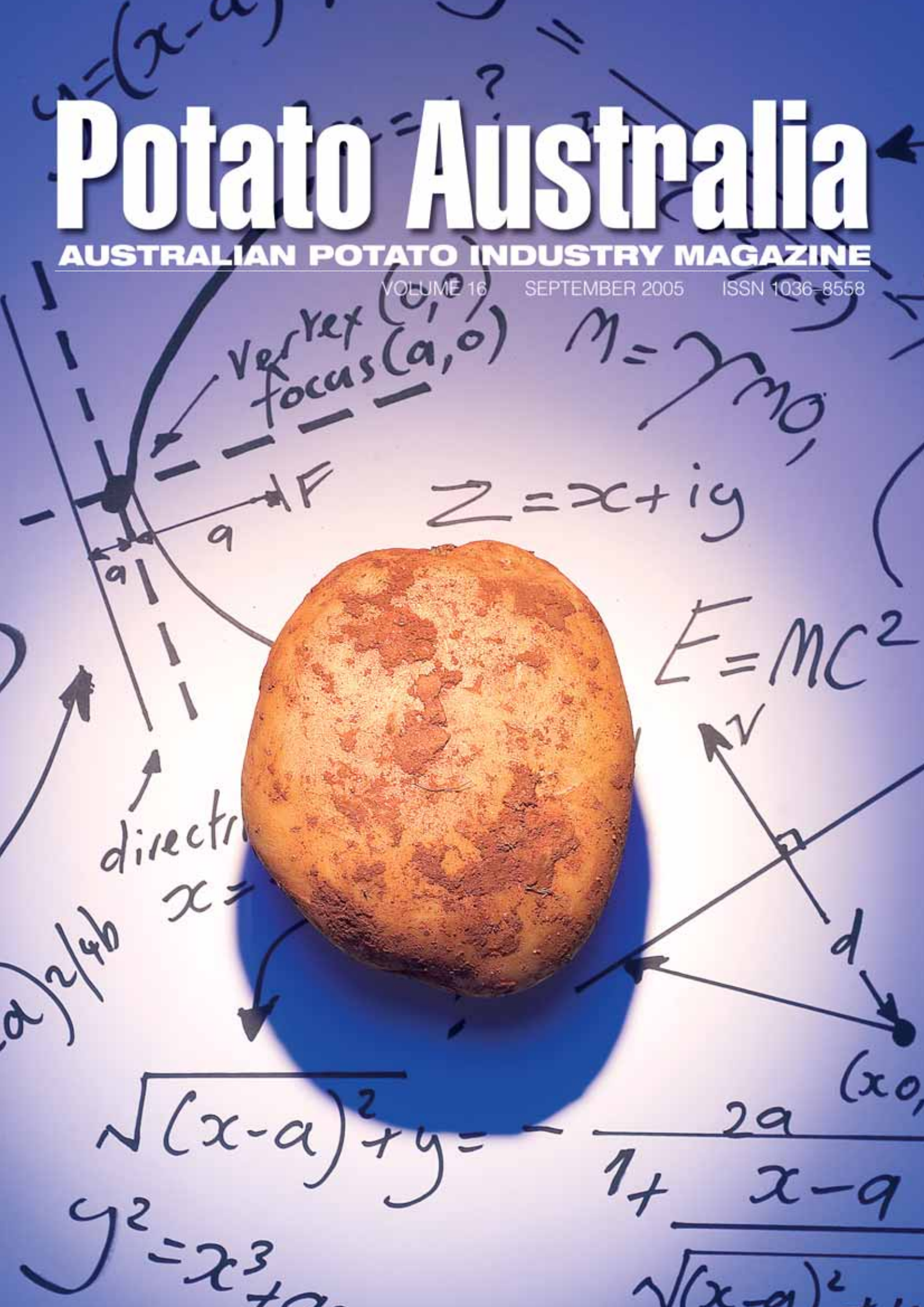
# Potato Australia

## AUSTRALIAN POTATO INDUSTRY MAGAZINE

VOLUME 16 SEPTEMBER 2005 ISSN 1036-8558



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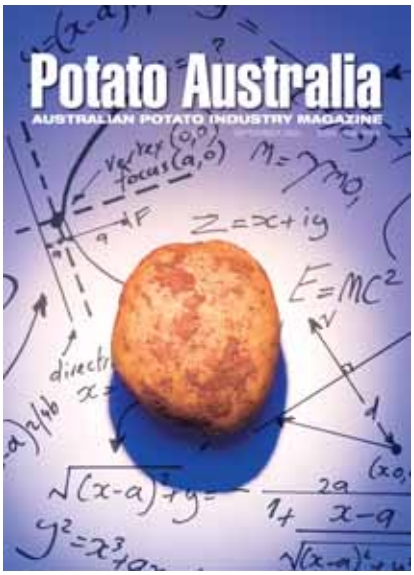


*Our cover photo aims to illustrate the complex nature of this well known staple food. While it can be viewed as a raw, fresh, tantalising potato, it can also be made by technology into a multiple array of processed high-value nutritious goods. The shot was styled and photographed by Janusz Molinski. Thanks to Kensington Fruit Supply for the potato that starred in the shot.*

*Cathy Sage, Editor*

# Contents

# Potato Australia

PPAA Potato Processing Association Australia

AUSVEG

**Potato Australia is produced by SageWords on behalf of AUSVEG and the Potato Processors' Association of Australia**



HAL

*Know-how for Horticulture™*

The Australian Government proudly supports research and development by matching the industry levy and Voluntary Contributions.

As from this edition Potato Australia will be distributed to New Zealand growers and their research reported in the magazine. This decision was made by representatives of AUSVEG, Potato Processors Association of Australia and Potato Merchant Association through the former Australian Potato Industry Council at their March meeting in 2004. Due to unforeseen circumstances last year the change was delayed till 2005.

# Veggie industry in crisis

**Tasmania's processed vegetable industry has suffered major setbacks with the loss of grower contracts and increasing pressure from processors to reduce the price they receive for their vegetables.**

As supermarket chains and fast food outlets continue to put downward pressure on prices to win market share, processors are being forced to seek ways to reduce costs and this in turn puts downward pressure on the amount paid to growers for their produce.

Growers are used to the never ending downward pressure on prices and have improved their efficiency considerably over the years. In recent times though there has been a greater willingness by retailers to source products from overseas which has put considerable pressure on both local primary (growers) and secondary (processors) industries.

We are now seeing the situation where produce and products are being increasingly sourced from overseas. So where does that leave Australian growers? Do we want an Australian industry in the future?

Tasmanian farmers have decided to stand up and let the rest of Australia know what is going on. With 80% of the processing vegetable industry based in Tasmania, it has a lot to loose. Any large downturn would have a major impact on local communities and the Tasmanian economy.

This is not only a Tasmanian problem though. It is also happening elsewhere in Australia!

## What can be done

Improving efficiency is a given and our industries invest heavily in R&D to assist in the cause. That alone though is not enough.

Consumers also need to know what is going on so they can make informed choices. This can be done through the media but they also need to be reminded when they do their shopping through clearer labelling of produce.

## The rally

The Fair Dinkum Food Campaign coordinated by Tasmanian grower, Richard Bovill, has been set up to make consumers more aware of the industry crisis and the subsequent damage it will have on rural communities.

A farmer's rally at Devonport, Tasmania in late June was attended by more than two thousand farmers, producers, politicians and general public.

It launched the Tasmanian Farmers and Graziers Association (TFGA) Fighting Fund. The money collected helped finance the Mainland Tractor Rally which left Tasmania in mid July and joined rallies in Melbourne, Shepparton, Mildura, Griffith, Bathurst and Sydney, officially ending in Canberra on 9th August.

The rally drew media and public attention to the impact that the buying habits of larger retailers have on rural families, and how these practices are being assisted by inadequate labelling laws for packaged food.

If you would like to contribute to the ongoing campaign to support the Fair Dinkum Food Campaign, donations can be deposited at any Westpac Branch or Westpac instore agency to "TFGA Vegetable Fighting Fund BSB 037608 Account 328118 or send to TFGA, P O Box 193, Launceston 7250.


# AUSVEGIE campaign fights for new vision for the vegetable industry

**As the Fair Dinkum Food tractor rally rolled from Tasmania to Canberra over the past two months, the lobbying arm of the campaign run by AUSVEG has been working behind the scenes towards a new vision for the industry.**

Canberra was an important milestone. The AUSVEG Board handed a plan of attack for the future sustainability of the industry to the Federal Minister of Agriculture, Peter McGauran. This plan - pathway to a new vision - detailed background work on key issues effecting the industry such as country of origin labelling, imported food inspection guidelines and the horticulture business code. Proposed actions on these issues will accumulate into a new vision for the industry which will be announced next year at the Australian Vegetable Industry Conference in Brisbane from 10-12 May.

