ROOTSTOCKS

Roy Menzies and Lester Snare - NSW Department of Primary Industries

### An Australian breeding program for Australian conditions

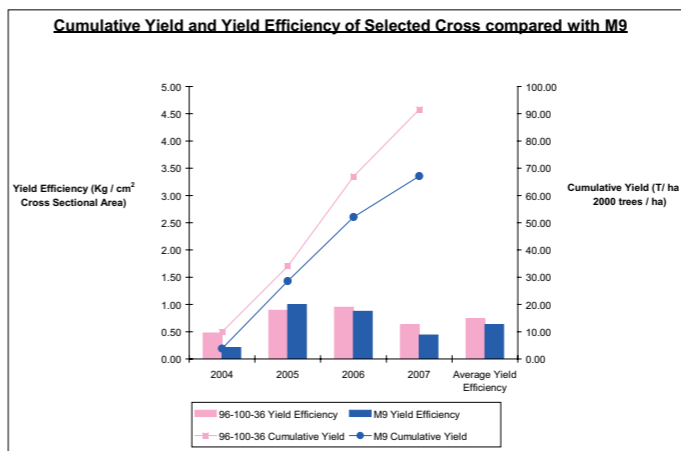
The trend in apple growing in Australia is towards closer planting, using smaller compact trees to improve production, efficiencies, yields and returns. Whilst a number of the more vigorous rootstocks are resistant to woolly apple aphid (WAA), fewer options are available when dwarfing stocks are required. The objective of this breeding program is to develop a dwarfing apple rootstock with WAA resistance. The use of resistant rootstocks is one of the most effective methods of controlling this pest.

Many intensive plantings in Australia are based on M9. This rootstock exhibits excellent production efficiency and produces a tree of suitable size. It is however, not resistant to woolly aphid and at times can be difficult to propagate.

### The breeding program

This project, initiated by NSW DPI, and funded by APAL through HAL commenced in 1996 and has utilised resistant parent material from around the world. The Malling-Merton (MM) series of rootstocks and its MM derivatives are a great source of resistance and have been used in this program. Other sources of resistance include Malus sieboldii and Malus robusta. The Malus robusta component has been introduced through the CG (Cornell University, Geneva) series which have M.robusta as one parent. It has been important to incorporate a diversity of species into the program for both WAA resistance and dwarfing characteristics.

The program is now split into two parts. Following an expansive culling program for material with non desirable horticultural traits, enough productivity data is now available from the first group of crosses to select a group of elite stocks. These stocks possess suitable dwarfing traits and yield capacities equivalent to or better than M9. Parentages of these stocks include M26, M9, Ottawa 3 and MM110. Selected elite stocks have been compared with M9, M26 and MM106 in the evaluation orchard. It is



The chart above shows the performance of selection 96-100-36 grafted to Jonagold in relation to Jonagold on M9. Cumulative yield has been presented at 2000 trees/ha.

anticipated that newer rootstocks like CG202 (Cornell-Geneva 202) from Cornell University, Geneva and JM 7 from the Morioka Research Station in Japan will be used in the program as further comparisons.

The second group of crosses were planted to the evaluation orchard in 2004 and require further evaluation although some stocks were eliminated due to excessive vigour. It is anticipated that within three more seasons an elite group will emerge to be included in the APFIP program.

The Australian apple industry has acknowledged the significance of woolly aphid as a key pest and now the program enters the critical stage of elite stock selection. The implications for the commercial apple industry, the tree nursery industry and other breeders is that a more sustainable and profitable rootstock will be available to meet Australian conditions.



Controlled crosses of rootstock seedlings.



Productive dwarfing rootstocks in the evaluation orchard.

## Biotech & Breeding

### AP05008 - EXTENSION TO AP00010 BREEDING FOR RESISTANCE TO APPLE BLACK SPOT BEYOND 2000

Aldo Zeppa - QLD Department of Primary Industries & Fisheries

The Queensland Department of Primary Industries and Fisheries (DPI&F) has bred apples with resistance to apple scab (colloquially known as apple black spot). There are presently 350 scab resistant selections growing in the test block at Applethorpe Research Station in Queensland. Provisional PBR for one of these selections (RS103 130) was granted in Australia in December 2005 and a US plant patents application submitted in December 2006 is pending.

RS103 130 and one other scab resistant selection have scored well in consumer evaluations conducted in Brisbane by DPI&F's post harvest sensory science group, where these apples were compared with Royal Gala, Fuji, Red Delicious and Red Jonagold. RS103-130 is a mid-season scab resistant apple maturing mid to late March (6 - 8 weeks after Gala), and has a broken red stripe to almost full block red over-colour on a yellow green to yellow background. Fruit is round-conic shaped with a medium length stalk. Flesh is off-white in colour, medium textured and crisp. It is juicy with a sweet, low-acid mild flavour. Consumers rated the appearance of RS103 130 and Red Delicious as better than Gala or Fuji. They rated the texture, flavour and overall likeability of RS103-130, Fuji and Gala as similar, and all three varieties as much better than Red Delicious for these three traits.

Consumer evaluation also favourably compared a second scab resistant apple selection (mid to late February maturity) with Gala, Jonagold and Hi Early Delicious. All four apples rated similarly for appearance. The scab resistant selection and Jonagold rated similarly for three criteria, namely texture, flavour and overall likeability; also both of these apples out-performed Gala and Hi Early Delicious in these three criteria. Additionally, the scab resistant selection displayed a low level of flesh browning when compared to Gala and Jonagold at five successive time intervals over a 90 minute period.