In late June, a successful industry crisis summit was held in Melbourne. Here industry leaders, union representatives, government officials and economists discussed the industry's future and looked at solutions to assist the industry going forward. This summit generated enormous media interest.

The AUSVEGIE Fighting Fund was established and these funds are being used to inform consumers about the benefits of Australian products over imports and convince the Australian government to get serious about accurate labelling, quality assurance and residue testing.

Australian consumer support for Aussie vegetables has been overwhelming. Their support has made a very real difference to the future viability of the industry because it has raised the awareness of our plight, gaining strong support from Government.

The focus for the industry beyond May 2006 is implementation of the new vision. It will involve a whole of industry and whole of government commitment to dealing with the industry's key issues. It will involve significant resourcing and will include managing a structural adjustment in the sector.

The nine key claims the AUSVEGIE campaign is making are:

**CLAIM 1:** AUSVEG is calling on all Australian Governments to implement Mandatory Country of Origin Labeling (COOL) on or associated with all fresh produce.

**CLAIM 2:** AUSVEG is calling on all Australian Governments to implement Mandatory Country of Origin Labeling (COOL) on packaged food including frozen product.

**CLAIM 3:** AUSVEG is calling on all Australian Governments to support removal of the terms "local and imported ingredients" on packaged goods where their use is potentially misleading to consumers, and replacing this with clear COOL.

**CLAIM 4:** AUSVEG is calling on all Australian Governments to support increased prominence of the COOL so that it appears on the front of the pack and clearly stands out from other information.

**CLAIM 5:** AUSVEG is calling on the Australian Government to commission an independent review of the statistical basis for classifying fresh and frozen vegetables as low risk foods.

**CLAIM 6:** AUSVEG is calling on the Australian Government to immediately start microbial testing of imported fresh, frozen and packaged produce.

**CLAIM 7:** AUSVEG calls on the Australian Government to introduce a Mandatory Horticulture Code of Conduct as per the Horticulture Australia Council (HAC) model as soon as practicable.

**CLAIM 8:** AUSVEG calls on the Australian and state governments to immediately repeal the Security Sensitive Ammonium Nitrate regulations or provide a compensatory grants scheme for those sectors affected. The National Farmers Federation submitted such a Compensatory Grants Scheme to the Australian Government in early 2005.

**CLAIM 9:** AUSVEG calls on the Australian Government to immediately implement an Australian Standard that would apply to imported produce that

Continued page 8

## $3 million boost to vegetable industry

$3 million was pledged by the Australian Government at the final destination of the tractor rally held in front of parliament house - Canberra.

This funding will be used to help the industry take the next steps to a new vision and implement strategies to improve economic sustainability.

The specific use of this money will become clearer once the outcomes of the Industry Partnerships project are known. However, the broad areas that will be vital to support the industry into the future are:

1. Creating sustainable businesses- for example a customised training package for producers to improve self reliance.
2. Positioning of the vegetable industry- addressing issues such as leadership, youth development, risk management and market development.
3. Strengthening vegetable industry relationships- by building stronger, more resilient supply chains through stronger alliances.
4. Accelerating priority research and development activities- by provision of additional resources focussing on achieving world's best practice.

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## AUSVEGIE campaign fights for new vision for the vegetable industry (continued)

reflects the standards imposed on domestic producers in the areas of:

- Food safety
- Food quality
- Environment
- Human rights and exploitation of labor
- Occupational health and safety.

For detailed information on the projects the industry is embracing as part of the AUSVEGIE campaign, please see material on www.ausveg.com.au.

***EUAN LAIRD***
***AUSVEG, CEO***
***(03) 9544 8098***
***euan.laird@ausveg.com.au***

## Vegetable Industry Partnership

**A joint venture project between the Australian vegetable industry and the Australian Government is evaluating the issues threatening the long term viability of the vegetable industry. The project aims to develop practical strategies and actions to improve the industry's performance and economic sustainability.**

The project has two key stages - Taking Stock and Setting Directions - and will include the full range of businesses involved in meeting consumer demand for Australian vegetables (including potatoes) and vegetable products for domestic and overseas markets. Started in June 2005, the work will be completed by November and will set out a pathway for the industry to meet its goals.

### Taking Stock

The Taking Stock component will analyse the industry's performance and situation focusing on:

- domestic and export markets and consumer trends
- the supply chain from production, packing and storage, transport, processing, wholesaling and retailing
- key aspects of service provision to the industry that impacts on its performance including the role of farm suppliers, agribusiness, financial institutions, technical advisors, training and education providers, Research and Development bodies and industry policy organisations
- the role of the industry in regional economies and communities.

### Setting Directions

Outcomes from the Taking Stock work will be used to help develop strategies and actions for the industry's future. It will provide information on potential opportunities and their likely benefits. It will also identify impacts of current and emerging threats. The project will help industry to set priorities which address identified issues (opportunities and threats) to improve it's profitability, competitiveness and sustainability.

Practical strategies will be developed for key issues and integrated with existing research and development initiatives. The strategies will guide how the vegetable industry, its supply chain and government could work together to improve the industry's:

- ability to continuously yield positive financial returns
- capacity to operate in future environmental and social settings
- ability to compete in the global marketplace
- capability to respond to change and be flexible
- confidence to manage it's affairs.

### Industry and Government participation

AUSVEG, HAL and the Australian Government Department of Agriculture, Fisheries and Forestry have formed a group to guide the project. A team of consultants have been engaged through Kiri-ganai Research Pty Ltd to help industry and Government participation.

The project will consult extensively with the industry and government through visits, face to face discussions and workshops. This consultation will be used to capture the knowledge and experience of vegetable industry organisations, farm businesses, representatives from across the supply chain including production, transport and distribution, processing and packaging, wholesaling, retailing and services. Natural resource management, regional development and public sector perspectives will also be considered.

### Further Information

For information regarding the Industry and Government Partnership project please contact me or Vicki Manson, Manager, Industry Partnerships Program, Australian Government – Dept of Agriculture, Fisheries and Forestry, Ph 02 6272 4547, Email: vicki.manson@daff.gov.au

If you want to participate in the project or find out more information on activities that will be undertaken please contact Kiri-ganai Research: Richard Price, Phone (02) 6295 6300, Mob 0409 624 297, Email richard.price@kiri-ganai.com.au

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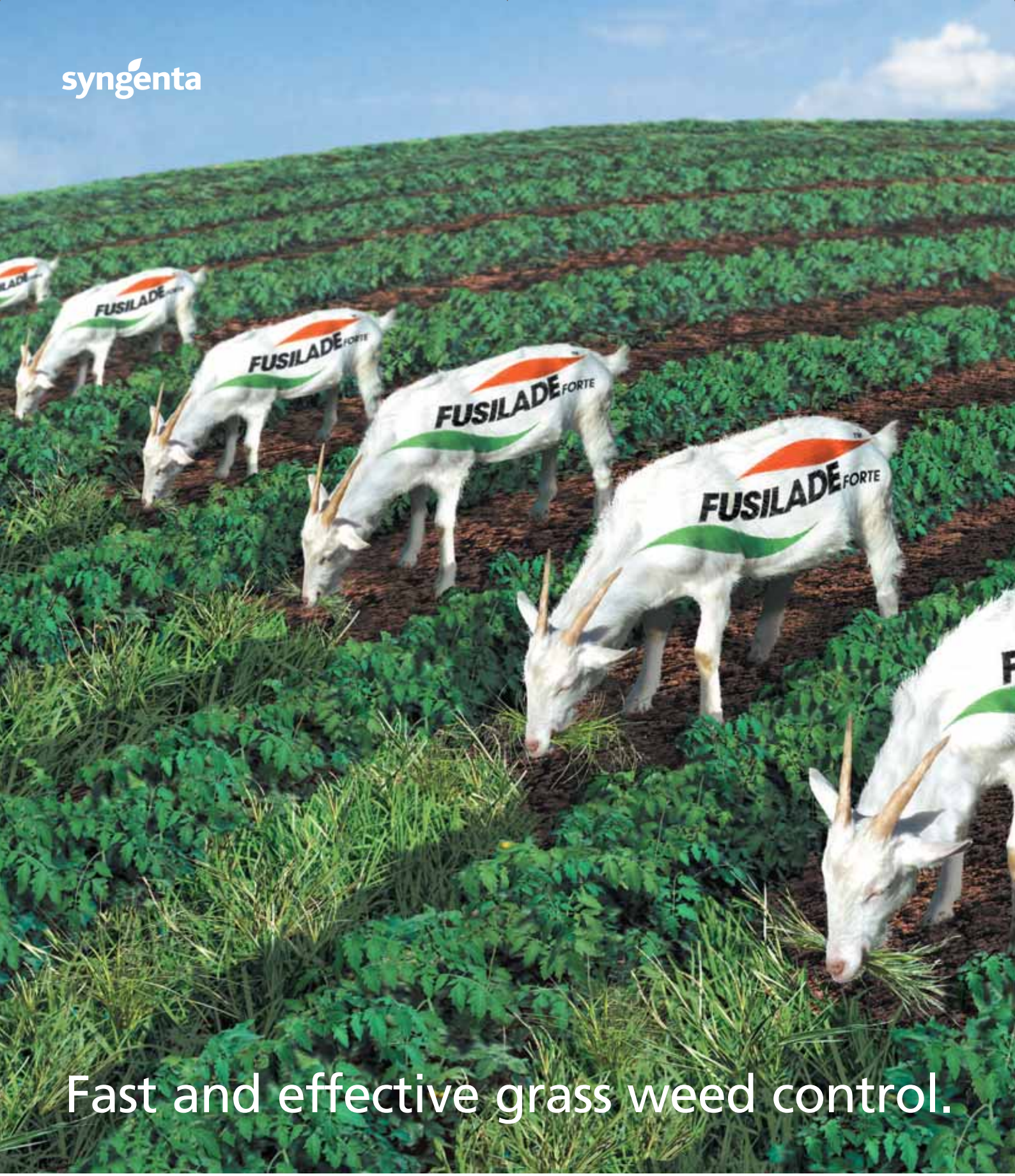


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# Potato Industry report

## Industry representative council restructure

**As previously reported in the June 2005 Eyes on Potatoes, it was decided at a special meeting of Australia Potato Industry Council (APIC) members in February to wind up APIC. I would like to take this opportunity on behalf of HAL to thank those people who served as representatives on the council over the organisation's life time.**

As a result of the wind up, the interests of levy payers in relation to HAL and the potato R&D levy program are now represented by AUSVEG and the Potato Processors Association of Australia (PPAA). I welcome PPAA as a new member of HAL and look forward to working with the association to address the R&D and communication requirements of the processed potato industry.

## Potato Fresh Industry Advisory Committee (PFIAC) – market development focus

The PFIAC focus is still on market development. To this end, a project in 2004-05 investigated the necessary steps to developing a marketing strategy for the potato industry (PT04011 – Developing a Marketing Strategy for the Australia Potato Industry). Comprehensive consumer market research has been completed and the results will be presented by Market Equity at September's national conference. Work continues in this area in 2005-06 with a Value Chain Analysis. Findings from this report will be presented at the September 2005 PFIAC meeting.

## Biosecurity – late blight A2

Biosecurity continues as a significant area of concern for Australian agriculture. The past year has seen lettuce aphid make its way from Tasmania to the mainland and upheaval in the citrus industry in Emerald Queensland as a result of repeated outbreaks of citrus canker.

The draft Potato Industry Biosecurity Plan released in June 2005 identified the A2 strain of late blight as the greatest threat to the industry here. A threat assessment is looking at the probability of the pest entering Australia, its likely financial cost and how difficult it would be to control and/or eradicate.

HAL in partnership with the potato industry and the Department of Primary Industries, Victoria, started a project in 2004-05 (PT04010 – Late Blight Management) that will produce a risk assessment for the A2 strain and develop an incursion management plan for quick response by industry if the disease is found. This work is due to be finished by May 2006.

## Global germplasm and genetics investigation

Staying competitive in an increasingly globalised market is vital to the long term economic and environmental sustainability of the Australian potato industry. To this end, HAL and the Australian potato industry are exploring opportunities for ensuring potato growers have access to the world's best potato germplasm and genetics. Diversity Arrays Technology have been contracted to undertake the project (PT05020). The group will make early recommendations to industry representatives in December 2005, with a final report due in March 2006.

## Processing Potato five year R&D plan

Despite some funding challenges, the Processing Potato Research and Development five year program was successfully contracted with Tasmanian Institute of Agricultural Research (TIAR) in 2004-05. The program puts in place firm foundations for ongoing world class research into potato soil borne disease.

Leaders of the five sub programs are due to report to the PPIAC at their next meeting in September 2005. HAL are working with TIAR to facilitate the first of three independent reviews of the program during the first half of the 2005/06 financial year.

## Industry Communication

HAL and the potato industry will be undertaking a review of the industries communication tools, resources, publications and practices. Findings of the review will be presented to the Processing Potato Industry Advisory Committee (PPIAC) and PFIAC at their September 2005 meetings. The findings of the review will assist the IAC and HAL to make communication investment decisions beyond the 2005-06 financial year.

## Thanks

I would like to take this opportunity to thank those involved in the PPIAC, PFIAC and AUSVEG Potato Group for their assistance in the past year. Special thanks to Euan Laird (AUSVEG Chief Executive), Paul Frost (PPAA President) and John Gallagher (IAC Chairman) for their time, energy, enthusiasm and work behind the scenes.

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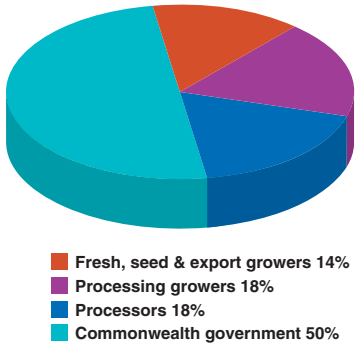
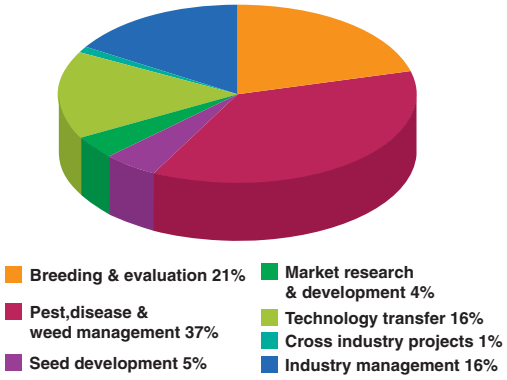
### Source of funds for projects in 2005/2006




### How the levy money was spent in 2004/2005




## Financial Report (Unaudited)

**Potato Investment Summary**
Year End 30 June 2005

| | R&D 2004/2005 |
|---|---|
| Funds Available 1 July 2004 | $1,490,462 |
| **INCOME** | |
| Levies Received | $1,138,125 |
| Commonwealth Contributions | $1,187,511 |
| Other Income | $89,463 |
| **Total Income** | **$2,415,100** |
| **Budget** | **$2,070,186** |
| ***Variance to Budget*** | ***$344,914*** |
| **PROGRAM INVESTMENT** | |
| Levy Programs | $2,168,112 |
| Service Delivery Programs by HAL | $206,911 |
| Cross Industry Program Contribution | $27,592 |
| Levy Collection Costs | $53,085 |
| **Total Investment** | **$2,455,700** |
| **Budget** | **$2,240,665** |
| ***Variance to Budget*** | ***$215,035*** |
| Annual Surplus/Deficit | -$40,600 |
| **Funds available 30 June 2005** | **$1,449,862** |

# Late Breaking News

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## Changes ahead for the potato genetic improvement program

### The HAL investment in the national breeding program is to be phased out.

The national potato breeding program has been conducted by the Department of Primary Industries Victoria (DPIV) since 1991. The investment to date of industry and the Australian Government through HAL has been $2.19 million, with a further $2.25 million invested in evaluation.

The HAL board has taken a decision to support a phasing out of the current breeding investment. This was based on a recent independent review of the current program and consideration of the outcomes of stakeholders (AUSVEG growers, processors, DPIV and HAL) at a meeting held in February 2005.

It was agreed at the stakeholders meeting that a scoping study should be carried out in 2005-06 to identify new opportunities for potato genetic improvement. This would include options to access leading edge science in Australian and overseas programs. This project is contracted and a preliminary report is due to industry in December 2005 with a final report in March 2006.

Following recent discussions by HAL and DPIV, it was decided there will be no crossing in the breeding program in 2005-06. However, G1 G2 and G3 lines will be progressed through evaluation.

The activities in 2006-07 and beyond, including the role of DPIV, will be decided on completion of the scoping study (March 2006).

HAL and the processing industry have already developed a comprehensive program for potato disease resistance (processing potato program). This program began in 2004 and has input from Australian and world-class overseas research.