In April 2006, the Brennan Review, conducted by plant breeding consultant Dr Paul Brennan recommended changes in the evaluation protocols of the DPI&F apple breeding program. These recommendations were implemented during the 2006-07 season, and incorporated into the program to quantify parameters for the 350 scab resistant selections in the test block at Applethorpe Research Station. Adoption of these recommendations intensified the rigour of evaluation so that inferior types are culled sooner. All 350 selections produced varying quantities of fruit this season; although 20 percent were only in 2nd leaf and will need to be evaluated for several more seasons.

Funded by: Queensland Department of Primary Industries and Fisheries, APAL levy funds, Horticulture Australia Ltd.



Scab resistant selection RS103-130 on tree.



Apple samples as presented for consumer evaluation by DPI&F sensory scientists

## Biotech & Breeding

### AP06049 PERFECT PEARS - THE NATIONAL PEAR BREEDING PROGRAM

Susanna Richards - Department of Primary Industries, Victoria, Tatura Centre

Perfect Pears is a national pear breeding program funded by state Departments of Primary Industries, HAL and APAL. It has two broad aims: firstly, the development of new varieties to provide Australian growers with the impetus to expand their pear production and take up more intensive production systems that can raise unit orchard productivity; secondly, new fruit products that will re-invigorate consumers' interest and confidence in pears, to facilitate market expansion and increase per capita consumption.

The program has initially used conventional breeding strategies to establish over 63,000 seedling trees from 160 inter-varietal European pear crosses and 20 inter-specific crosses between European and Asiatic pears. In the future, the program aims to adopt new biotechnologies to facilitate varietal development.

The key breeding objectives are to develop new pear varieties with a combination of attractive fruit appearance, superior flesh eating quality, good storability and shelf life. Different maturity types to extend pear seasonality and the incorporation of scab resistance to reduce fungicide use are also target traits.

During the 2006/2007 season, the National Pear Breeding Program continued to identify and evaluate new pear selections and determine the harvest range and storage potential of current selections. There are now 230 selections under advanced evaluation in replicated trellised trials, and a further 24 new seedling hybrids were identified.

Assessment protocols were streamlined so that genetic data collected on new seedlings and existing selections can be directly compared to expedite the assessment of optimum harvest periods and storage potentials. Selections were harvested at three different periods and assessed out of storage after two and three months. In the following season elite selections will be evaluated under both air and control atmosphere storage. Growers will again be invited to assist with the

evaluation of elite selection, to determine which selections are fast-tracked for evaluation to Australian Pome Fruit Improvement Program (APFIP) sites.

The commercialisation strategy for the release of new varieties from the program has continued to be developed. The two major nurseries, Flemings and the INN international consortium and ANFIC who are linked with AIGN (Associated International Group of Nurseries) visited the breeding program in season to view some of the elite selections.

This season's results continued to show the potential of a mid- and a late-season selection (Photos 1 and 2). The mid-season selection (Photo 1) has strong red blush on a green background with a smooth reasonably symmetrical shape. It develops a soft, juicy, texture with aromatic flavours similar to the variety Comice. This selection has the potential to handle and store well similar to Packham and will be assessed under CA storage next season. It has been fast-tracked for evaluation and has started to fruit at APFIP sites this season. The late-season selection (Photo 2) has a crisp, sweet flesh and can be eaten directly off the tree similar to a nashi. Its potential for storage may be limited, but further testing is required.

A small mid-season pear selection with extensive red blush was identified for the first time this season. It has firm texture like Corella but with a subtle European pear flavour, and stores well under air storage for three months. The sizing potential of this new selection will be investigated next season, and will be fast-tracked to APFIP evaluations.

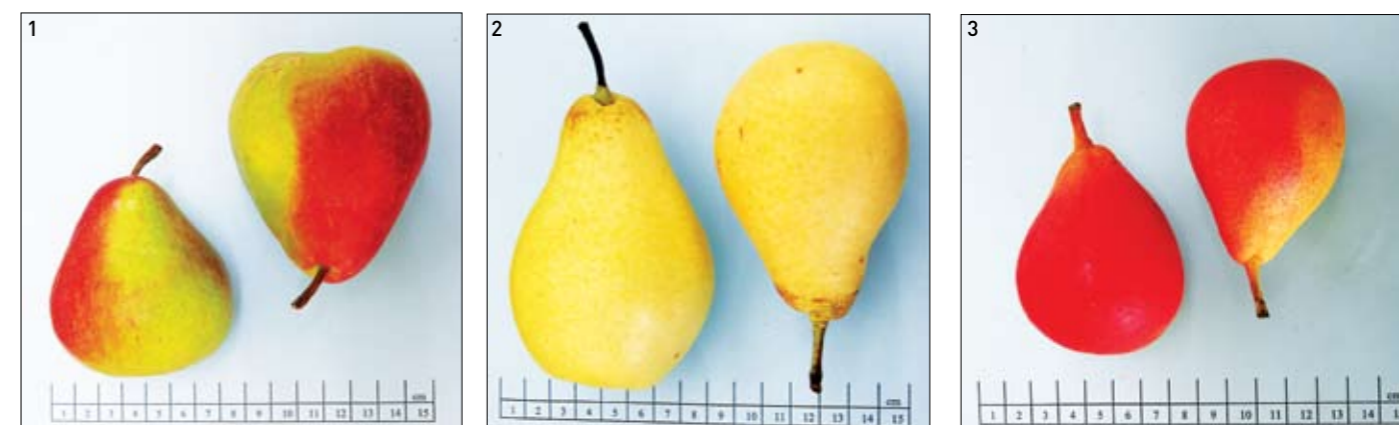


Photo 1: A mid season European pear selection with attractive green/red skin.