The proposed reorganisation of the current breeding investment will allow for a similar approach for genetic improvement and possible integration with the existing processing potato program.

HAL and DPIV will continue discussions over coming months to agree on a way forward. The focus is to provide improved return on investment for the longer-term benefit of all stakeholders.

For more information please contact biotechnology portfolio manager Marian Sheenan on Ph: (02) 8295 2300.

# The Power of Potatoes: phytochemical jewel box

**Dr Carolyn Lister, Crop and Food Research New Zealand, reminds us that potatoes are not simply 'carbs' but a nutritious food.**

Phytochemicals are chemicals produced by plants that may have health related benefits. The potato has been described as a phytochemical jewel box, yet research shows consumers have a poor understanding of nutritional content of the potato. In a US study, only 6% knew potatoes were an excellent source of vitamin C, while 34% knew potatoes with skin on are a good source of potassium. Only 4.2% of shoppers knew both these facts. Dieters and non-dieters believed, wrongly, that potatoes were nothing but carbs.

In fact, an average potato only has around 10% of the recommended daily intake of carbohydrates and carbohydrates are an important source of energy. Potatoes are great:

**Vitamin C:** they provide a significant contribution to Vitamin C intake – in New Zealand that's about 30% of the requirement.

**B group vitamins:** they are a valuable source of B group vitamins, particularly B6, thiamine and niacin.

**Antioxidants:** Potatoes contain Vitamin C and phenolics compounds – both strong antioxidants offering protection against some diseases.

**Minerals:** Potatoes are rich in minerals, particularly potassium, and low in sodium. They provide a desirable balance for a healthy diet. Other important minerals include iron and magnesium.

**Protein:** they are a source of high quality protein.

## Are all fried foods bad for you?

Chips, like many other fast foods, are cited as being part of the problem contributing to the current worldwide obesity epidemic. Maybe we should ask – "What are the relative nutritional advantages and disadvantages of consuming fried foods?" – especially with health educators urging us to limit the consumption of fat and fatty foods. Frying generally has little or no impact on the protein or mineral content of food and in the case of potatoes, dietary fibre content is increased after frying due to the formation of resistant starch.

The high temperature and short transit time of the frying process cause less loss of heat-mobile vitamins than other types of cooking. Water-soluble vitamins, lost during boiling through leaching into the cooking water, are retained. For example, vitamin C concentrations of French fried potatoes can sometimes be as high as for raw potatoes, and thiamine is well retained in fried potatoes products.

Although some unsaturated fatty acids and antioxidant vitamins are lost due to oxidation, fried foods can be a good source of vitamin E depending on the type of oil they are cooked in. (Only some NZ fries offer this benefit).

It is true that some fat is inevitably taken by the food being fried, contributing to and increased energy density. However, this also results in highly palatable foods with a high nutritional content. It has been concluded that fried foods certainly have a place in our diets in moderation. Attempts to reduce the oil content of potatoes while retaining the other benefits of frying may be desirable and it is preferable to choose oil with a good vitamin E content.

## Potatoes are not fattening

Carbohydrates are an important nutritional component and provide a preferred source of energy for the body. Potatoes will help fill you up as they have a high satiety value, which means you will feel satisfied between meals. The energy density of potatoes is low and it is able to displace fatty materials from the diet, thus reducing energy intake without a feeling of emptiness. Rather than reduce nutrient-packed foods like potatoes, look for ways to swap nutrient-poor fatty and sugary snacks.

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# Portland growers get PCN protection

**From the first of October 2005, Portland potato growers will operate in a declared Plant Protection District, with legislative controls introduced to reduce the risk of potato cyst nematode (PCN) threatening Portland's ware and certified seed potato industry.**

The controls were requested by the Portland growers to protect their industry, customers and suppliers against the threat of PCN. They will ensure the pest does not enter the district and will set an industry standard for maintaining pest freedom.

Under the order governing the Portland Protection District, movement of seed potatoes and equipment will be regulated by the Victorian Department of Primary Industries' (DPI) Plant Standards Branch.

The conditions which will apply under the order are:

1. Prior to entry into the District, all potatoes to be used as seed in the District will require PCN testing and a Plant Health Certificate issued by a DPI inspector, if not part of a State-recognised certification scheme.
2. Prior to entry into the District, used machinery associated with the cultivation of potato crops in other districts will require a Plant Health Certificate issued by a DPI inspector.
3. Prior to entry into the District, all used bins, bulk bags and bulk handlers will require a Plant Health Declaration issued by the owner.

or

If a business has farmed within 10km of a PCN detection, a Plant Health Certificate issued by a DPI inspector will need to accompany all used bins, bulk bags and bulk handlers moving into the District.

The Portland district is remote from PCN-affected areas and has been testing for PCN since 1991 to allow access to South Australian markets. About 3000 tonnes of certified seed is grown in the district each year.

PCN was first detected in Victoria in 1991 and caused great anxiety throughout the potato industry when it was found at Koo Wee Rup in December 2003.

The Koo Wee Rup detection suspended access for 40,000 tonnes of Koo Wee Rup potatoes to interstate markets.

Through joint industry and DPI efforts, access was later granted under strict regulations which have proven to effectively control PCN and have secured the livelihoods of 30 potato-growing families in the Koo Wee Rup district.

Potato growers at Colac and Warragul have applied for similar Protection District status.

***GARY DARCY***
***Victorian Department of Primary Industries***
***☎ (03) 9210 9392 or 0409 457 499***
***e gary.darcy@dpi.vic.gov.au***


***Portland Plant Protection District boundaries.***

# Potato Processors Association of Australia

## Report

**The process of industry change that started in 2002 continued this year with the dissolution of the Australian Potato Industry Council (APIC). This was probably the final stage in a progression of events that has seen the two main sectors of the potato industry – fresh and processing - establish their own identity and directions.**

### New structure

APIC was originally established to simplify the setting up of the industry's statutory R&D levy. It provided cross industry representation and support for the levy, which was a necessary prerequisite on the part of the Australian government. Over time, the role of APIC has diminished as the research and development needs of fresh and processing sectors became less compatible and the role of merchants in the supply chain weakened. The process to dissolve APIC and establish a representative structure that more accurately reflected the industry's current structure was initiated by AUSVEG in November last year. On reflection of the justification for change, the PPAA agreed that the dissolution of APIC was a logical progression that would see the needs of both fresh and processing sectors more clearly defined.

AUSVEG and the PPAA will now share peak industry representation for the processing industry. This change has enabled the PPAA to join AUSVEG as a member of HAL, the member owned company charged with administering and managing the industry's R&D program. In a practical sense, the change requires agreement between AUSVEG and the PPAA on issues relating to planning and managing the processing industry's R&D program. Both parties are looking forward to a long and fruitful relationship focused on meeting this responsibility.

The PPAA would like to thank all those who have served as APIC councillors for their management of the industry's R&D program over the years and the many good projects that have been commissioned during its time as our peak representative body.

### International R&D contracts

Season 2004-05 saw the completion of the first year of the processing potato industries five-year R&D plan. The work schedules as outlined in the plan have been completed satisfactorily and we now have the foundation of research upon which significant inroads can be made in the area of prediction and control of ubiquitous soil borne diseases. There were significant delays in the signing of contracts between the Tasmanian Institute of Agricultural Research (TIAR) who have been charged with managing the R&D Plan and HAL as a result of Agriculture and Agri-Food Canada not being able to meet HAL's voluntary contribution funding criteria. This problem was eventually resolved but not without significant time delays and restructuring of program funding arrangements. It is hoped lessons have been learnt from this experience, especially as we look to increase collaborative research links with other overseas research organisations in the next two years of the plan.

The plan includes a staggered start-up of sub-programs to accommodate funding shortfalls in the early years. In year two, work will start on sub-programs to deliver more immediate solutions to the problem of inherit soil borne diseases and provide a greater level of industry interaction between researchers and growers. This will be an important time and important process to raise recognition and understanding of the benefits that flow from the R&D levy. The level to which interested parties get involved at this time will be critical to the overall success of the plan. I encourage all growers to join in working with the PPAA and our contracted researchers to meet this challenge.

### Accessing new varieties

Aside from the processing R&D plan, HAL has commissioned a project to identify and recommend the best approach the Australian potato industry can take to accessing the world's best germplasm and genetics. The review will be conducted in two phases, with the stage 1 report due in December. The review, along with outcomes from the planned debate on this issue at the upcoming National Conference, will establish a long term plan for the industry in terms of access to new varieties, putting to rest the insecurity and problems that have dogged the existing program for a number of years.

### Reviews

There will also be a review of the industry's communication plan this year, which will identify new and existing needs and develop delivery strategies. The processing industry will start updating its strategic plan, a process it aims to complete by the end of 2005-06. This will be a timely update, coinciding with the first review of the five-year R&D plan and coming at a time when the industry is experiencing increased competition from overseas suppliers.

The PPAA would like to thank Simon Drum, our HAL Industry Services Manager, who has worked diligently to keep our existing portfolio of projects on track while creating the structure and planning framework required to identify, define and address the future R&D needs of the processing sector. The PPAA looks forward to contributing positively to this ongoing process in the coming year.

***PAUL FROST***
***President / Chairman***
***Potato Processors Association of Australia***
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***pfrost@cbi.net.au***

## Latest R&D Reports

The following is a list of HAL Final Reports released in the past three months.

| | |
|---|---|
| Improving virus control in seed schemes by combining aphid monitoring and virus testing | PT03061 |
| Monitoring and developing management strategies for soil insect pests of potatoes | PT01008 |
| Prediction and molecular detection of soil borne pathogens of potato | PT01019 |
| Seed Potato Certification Workshop 2004 | PT04013 |
| The Workboot Series – The story of potatoes in Australia | PT02007 |

The reports are available in hard copy form only and cost $22.00 in Australia or $US30 outside Australia including GST and postage. Summaries of the projects and an order form can be found on HAL's internet site at – www.horticulture.com.au. Select **Project results** then **Potato** and use the search engine to find the reports of interest.

For those people not connected to the internet call Horticulture Australia on (02) 8295 2300.

## New Agriculture Minister appointed

**Senator Peter McGauran has been appointed new Federal Minister for Agriculture, Fisheries and Forestry.**

Mr McGauran had replaced Warren Truss who is now Federal Transport Minister in a reshuffle of Cabinet portfolios following the resignation of National Party Leader John Anderson in July this year.

## Sixth World Potato Congress, Idaho, USA, 2006


The Sixth World Potato Congress will be held from 22-26 August 2006, in Boise, Idaho, USA and will include pre-conference tours from 10 August.

A three-day international equipment exhibition and demonstration farm show will follow the main congress sessions to be held on 22-24 August.

Plenary sessions include a global potato industry market analysis, environmental snapshot, potato processing industry report, the industry situation in developing countries, crop protection outlook and a farm equipment industry outlook.

Focused topics on the following day will cover potato marketing cooperatives, worldwide pest problems, biotechnology, food safety/HACCP, storage technology, human nutrition, soil health, disease forecasting, women in the industry, high tech innovations and seed potato issues.

The third day will involve presentations of stem count/tuber set management, new varieties and water management.

The committee welcomes suggestions for topics and potential speakers. Those interested should contact conference organiser Monty Cox on email: mcox@potatofoundation.com

More information about the congress can be found on their internet site at - www.potatocongress.org

*John Rich, a member of the World Potato Congress Advisory Committee, invites prospective World Potato Congress attendees to contact him regarding a pre-congress study tour being planned by AgTour Australia to travel through Oregon, Washington and Idaho. In response to requests, AgTour Australia also plans to include a seven night cruise option to Alaska before the USA Tour component begins on 10 August.*

*John can be contacted by email on john.rich@agtour.com.au The AgTour Australia Office can be contacted on 1300 301 128.*

## Recent research on potatoes in New Zealand

**It has been a busy year for potato research in New Zealand. The following list provides an overview of the some of the work being undertaken.**

- Transfer of soft rot resistance from Solanum brevidens to potatoes. This work is developing breeding lines from cell hybrids of potato and Solanum brevidens with resistance to soft-rot (and potentially other pests, diseases and environmental stresses) by determining the chromosome match in progeny lines, and assessing their tuber production and resistance to soft rot.
- Marker assisted selection for resistance to powdery scab. The project is working towards a diagnostic tool that can be used for marker assisted selection (MAS) for resistance to powdery scab (Spongospora subterranea f.sp. subterranea) in potato. This is achieved by studying the genetics of powdery scab resistance in potato populations, choosing for resistance then identifying molecular markers in these populations that can be used to select resistance to powdery scab. This will make development of resistant potato cultivars quicker and more efficient.
- Working with industry partners to import genetic material. Currently, potato material cannot be imported because there is no Level 3 quarantine facility. An industry solution is being sought.
- Information sheets have been produced for growers on rhizoctonia, sclerotinia and control of volunteer potatoes.
- Risk assessment of genetically engineered (GE) potatoes. As part of an ongoing evaluation of high performing GE potatoes, the populations of soil microflora and fauna associated with transgenic potato plants (plants that have DNA introduced from unrelated species) and their non-transgenic counterparts are being compared during decomposition of plant biomass.
- Alternatives to chemical sprout suppressants - variety dormancy and cool storage ability. Varieties and breeding lines are assessed for dormancy in long term post harvest storage tests. Lines are being bred and assessed for processing quality in fry tests after extended periods of cool storage, to improve and maintain high levels of product quality of crisps and French fries year round. The project is liaising with programs to improve the understanding of the resistance to cold induced sweetening in potatoes.
- Molecular detection of pests and diseases.
- Development of the potato calculator. The potato calculator has been developed for New Zealand potato growers. It is based on a simulation model of plant growth and, using soil and weather information, creates an interactive management schedule for irrigation and nitrogen fertiliser applications.
- Management strategy for aphids and viruses.

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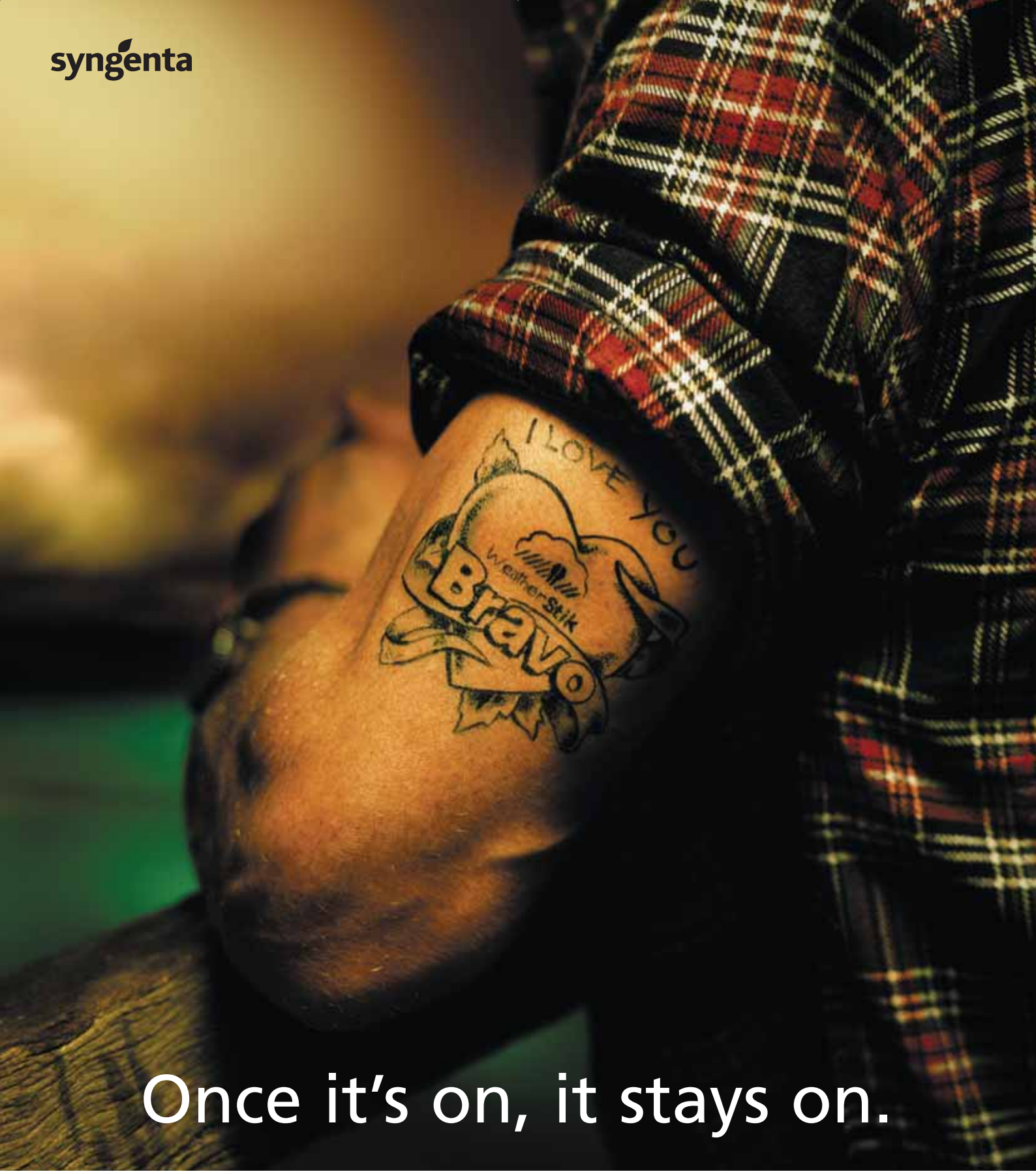