Photo 2: A late season Nashi type selection with good eating quality off the tree.

Photo 3: A small mid season European pear selection with extensive blush.

# Orchard Production Projects

## HP04009 INTENSIVE PEAR PRODUCTION IN AUSTRALIA

ANGIE GRILLS - Department of Primary Industries, VIC

The 2006/07 season provided many challenges to pear growers with drought and frost impacts felt in many regions. Whilst this has been a difficult period, it is essential that the industry remains focused on improving production efficiency to ensure long term sustainability. Intensive production is still an avenue through which the industry can maintain its competitiveness and importantly ensure that with the advent of a new variety can achieve early production and market advantage.

The Adoption of Intensive Pear Production project was established to develop Australian skills and expertise in intensive pear production. The project is guided by a steering committee that meets yearly. The key activities in the project to date have centred on gathering information about intensive pear production both locally and around the world and providing a communication link to growers.

The ongoing focus of the project is to develop and maintain links with pear production experts worldwide and keep the Australian industry up to date with international pear production trends. Key activities aligned to this have been participation in the 2006 APAL study tour of Europe and attendance at the 10th International Society for Horticultural Science (ISHS) Pear Symposium in Portugal (where a paper was co-authored with John Palmer from HortResearch in New Zealand). Some of the key learnings from these trips were:

- Generally 2000-4000 trees/ha is seen as the optimal density range for intensive pear plantings.
- Pear production is increasing in Asia, Argentina and South Africa.
- There is some stagnation in European production, however there are still many young orchards yet to bear (particularly in Belgium and the Netherlands where conference plantings have expanded rapidly in the past two years).
- Most pear production regions, like Australia, are seeking new varieties to 'excite' the industry. Many regions in Europe are consistently achieving high early production in the third year and therefore at this stage will have the advantage when new varieties are released.
- The first club varieties of pears have been seen in Europe.
- Research looking at improving fruitset of pears with gibberellins and Regalis® (particularly after stress events) and rootpruning and stem incisions has shown interesting results in Europe, which may be applicable to Australian conditions.



Photo 1

These learnings are being communicated through articles as well as a recently developed website on intensive pear production which can be accessed through the Victorian DPI site ([www.dpi.vic.gov.au](http://www.dpi.vic.gov.au)). This site will serve as an important central location from which growers can access articles produced by the project as well as other relevant reports and links (as they arise).

The project has also supported activities such as drought/frost management, pruning/training at the APFIP pear rootstock trial site as well as the visit of Jef De Coster to the Goulburn Valley.

The next phase of the project will focus on developing management tools to assist growers with making decisions about planting pears intensively, as well as collaborating with other pear-related projects and technical field days.

Funded by: Department of Primary Industries VIC, Commonwealth funds through HAL, APAL levy funds

**Photo 1: Growers thought flower numbers were low in Belgium in 2006, so they sprayed with gibberellins which set too many fruit and resulted in a need for more extensive hand thinning.**

**Photo 2: The 'Doorgroeibomen' (or sprint tree) system in Belgium achieved close to 30 t/ha in its second leaf. Nursery trees are two years old when planted, but not cut back in the final year in the nursery, as with 'normal' feathered nursery trees.**



Photo 2

# Orchard Production Projects

## AP05006 PACKING SHED BENCHMARKING

Graeme Forsythe & Associates

After labour, packing is one of the largest costs faced by fruit producers. Packing costs are of the order of 25-35% of total production costs.

Packing costs are notoriously hard to measure as they contain, many, sometimes hidden, components. These costs include fixed costs related to owned assets and leases, variable costs (labour and consumables such as packaging) and a basket of other costs such as services, insurances and other overheads, partial use of cool rooms and transport, palletisation costs, despatch costs etc.

One way of measuring the efficiency of a packhouse is to benchmark its performance against that of other packhouses.

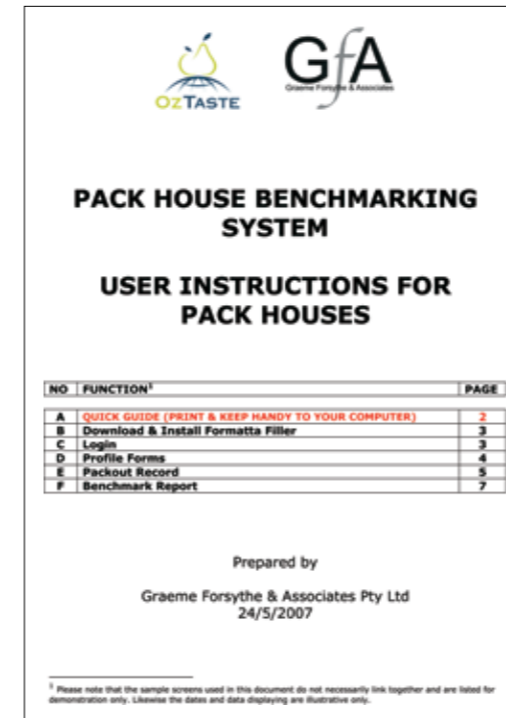
This project has devised simple, web-based software that allows the owners and managers of packhouses to benchmark the performance of their shed against that of others.