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# HAL Potato R&D Levy Projects for 2005- 2006

| Project title | Chief investigator | Phone | Page |
|---|---|---|---|
| Processing potato industry R&D program | Dr Rowland Laurence, Tasmanian Institute of Agricultural Research @ | 03 6430 4901 | 22 |
| **Crop management** | | | |
| Coordination of the National Cadmium Minimisation Strategy | Dr Michael Warne, CSIRO Soil and Water | 08 8303 8533 | 31 |
| Sustainable agronomy packages for export potatoes | Dr Ian McPharlin, Department of Agriculture WA | 08 9368 3671 | 32 |
| **Breeding and evaluation** | | | |
| Breeding potatoes for improved quality and efficiency | Tony Slater, Victorian Department of Primary Industries | 03 9210 9222 | 39 |
| Global Germplasm & Genetics Investigation | Andrzej Kilian, Diversity Arrays Technology Pty Ltd | 02 6246 4519 | 28 |
| State breeding evaluation trials | State industry organisations | | 28 |
| **Pest, disease and weed management** | | | |
| Common scab threshold on tuber seeds for processing potato crops | Dr Hoong Pung, Serve-Ag Research | 08 6423 2044 | 47 |
| Control of black dot in potatoes | Dr Trevor Wicks, SA Research & Development Institute (Robin Harding) | 08 8303 9323 | 56 |
| Development and implementation of industry biosecurity plans | Rodney Turner, Plant Health Australia | 02 6260 4322 | 50 |
| Evaluation and commercialisation of common scab resistant clones of commercial potato varieties | Dr Calum Wilson, Tasmanian Institute of Agricultural Research | 03 6223 6841 | 52 |
| Late Blight Management Plan | Dr Jackie Edwards, Victorian Department of Primary Industries | 03 9210 9222 | EOP 05 |
| PCN 'Area Freedom' for WA: Evaluation of the current status of PCN (Globodera rostochiensis) | Vivian Vanstone, Departmentof Agriculture WA | 08 9368 3141 | 49 |
| Prediction and molecular detection of soil-borne pathogens of potato | Dr Nigel Crump, Victorian Department of Primary Industries | 03 9210 9222 | 51 |
| Fresh Potato Value Chain Analysis | Tom Rafferty – Supply Chain STO | | 28 |
| Supply chain handling systems for premium potatoes | Adrian Dahlenburg, SA Research and Development Institute (Nancy Bagnato Leo) | 08 8303 9416 | 58 |
| Effects of potato seed characteristics on seed piece breakdown and poor emergence | Dr Hoong Pung, Serve-Ag Research | 08 6423 2044 | 62 |
| Maintenance and refreshment of the certified seed public variety in-vitro collection | Keith Blackmore, ViCSPA | 03 5962 9043 | 66 |
| Optimising production and storage conditions for seed potato physiological quality | Dr Philip Brown, University of Tasmania | 03 6226 2716 | 69 |
| Seed potato handling and storage – implementing best practice * | Dr Doris Blaesing, Serve-Ag | 03 6427 0800 | 68 |

## Technology transfer

| | | | |
|---|---|---|---|
| Communicating R&D outcomes to the potato industry through Potato Australia and Eyes on Potatoes | Cathy Sage, SageWords | 03 9328 5310 | **NR** |
| Coordinating technology transfer in the Australian potato industry * | Leigh Walters, SA Farmers Federation | 08 8232 5555 | **59** |
| Implementing the Potato Industry's communication plan | Leigh Walters, SA Farmers Federation | 08 8232 5555 | **59** |
| Making past industry information from R&D more accessible * | Leigh Walters, SA Farmers Federation | 08 8232 5555 | **59** |
| Potato Internet Service | Leigh Walters, SA Farmers Federation | 08 8232 5555 | **59** |
| Communications Review | SOCOM | 03 8317 0111 | **28** |

■ New projects that have been approved and will commence once contracts have been finalised or have commenced this year.

■ Projects ending in late 2004 and 2005

■ Ongoing Projects

EOP 05 Reported in June 2005 Eyes on Potatoes

@ Program Coordinator

NR No report is provided as the outcomes are sent to everyone

In some cases projects that are supported for funding do not commence. Any new projects listed last year that are not listed this year did not go ahead. Projects that are listed as ending this year that were not listed last year are short term projects that are approved after the production of Potato Australia.

HAL

*Know-how for Horticulture™*

VOLUNTARY CONTRIBUTIONS

## HAL Potato R&D

# VC Projects for 2005-2006

VC or Voluntary Contribution projects are not funded by the Potato Levy. Instead of levy money being matched "dollar for dollar" by HAL, a contribution from a non-government organisation is matched. The money may come from a company, farmer group or foreign government. This money is paid to HAL, matched and then paid back to the Chief Investigator responsible for the project as progress payments. Except for the difference in the source of funds, VC projects are managed like levy projects. Although the funding comes from a private group in Australia the work maybe done by a government department. Decisions on whether to fund a VC project are made by HAL with advise from the Potato Industry Advisory Committee as required.

| Project title | Chief investigator | Phone | Page |
|---|---|---|---|
| Processing Potato R&D Program | Dr Rowland Laurence, Tasmanian Institute for Agricultural Research | 03 6430 4901 | 22 |
| **Crop management** | | | |
| Crop management service for Tasmanian growers | Mark Heap, Simplot (Chris Russell) | 03 8387 5124 | 31 |
| National coordination of reclaimed water use in horticulture | Jim Kelly, ARRIS | 08 8303 7247 | 30 |
| **Breeding and evaluation** | | | |
| Potato evaluation trials – Arnotts | Allan Smith, Arnotts Snackfoods | 07 3372 7411 | 34 |
| Potato evaluation trials – McCain Foods | David Ryan, McCain Foods | 03 5338 0254 | 36 |
| Potato evaluation trials – Simplot | Dr Rowland Laurence, Tasmanian Institute for Agricultural Research | 03 6430 4901 | 35 |
| Potato evaluation trials – South Australia | Clinton Zerella (Potato Growers of SA) | 08 8380 9096 | 36 |
| Potato evaluation trials – Victoria | Keith Blackmore, ViCSPA | 03 5952 9043 | 37 |
| Potato evaluation trials – Western Australia | Peter Dawson, Department of Agriculture WA | 08 9892 8461 | 38 |
| **Seed development** | | | |
| Crop management service development for seed potato production in Tasmania | Mark Heap, Simplot Australia (Chris Russell) | 03 8387 5124 | 62 |
| Improving virus control in seed schemes by combining aphid monitoring and virus testing | Mark Holland, Department of Agriculture WA | 08 9368 3721 | 64 |
| Support for seed potatoes sales to Sri Lanka: determining constraints to production | Peter Dawson, Department of Agriculture WA | 08 9892 8461 | 65 |
| Partnership to build crisping potato capacity in West Java | Peter Dawson, Department of Agriculture WA | 08 9892 8461 | 70 |
| Identifying virus infected seed potato plots in the year prior to certification | Keith Blackmore, ViCSPA | 03 5622 3025 | 28 |
| Managing viruses in Tasmanian seed potato stocks | Dr Frank Hay, Tasmanian Institute for Agricultural Research | 03 6421 7698 | 28 |
| Economic contribution of the horticulture industries to the Queensland & Australian economies | Mark Panitz, Growcom | 07 3620 3844 | 60 |

- New projects that have been approved and will commence once contracts have been finalised or have commenced late last year or this year.
- Projects ending in late 2004 and 2005
- Ongoing projects

# Which of these seed potato varieties is the most productive?

**seed potato 1**

**seed potato 2**

**seed potato 3**

Elders has established a portfolio of potato varieties with improved characteristics to help potato growers select the best variety for their requirements. The seed potatoes are grown with selected seed growers that Elders works with, to help potato growers select and buy the highest quality certified seed available.