Simple, readily available data related to each shift the packhouse works is collected and entered into the system via a web site. Data gathered includes the number of labour hours utilised that shift (number of people working x length of shift) and their cost, the weight of fruit tipped on to the grader and the packed outputs (cartons of various sizes and grades, hat bins of Class 2 fruit, bins of juice fruit etc).

All sheds participating in the program enter their data for a particular period by a set cut off time. The program then calculates the efficiency of each shed participating in the program. Outputs such as bins tipped per labour hour, bins tipped per person, labour cost per bin tipped, labour cost per kg tipped, labour cost per kg packed, standard cartons per packer, time(minutes) to pack a standard carton are then calculated.

Finally these are tabulated so that the shed which entered its data can compare its results with those of other packhouses in the program.

The system can be used with most, if not all, types of produce. The system will be made available to Apple and Pear Australia Limited for placement on their website and accordingly access for all industry members.



the system comes with easy set up and usage instructions

# Orchard Production Projects

## AP 06069 INTENSIVE APPLE ORCHARD PRODUCTION SYSTEMS

Paul James - Rural Solutions SA

### Comparison and economic assessment under Australian conditions – stage 2

#### Summary

This new project is a continuation of the original HAL/APAL funded project "Intensive Apple Orchard Production Systems – Comparison and economic assessment under Australian conditions – stage 1".

The project is managing and monitoring the performance of a demonstration planting of 76 different orchard planting systems x rootstock x planting densities. Two varieties are under evaluation – Cripps Pink and Cripps Red (38 combinations for each variety). Planting densities range from 2000 to 6666 trees/ha and the orchard systems being evaluated include, tall spindle, closed V, open V (open Tatura) and super spindle. Rootstocks being used include M.9, Ottawa.3, M.26 and MM.106

All costs, labour inputs, yields and pack-out performances are being recorded and used in an economic model to evaluate the economic performances of the various systems – the objective being to see which



M.26 x Open V (3555 trees/ha) Marketable yield (2007) 66.6 tonnes/ha Count 100

orchard systems and planting densities provide Australian growers with the best commercial returns with the lowest risks. Preliminary results show that single row systems between 2500 – 3500 trees/ha are the leading options. This does not mean that double row systems are not necessarily uneconomic but at this stage in our evaluation do not provide any significant advantages over single row systems. Further evaluation may change this preliminary result as the V systems at this stage are beginning to have significant yield advantages over the single row systems. Row spacing and in row spacing are important factors in determining tree management strategies.

This project will be obtaining all of the relevant information for the next four seasons to update the economic model developed by the project. This updated information will replace "calculated" economic figures with actual costs and returns to provide actual economic performance figures for the first 10 years of each "orchard system".

This season management of the field plantings has continued under the established management guidelines developed for the project. These guidelines have been developed in conjunction with the South Australian Pome Fruit Improvement Committee Inc and are reviewed annually.

All pest and disease management practices were undertaken throughout the dormant and growing season using Integrated Fruit Production (IFP) practices and guidelines. The insect control program was built around the use of mating disruption pheromones and the use of Insegar® insect growth regulator. The planting was routinely monitored for Codling Moth, Light Brown Apple Moth and Mites throughout the growing season using a commercial service. The Apple Scab control program was based on a combination of a base control program supplemented with additional information from the Adelaide Hills "Blackspot" monitoring program with additional control measures applied if required.

A detailed assessment of unmarketable fruit at harvest indicated that the principal fruit quality problems in the trial planting were caused by bird damage (due to unusually high bird numbers in the district) and sunburn (57.1 per cent of Cripps Pink and 52 per cent of Cripps Red cull fruit). Apple Scab problems were virtually none existent. Insect problems, although generally low were affected by an early looper infestation. Predatory mites controlled any pest mite problems, with no miticide applications used.

Winter pruning and hand thinning of the trial planting was undertaken by members of the SA Pome Fruit Improvement Committee. All the required time measurements were recorded. Summer pruning times for each system were also recorded. This information will be incorporated into the project economic comparison model in the near future.

All yields were recorded along with a detailed assessment of cull fruit. This information has already been incorporated into the project information and disseminated to a number of industry groups.

This project is closely linked to the APAL Future Orchards 2012 (FO 2012) project. Four combinations from the project have been included as "Monitoring Blocks" in this project and the information required (to

date) on these blocks has been provided to the FO 2012 project. Practical aspects of the FO 2012 project are being used to adjust the management, tree training and pruning of trees in the trial planting. Aspects of bud counting, being encouraged by the project will be used to assist with this season's winter pruning practices. The planting will also be used as a practical demonstration of orchard skills and practices i.e. fruit growth development.