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**Contact your local Elders branch.**

Elders

*Buy quality Elders seed potato varieties – **get productive potato crops***

EHO235885 07/05

# Processing Potato R&D program update

**The Processing R&D program, started in 2004, is now established and activities have begun. Although the program is split up into a number of sub-programs, a lot of the work is shared.**

**Harvests of the first field trials are complete and researchers are busy looking at the results.**

## DNA probe tests

This sub-program will develop soil tests for common scab, powdery scab and rhizoctonia. Although much work has already been done in Australia and New Zealand on tests for common and powdery scab, the tests still need to be fully checked to ensure they are reliable and effective so that they can be used with confidence in the research programs, on a wide range of soil types. The process is somewhat analogous to taking a prototype of a car and doing road and workshop trials to ensure it meets expectations so there will be no nasty surprises after it leaves the showroom.

### *Progress*

Major soil types have been tested to ensure DNA can be extracted effectively with very promising results to date using the South Australian Research and Development Institute's 'in-house' extraction process.

A large number of soil samples have been collected from field test strips by program staff for future testing.

Work has been carried out to test how well the probes can identify different disease types such as the rhizoctonia AG groups. (As discussed in a past Potato Australia article by Dolf de Boer, there are significant differences between the various AG strains of rhizoctonia and how they impact on potato plants. Being able to clearly identify which strain is which will be very valuable in understanding rhizoctonia and developing effective management strategies.)

### *Next 12 months*

Work in the next year will focus on refining and testing the probes for the range of diseases to ensure they provide results that can be interpreted and used for decision making. Other work will include establishing standardised approaches for scoring disease, doing bioassays and soil sampling.

## Soil sampling

To be able to interpret the results of a DNA probe test, it is important a consistent form of sampling exists. How a soil is sampled will depend on where the disease material is located. If a disease survives as resting spores largely near the surface there is no point in sampling too deep. Alternatively if the disease survives over a large depth range, sampling has to be adjusted to accommodate its distribution. It might be that a shallow sample is a good indicator if the disease material is distributed over a large depth range, or it may not be. Developing a suitable method of soil sampling that will deliver a meaningful result is an important step in the research.

***Nigel Crump taking one of many thousands of soil samples that will be taken throughout the course of the research program***

## Using the test result

The research program will develop and refine existing DNA tests so they provide a reliable tool for research and industry. Generating a test result though is only one step to making a decision about what to do.

Knowing how much of a disease organism there is in the soil may not indicate whether a disease problem will occur in the coming season. Whether a disease becomes a problem in the crop depends on a number of factors which differ between diseases.

Developing the ability to be able to interpret and use the results in decision making will also be an important part of the research work.

## Soil amendments

The sub-program will develop new techniques to reduce the impact of soil-borne disease on potato crops by manipulating soil conditions. This will include use of organic soil ameliorants to reduce or eliminate the impact of soil borne diseases.

Short to medium term benefits for industry will include effective, affordable, disease reduction strategies. In the long term, as our understanding of the processes in the soil improves, methods will be developed that curb disease by creating an unfavourable soil environment for their growth and reproduction in the soil.

***Soil amendment trial***

***Progress***

116 potato disease test strips were established in three states (29 South Australia, 30 Tasmania and 57 in Victoria) and soil samples collected for disease and nutrient assessment. These sites have now been harvested, yields noted and tubers assessed for a range of soil borne diseases. The results will be compared to similar results generated by Agrifood and Agriculture Canada, providing researchers with more comprehensive information on soil properties which influence disease.

A field trial has been established to test thirteen different soil amendments including organic amendments, lime, nutrient and fungicide treatments – for their ability to control soil borne diseases. This has been harvested. A field day was held on the Ballarat site on 25 May 2005 in collaboration with Vegcheque. Twenty growers and industry representatives (McCains) attended.


With different staff working on the program, it has been important they all use a common approach to identify and rate diseases. Standard disease assessment methods have been identified or developed and staff trained in their use. Training workshops were held at Knoxfield in March and at Launceston in April.

***Next 12 months***

Work will focus on analysing results from the test strips to identify soil factors that might influence development of soil borne potato diseases. This information will be used to select treatments for two further soil amendment trials (a powdery scab and common scab trial) that will be planted later this year. Extra work will be done in the glasshouse and in the field as required.

New test strips will be established and site histories collected to identify the influence of cropping practices on development of soil borne diseases.

## Crop rotations

We need to better understand the interactions between soil borne potato diseases, crop management, alternate crops and the environment, and identify practical ways growers can manipulate their cropping systems to decrease disease build-up or activity.

***Progress***

The main focus has been developing a grower survey and establishing the process by which large volumes of information can be collected, stored and used. To be able to develop more effective management strategies, a lot of information about crops and paddocks is required in conjunction with the DNA probe test results.

Other work included continuing a rhizoctonia ecology rotation trial in Victoria and working with processing company staff to assess how the crop information they collect can be better used to benefit the industry.

***Next 12 months***

Future work will focus on carrying out the grower survey in three states, continuing to work with processors to identify how data they collect can help better understanding of diseases and continuing a trial in Victoria looking at how seedbed preparation and organic matter management can affect the incidence and severity of rhizoctonia.

## Enhancing resistance

This sub-program aims to produce and commercialise common scab resistant varieties using conventional selection procedures. Lines are selected from existing varieties that are resistant to thaxtomin, a toxin which is critical to development of the disease.

Work is also being carried out to identify resistance or tolerance to tomato spotted wilt virus. These characteristics will then be used in the breeding program to produce more resistant and tolerant varieties.

***Progress***

Funding for this work has only just begun. Early work has focused on continuing glasshouse assessments of potentially resistant varieties and preparing for the new work program. Several lines of *Russet Burbank* have been identified with enhanced resistance to common scab.

***Next 12 months***

Field trials will assess disease and agronomic characteristics of common scab resistant lines. Research will also begin on identifying genetic markers to improve our ability to screen for resistance to tomato spotted wilt virus.

***Minimising diseases reduces losses in the field and in the factory***


***It is important that Australia is an efficient producer of processed potatoes if it is to remain competitive in world markets***

## Resistance screening

We aim to develop effective methods for screening important diseases. This will result in more disease resistant and tolerant lines being identified which should lead to new higher yielding varieties that are less damaged by disease.

### *Progress*

Funding for this work has only just begun so early work has largely been funded through the breeding program.

Work to date has focused on a powdery scab screening trial which has been harvested, an initial tomato spotted wilt virus screening trial, discussions on screening approaches used elsewhere in the world with the view using world's best methods (ie. New Zealand, Scotland and Peru), and assessing a screening method for common scab to be used in the coming season.

### *Next 12 months*

The next stage will focus on establishing screening trials in the breeding program for the three major diseases to test screening protocols.

## Screening for diseases

When assessing hundreds of potential varieties for disease resistance and tolerance, having an effective and cost efficient approach is very important. Only limited testing could be done in the past. Selections were assessed in the later stages by which time many had been culled out due to poor performance. Unfortunately this process can miss selections that have good resistance that may not be commercially acceptable but could be used in the breeding program to produce commercially valuable varieties.

## Communication

The Communication sub-program will work with the research groups and industry to effectively communicate outcomes to industry, develop strong links with processors, ensure effective international links to maximise industry benefit and network in the research program.

### *Progress*

The main early thrust has been improving internal networking by developing simple communication tools such as an internal newsletter, contact directory and communication guide.

Other jobs have involved working with sub-program leaders to raise awareness of the program and identifying communication needs of the sub-programs.

***Breeding new varieties is an important part of the long term strategy for controlling damaging diseases***

### *Next 12 months*

We will focus on strengthening links with industry, raising more awareness of program activities, building a strong relationship with international collaborators, preparing materials and providing support at the Potato 2005 National potato conference and developing the communication component for the new industry internet service and address communication needs in the June planning meeting.

***Diseases can also create problems in storage***

## Contact details

For more information on Processing Potato R&D please contact the following people:

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## New scientists

An important aspect of Processing Potato R&D is the ability to attract new scientists to work on potato issues. The following students have started working in the program. We welcome them on board and wish them well in their new careers in the potato industry.

Rachel Powney, based at Department of Primary Industries at Knoxfield in Victoria, will do her honours project on Verticillium species in potato crops in South Eastern Australia. She has completed a survey of potato crops for variation present in Australian Verticillium species.

Bhim Khatri will work on a PhD to study organic amendments/disease in rotations at the University of Tasmania in Hobart.

Guy Westmore, also at the University of Tasmania in Hobart, is doing a PhD on the role of potato volatile phytochemicals in providing resistance to the thrips which spread Tomato Spotted Wilt Virus.