Paul James (project leader) participated as a guest presenter in the June 07 "northern loop" orchard walks held in Stanthorpe (Qld), Orange and Batlow (NSW) and Shepparton (Vic). He prepared field day notes and delivered a presentation outlining this project, its progress and economic findings. He also provided assistance in the pruning demonstrations undertaken as part of these orchard walks.

Mr James also participated in the Apple & Pear Australia Ltd (APAL) study tour to New Zealand to view promising selections from the PREVAR program. The study tour also undertook a quick trip to view orchards in the Nelson region. A presentation on the trip is being prepared and some information from the trip has been used in the Future Orchards 2012 project.

The project planting and the information it is producing is being used extensively. There is a lot of interaction with the future orchards 2012 project and a number of growers from interstate are travelling to SA to view the planting.

In 2006-2007 a number of communication / extension activities were undertaken including:

- report for APAL Annual Research and Development publication
- presentation to IFTA pre conference tour (Jan 07)
- presentation to IFTA International Conference – Hobart (07)
- article in March 07 edition of Australian Fruit Grower
- use of the trial planting for training of growers
- use of the trial planting for field demonstrations as part of Future Orchards 2012 project
- use of four planting combinations as "Monitoring blocks" in FO 2012 project providing ongoing information to growers through FO 2012 website
- presentations to Stanthorpe, Orange, Batlow and Shepparton growers as part of June 07 project orchard walks
- provision of information for June 07 Lenswood orchard walk.

# Orchard Production Projects



Tall Spindle trees at full fruit



Pink Lady production 2007

# Pests & Diseases

## AP05002 ALTERNARIA FRUIT SPOT: NEW DIRECTIONS

Mr Graeme Forsythe - Qld Department of Primary Industries & Fisheries

The aim of this project was to develop new directions for research into Alternaria diseases of apples, in particular Alternaria fruit spot in Australia. The project is almost complete, with the final report due on the 31 August 2007. The three main objectives of the work were to undertake a comprehensive literature review of techniques used to research Alternaria diseases of trees crops; to perform some preliminary analysis of Alternaria isolates collected from Australian apple orchards in the previous project AP02011 and to develop a new project proposal for further research.

The literature review, "Technologies for investigating Alternaria diseases of tree crops" has been completed. The main findings include:

- Alternaria diseases of citrus appear to have many similarities to the situation in apples, and may provide several useful techniques for studying Alternaria in apples. Of particular interest is a prediction model for spore release, which may assist in determining optimum timings for fungicide applications.
- That more than one method of identification is needed to ensure accurate identification of Alternaria species. This is especially important for isolates belonging to the A. alternata complex of pathogens, of which A. mali is one.
- Several methods for evaluating fungicide efficacy and isolate pathogenicity in the laboratory using leaf bioassays and Petri dish tests.
- Techniques to identify, and differentiate, pathogenic isolates using the presence of absence of toxins in culture, and toxin genes in isolates.

Analysis of the representative isolates of Alternaria species affecting apples in Australian orchards is ongoing. Alternaria species isolates collected during the national survey of apple orchards (AP02011) continue to show considerable variability in culture, and no clear



Alternaria on leaves

differences have been found between isolates from Queensland and New South Wales (that regularly produce high losses) and those collected from other states of Australia (Victoria, South Australia, Tasmania and Western Australia). We have demonstrated the ability of a range of isolates from around Australia to cause lenticel spot symptoms on apple fruit, similar to those observed in the field. It remains unclear whether or not these infections are truly pathogenic, or saprophytic in nature. A successful application to APAL and HAL in the 2005 call, has resulted in this project being extended as AP06007 until January 2010.



Defoliation from Alternaria



Alternaria on fruit

# Pests & Diseases

## AP05015 SUCCESSFUL REPLANTING OF ORCHARDS WITHOUT CHEMICALS

Dr Gordon S Brown - Scientific Horticulture

As a result of 3 years of glasshouse trials conducted in the late 1990's a field trial was established in 1999 to test promising treatments against apple replant disease in the field. This field trial has been studied since establishment and one treatment, treating the soil with high rates of lime prior to planting, despite disappointing growth in the first season, has provided long term cumulative yield close to that of soil fumigation. As a result a new replant field trial was established in Tasmania in 2005.

The aim of this trial was to establish the impact of a new seed mix of high glucoasimulate brassicas as well as peas as a cover crop prior to planting and to verify the lime treatment effects on a different site

The cover crops were established and grown over the 2005/6 season prior to incorporation into the soil. It was found that the pea crop did not produce a large biomass and the seed cost was high compared to the brassica crop.

In the autumn of 2006 the ultimate tree beds were formed and the lime, as well as a Basamid(r) treatments were applied to the field site. The treatments were repeated on 6 different rows, each row having one of three different cover crop treatments in the previous season. The site was planted to MM106 rootstocks in the spring of 2006 and these trees have now grown for a full season.

An unexpected result was obtained in that the trees growing in the end 2 rows had superior growth (77% improvement) to the remaining 4 rows of the experiment. A study of farm records has revealed that these two rows, while having the same cultivar on the top had different rootstocks - M26 and Northern Spy. The remaining 4 rows with severe apple replant disease followed trees growing on MM106 rootstocks.

This finding suggests that the pre existing rootstock has an impact on the severity of apple replant disease and this observation needs to be studied in more detail. This unexpected result has damaged the results for the cover crops, however, for the remaining 4 replicates it appears as though the high glucoasimulate brassicas as a cover crop caused a 23% increase in tree growth while the peas had no effect.

During the summer the rate of photosynthesis using chlorophyll fluorescence was measured and this found that while the Basamid(r) treatment had elevated levels of potential photosynthesis the Lime treatments were similar to the control trees.

At the end of the season, based on the terminal shoot length, while there was improved growth in the Basamid(r) treatments, the lime treatment had not improved the performance of the trees as was observed in the 1999 field trial. Photographs have been taken and image analysis is being carried out to obtain data for tree volume.



Cover crop establishment treatments



Incorporation of preplant treatments



Incorporation of preplant treatments



First season's growth treatments

## Pests & Diseases

### FR04025 INTEGRATED MANAGEMENT OF BACTERIAL DISEASES IN POME FRUITS

Dr Chin Gouk - Department of Primary Industries, Tatura, VIC

There is a gap in understanding of the role of bacterial diseases and other factors affecting tree health and productivity of pear orchards. This project aims to collect and analyse a range of data including disease incidence, fruit set, fruit yield, quality and cultural practices from the growing season through to pack-out. This information will increase our understanding on factors contributing to declining tree health and low productivity of pear orchards.

During the 2006/07 season, a study of the impact of pruning on fruit yield and quality was conducted in seven pear orchards in the Goulburn Valley and Cobram. The incidence of bacterial blast, fruit set, fruit numbers and quality during the growing season and at pack-out were monitored. Fruit harvested from the trials were graded commercially in the pack house. Fruit rejected for juice was categorised further to determine the key criteria for quality downgrade.

Data on fruit numbers and quality are currently being analysed to determine the percentage of pack-out from the orchard blocks. Analysis of downgraded fruit from the trials indicates that small and misshapen fruit was the key factor for downgrade, this category accounted for 37-60% of the downgraded fruit. The second major factor for downgrade was russet associated with frost injury, constituting 10-40% of the downgraded fruit. Two of the orchard blocks that suffered severe frost injury had up to 40% of the downgraded fruit in the russet category. Whilst the effect of renewal pruning will not be evident in the first season, baseline data on disease incidence, fruit set, yields and pack-outs collected would be useful for comparison with subsequent seasons and for cost-benefit analysis of disease management strategies.

Biochemical analysis of the causal bacterium of pear bacterial blast, *Pseudomonas syringae*, was conducted since this bacterium is known to produce a plant growth hormone, indole-acetic acid (IAA). The first aim of the experiment was to determine if the bacterial isolates collected from pear orchards produced IAA, secondly, to determine whether IAA could be detected in infected tissues. Using High Performance Liquid Chromatography, *P. syringae* was found to produce higher levels of IAA compared to another saprophytic



Blackening of pear flowers infected with bacterial blast

bacterium. High concentrations of IAA were also detected in infected blossoms. More analysis of a range of healthy and infected tissues will be conducted in spring.

Further studies in the coming season will build on the data gained from the field trials to include monitoring of disease incidence in orchards under intensive production, testing of nutrient status in orchards with high incidence of small and misshapen fruit, monitoring of copper resistance and continuing the analysis of the presence of IAA in plant tissues.

#### Funding Sources

Horticulture Australia Ltd, Apple and Pear Australia Ltd., Canned Fruit Industry Council of Australia, Department of Primary Industries, Fruit Grower Victoria, Cobram Growers

## Pests & Diseases

### AP06011 UNDERSTANDING THE FUNDAMENTAL INTERACTIONS BETWEEN WOOLLY APPLE APHID AND POME FRUIT

Kevin Powell - VIC Department of Primary Industries

Woolly apple aphids cause economic damage to industry due to their feeding activity on the roots and aerial parts of the tree. In addition, the high level of production of "honeydew" waste products from the woolly apple aphids results in the development of a sooty mould on the fruit, reducing the quality and marketability of the product. IPM strategies may be employed to control the woolly apple aphid, however, in intensive orchards where susceptible dwarfing rootstocks are used as well as a high usage of insecticides the insect is becoming a major problem. Further, while the use of resistant rootstocks is possible in less intensive orchards there is potential for breakdown in rootstock resistance.

This project will improve the current understanding of the biology of woolly apple aphid, with the long-term aim of improving current management strategies. The aims of the project are to:

- determine the essential dietary requirements of the pest through the development of an artificial feeding system. The artificial feeding system will allow for testing of alternative control strategies for woolly apple aphid
- compare the feeding behaviour of woolly apple aphid on susceptible and resistant apple varieties. Feeding behaviour studies may provide insight into the impact of orchard management on the pest insect
- identify important plant volatiles that may increase the level of attraction of natural predators and parasitoids. Potentially, the application of the plant volatiles to the orchard production system may increase the rate of re-colonisation by beneficial insects and therefore reduce the impact of woolly apple aphid on apple production.

In the first six months of the project the team has developed a system for rearing woolly apple aphids under glasshouse and laboratory conditions. Two aphid populations from different regions have been established which will be used in the first stages of the project to develop an artificial diet feeding system.



Woolly apple aphid in commercial apple orchard

Parasitized woolly apple aphid laboratory culture



# Projects 06-07

Project Code	Title	Service Provider	Research/Contact
AP01006	Developing systems for organic and low input apple production	QLD Department of Primary Industries & Fisheries	Dr Simon Middleton - 07 4681 6100
AP02014	Australian national apple breeding program (ext)	Department of Agriculture & Food Western Australia	Ms Eleanor Melvin-Carter - 03 9368 3295
AP02018	Long distance resistance: A novel and innovative approach to improve pome fruit	VIC Department of Primary Industries	Dr Gowri Maheswaran - 03 9479 3862
AP03018	Pear variety and rootstock improvement	Australian Pome Fruit Improvement Program Ltd.	Mr Garry Langford - 03 6266 4344
AP03020	A joint venture for development of new pome fruit products	Apple & Pear Australia Limited	Dr Brett Ennis - +64 6 835 2530
AP03032	Preparing the Case for Structural Adjustment	Apple & Pear Australia Limited	Dr George Reeves - 0262486699
AP04004	Breeding woolly aphid resistant dwarfing apple rootstocks (continued AP96019 and AP00007)	NSW Department of Primary Industries (NSW DPI)	Mr Roy Menzies - 02 63301213
AP04009	Adoption of intensive pear production	VIC Department of Primary Industries	Ms Angie Grills - (03) 5871 0600
AP05002	Alternaria apple fruit spot: New Directions	QLD Department of Primary Industries & Fisheries	Ms Christine Horlock - 07 46816100
AP05006	Packing Shed Benchmarking	OzTaste Pty Ltd	Mr Graeme Forsythe - 02 9874 1009
AP05008	Extension to AP00010 - Breeding for resistance to apple black spot beyond 2000	QLD Department of Primary Industries & Fisheries	Mr Aldo Zeppa - 07 4681 6100
AP05015	Overcoming apple replant disease (ARD) with leguminous cover crops and calcium hydroxide	Scientific Horticulture Pty Ltd	Dr Gordon Brown - 03 6239 6411
AP05017	Australian Pome Fruit Improvement Program Ltd	Australian Pome Fruit Improvement Program Ltd.	Mr Garry Langford - 03 6266 4344
AP05029	Investigate the current state of knowledge worldwide regarding Nectria galligena (Ng) or European Canker.	VIC Department of Primary Industries	Dr Jacqueline Edwards - (03) 9210 9222
AP05525	2006 Apple State Promotions	Apple & Pear Australia Limited	Ms Trudy Gosney - 02 8295 2300
AP06006	Alternative fruit fly management for market access for apples	QLD Department of Primary Industries & Fisheries	Mr John Hargreaves - 07 3286 1488
AP06007	Extension AP05002: Alternaria Fruit Spot: New Directions	QLD Department of Primary Industries & Fisheries	Ms Christine Horlock - 07 46816100
AP06011	Understanding the fundamental interactions between Woolly Apple aphid and pome fruit (Revised)	VIC Department of Primary Industries	Dr Kevin Powell - 02 6030 4542
AP06013	Enhanced specificity of fireblight diagnostics for improved incursion response	CRC For National Plant Biosecurity	Dr Gary Kong - 07 4688 1319
AP06042	Leadership Development: Young Grower Scholarships	Apple & Pear Australia Limited	Ms Alma Reynolds - 03 5825 2355
AP06047	Cold treatment of apples, pears and nashi against Q'fly for access to Taiwan	QLD Department of Primary Industries & Fisheries	Mr Peter Leach - 07 4044 1679
AP06049	Designer Pears	VIC Department of Primary Industries	Ms Nola Smith - 03 5573 0900
AP06053	Development of F02012 Website and Database	Apple & Pear Australia Limited	Ms Alma Reynolds - 03 5825 2355
AP06054	Investigations on the survival of Erwinia amylovora in mature apple fruit calyces	Apple & Pear Australia Limited	Dr Maria Lopez Gonzalez - 03 9329 3511
AP06055	Guidelines for irrigation management	RMCG	Dr Anne-Maree Boland - 1300 306 043
AP06069	AP - Intensive Apple Orchard Production Systems - Comparison and economic assessment under Australian Conditions - Stage	South Australia Research & Development Institute (SARDI)	Mr Paul James - 08 8389 8805
AP06900	Partnership/Industry Consultation 2006/07	Apple & Pear Australia Limited	Mr Tony Russell - 03 9329 3511
AP06910	Partnership/Industry Consultation 2006/07	Apple & Pear Australia Limited	Mr Tony Russell - 03 9329 3511
FR04024	Residue risk analysis and development of risk management options for major export markets for certain fruits and vegetables	AKC Consulting Pty Ltd	Mr Kevin Bodnaruk - 02 9688 0444
FR04025	Integrated management of Bacterial Diseases in Pome Fruits	VIC Department of Primary Industries	Dr Chin Gouk - 03 5833 5227
HG03070	Development and implementation of industry biosecurity plans	Plant Health Australia	Mr Rodney Turner - 02 6260 4322
HG06040	Optimal irradiation procedures for sterilization of Queensland fruit flies	Macquarie University	Dr Phillip Taylor - 02 9850 9463
MT05001	Extension to project HG05031 - Revision of Australian Standards AS1418.10 and AS2550.10 as applied to Elevating Work Pla	Keith Batten & Associates	Mr Keith Batten - 02 8295 2300
MT06001	Further development of integrated pest management strategies to control thrips in pome and stonefruit in WA and Qld	Department of Agriculture & Food Western Australia	Dr Sonya Broughton - 08 9368 3271
MT06020	Improving Market Access R&D for the Australian Horticultural Industries	NA	Mr Kim James - 02 8295 2300
MT06025	Developing female lures for improved market access	CRC For National Plant Biosecurity	Mr Andrew Jessup - 02 4348 19
MT06027	Woolworths Scan Data Project	Horticulture Australia Limited	Ms Trudy Gosney - 02 8295 2300
MT06032	Enhanced Biosecurity risk analysis tools	CRC For National Plant Biosecurity	Dr David Cook - 02 6246 4093
MT06046	PHA - National Fruit Fly Coordinator	Plant Health Australia	Ms Alma Reynolds - 03 5825 2355

# Across Industry Program 06-07

Project Code	Title	Start Project	Project Completion	Service Provider	Research/Contact
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## Outcome 1:

Enhance the efficiency, transparency, responsiveness and integrity of the supply chain for the total industry to provide clear market signals

AH04006	Horticulture gene technology communication	2004/05	2006/07	Agrifood Awareness Australia Limited	Paula Fitzgerald - 02 6273 9535
AH04007	Pesticide regulation coordinator	2004/05	2009/10	AKC Consulting Pty Ltd	Kevin Bodnaruk - 02 9688 0444
AH04009	Coordination of minor use permits for horticulture	2004/05	2007/08	AgAware Consulting Pty Ltd	Peter Dal Santo - 03 5439 5916
AH04035	Minor use coordination HAL management costs	2004/05	2009/10	Horticulture Australia Limited	Brad Wells - 02 8295 2300
AH05018	Review of successful consumer satisfaction projects	2005/06	2006/07	Horticulture Australia Limited	Sarah Pennell - 02 8295 2300
AH06004	Horticulture Code of Conduct - industry support package	2006/07	2006/07	Horticulture Australia Council	Kris Newton - 02 6273 9600
AH06007	Primary production and processing standards	2006/07	2007/08	Horticulture Australia Limited	Richard Bennett - 03 5825 3753
AH06012	Evaluation strategies for varieties derived from Australian breeding projects or imported varieties	2006/07	2006/07	Horticulture Australia Limited	Marian Sheehan - 02 8295 2300
AH06013	Horticulture for the consumer CRC - business plan	2006/07	2006/07	Australian Institute for Commercialisation Ltd	John Kapeleris - 1300 364 739

## Outcome 2:

Maximise the health benefits of horticultural products in the eyes of consumers, influencers and government

AH06008	Human nutrition needs for horticultural industries allocation	2006/07	2006/07	Horticulture Australia Limited	Sarah Pennell - 02 8295 2300
AH06010	Promoting the health advantages of F&V to increase their consumption - Phase 2	2006/07	2006/07	Horticulture Australia Limited	Chris Rowley - 02 8901 0329

## Outcome 3:

Position horticulture to compete in a globalised environment

AH05003	Coordination of market access for horticulture products	2005/06	2006/07	Stephen Winter & Associates Pty Ltd	Stephen Winter - 03 9832 0787
AH05024	Fruit fly workshop	2005/06	2006/07	Horticulture Australia Limited	Brad Wells - 02 8295 2300
AH05034	Market access support program	2005/06	2006/07	Horticulture Australia Limited	Kim James - 08 6389 1407
AH06006	Establishment of a pesticide residue task force	2006/07	2006/07	Horticulture Australia Limited	Brad Wells - 02 8295 2300
AH06014	Codex attendance 06/07	2006/07	2006/07	Horticulture Australia Limited	Richard Bennett - 03 5825 3753

## Outcome 4:

Achieve long-term viability and sustainability for Australian horticulture

AH06003	Horticulture for Tomorrow - Phase II	2006/07	2006/07	Horticulture Australia Limited	Alison Turnbull - 02 8295 2300
AH06002	IMC Horticulture industry strategic plan contribution	2006/07	2006/07	Horticulture Australia Limited	John Webster - 02 8295 2300
AH06009	Horticulture Water Initiative Phase 3	2006/07	2006/07	RMCG	Anne-Maree Boland - 1300 306 043
AH06011	Industry development review	2006/07	2006/07	Richard de Vos	Richard de Vos - 02 9973 4507
AH06015	Cooperative venture for capacity building (CVCB) membership fees	2006/07	2007/08	Horticulture Australia Limited	Richard Stephens - 02 8295 2300
AH06016	Human capability - building strategy benchmarking horticulture's labour and skills needs	2006/07	2006/07	Horticulture Australia Council	Kris Newton - 02 6273 9600
AH06019	Australian horticulture's response to climate change and climate variability	2006/07	2006/07	Horticulture Australia Limited	Alison Turnbull - 02 8295 2300
AH06100	Horticulture data audit	2006/07	2006/07	AEC Group Limited	Ashley Page - 07 3831 0577
AH06101	Horticulture data audit associated costs	2006/07	2006/07	Horticulture Australia Limited	Andrew Collins - 02 8295 2300
AUSHORT					
AH01015	Key genes for horticultural markets	2001/02	2006/07	CSIRO Plant Industry	Steve Swain - 03 5051 3159
AH03002	Area wide management of fruit fly - Central Burnett	2003/04	2006/07	QLD Department of Primary Industries & Fisheries	Annicc Lloyd - 07 3896 9366