Cathy Todd, at the University of Adelaide Waite Campus in South Australia, is doing a PhD looking at the interaction of rhizoctonia AG groups with trace elements and fungicides. Past work has highlighted significant differences in the severity of disease depending on the rhizoctonia AG group present.

***PPR&D Research team and Simon Drum from HAL - L to R: Rowland Laurence, Simon Drum, Leigh Sparrow, Kathy Ophel Keller, Calum Wilson, Tony Slater and Nigel Crump***

Simplot

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# New projects approved by Horticulture Australia

## Maintenance and refreshment of the public variety in-vitro collection for Australia

Industry and HAL have committed to support VicSPA and the Department of Primary Industries, Victoria for the next five years to cover the cost of maintaining the public in-vitro collection stored at their Knoxfield facility.

Your Levy @ Work

## Managing viruses in Tasmania seed potato stocks

This project aims to monitor the effectiveness of the management strategy put in place to eliminate potato virus S (PVS) and potato virus X (PVX) in seed potatoes in Tasmania. This will reduce the impact of viruses on potato yields and protect seed potato exports between states and to other countries. The virus issue was rated the highest priority by the Potato Agricultural Research Advisory Committee (Potato ARAC).

VOLUNTARY CONTRIBUTIONS

## Identifying virus infected seed potato plots in the year prior to Certification

During last season, virus diseases caused more than 120 hectares of seed crops to be rejected for seed use. This meant that more than 3,000 tonnes of certified seed valued at $1.5 million was lost to seed growers and more importantly seed buyers. Seed buyers are now very short of important seed stocks for next season's crops. This project puts in place a strategy to identify problem lots before they are planted, and improve the volume and efficiency of the Seed Potato Certification Scheme.

VOLUNTARY CONTRIBUTIONS

## Global Germplasm & Genetics Investigation

Remaining competitive in an increasing globalised market is vital to the long term economic and environmental sustainability of the Australia potato industry. To this end, HAL and the Australian potato industry are exploring opportunities to ensure Australia's potato growers' have access to world's best potato germplasm and genetics. Diversity Arrays Technology have been contracted to undertake this project. The group will make a presentation providing preliminary recommendations to industry representatives in December 2005, with a final report due in March 2006.

Your Levy @ Work

## State Breeding Evaluation Trails

Funds have been allocated to each state to evaluate fresh potato varieties developed to generation three (G3) stage by the National Potato Breeding Program at Toolangi in Victoria.

Your Levy @ Work

## Fresh Potato Value Chain

This study investigates the supply chain for fresh potatoes in Australia to:

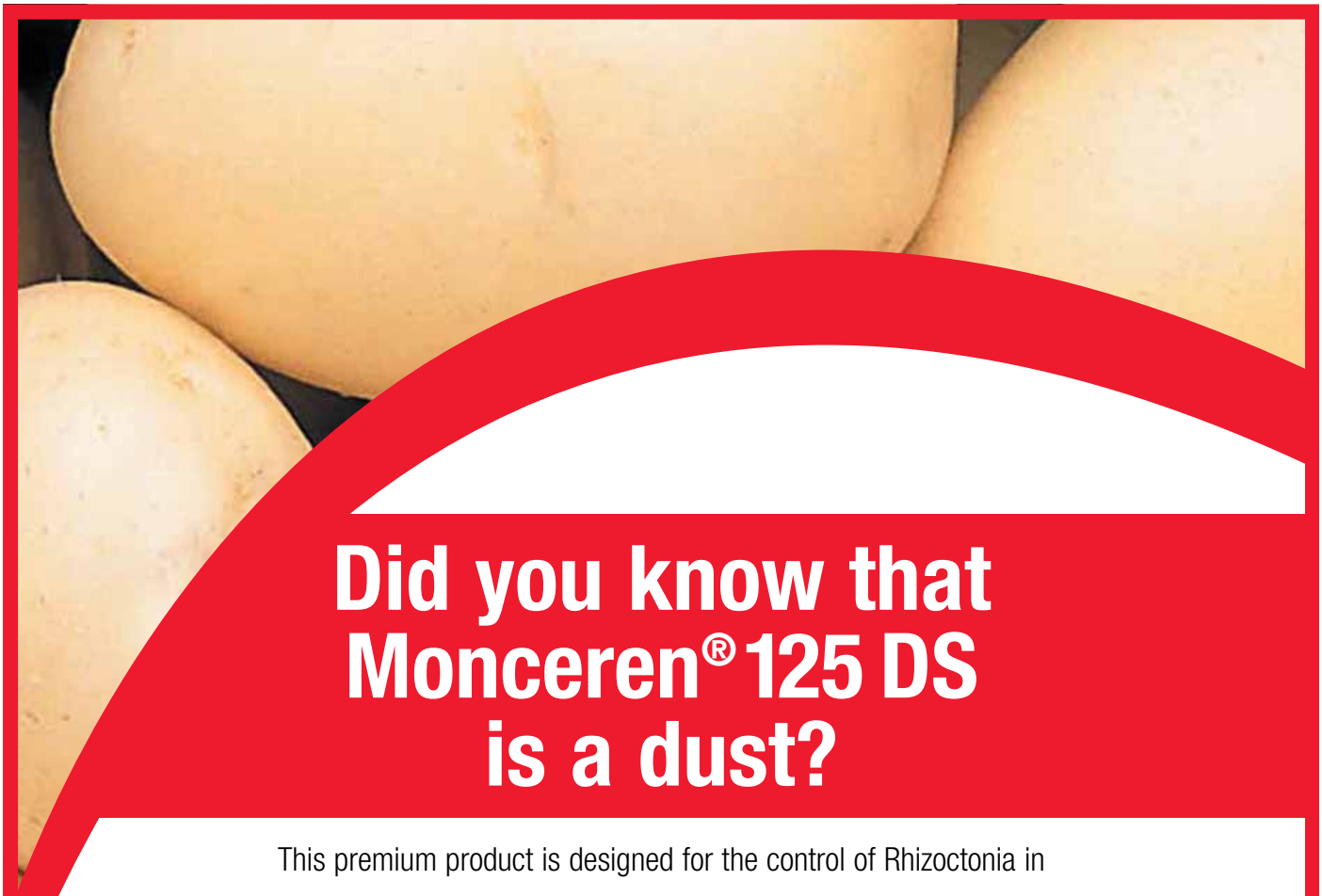
- improve transparency in transactions through the fresh potato supply chain in Australia
- provide equitable and effective arrangements for costs of activities to stimulate market demand for fresh potatoes, based on capture of benefits
- identify how supply chain performance impacts consumer buying decisions for potatoes and understand how the industry might influence potato consumption and maximise grower returns
- understand the key paths to market for Australian grown potatoes and the information tools potato growers need to adopt and capture the benefit from improved supply chain management
- gain a deeper understanding of the dynamics, trends and potential of the various distribution channels, including identification of the numbers of growers and wholesalers servicing each channel, risk and return for each channel, rate of growth or decline.

Your Levy @ Work

## Communications Review

HAL and the potato industry will review the industry's communication tools, resources, publications and practices and present the findings to the Potato Industry Advisory Committee (IAC) at their September 2005 meeting. Review findings will help the IAC and HAL make communication investment decisions beyond 2005-06.

Your Levy @ Work



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EME233343 08/04

VOLUNTARY CONTRIBUTIONS

## National push

# for reclaimed water in Horticulture

**This year has seen development of two new schemes in Victoria; the Eastern Irrigation Scheme and Werribee Irrigation District, which have demanded a lot of our time as the national coordinating body, helping growers and the horticultural industry understand how safe reclaimed water use can be.**

The Queensland Department of Sustainability and Development has also commissioned a business case to support the supply of recycled water to growers of the Lockyer, Bremmer and Warrill Valleys. The Lockyer Valley Water Users Forum has signed a memorandum of understanding, for five years with Brisbane Water and Ipswich Council, for supply of 25 GL per annum of reclaimed water.

Clearly, industry recognises the value of a permanent supply of water of a guaranteed quality, to continue or develop their businesses. This has been shown through the increased demand for high quality recycled water since development of the Virginia Pipeline Scheme. A benefit from the project has been timely delivery of information to growers and appropriate government and private agencies, and confidence building with all stakeholders.

A recent major event was the Recycled Water Study Tour 05, which took 21 delegates from the water industry and regulatory agencies to look at recycled water use internationally (Singapore, Mexico, California and Florida). Participants collected an enormous amount of information on recycled water use around the world, from discussions with people with decades of experience in developing, promoting, commissioning and running reuse schemes. These learnings will undoubtedly play a crucial role in the future development of recycled water schemes in Australia.

***Wholesale nursery, Apopka Florida, uses reclaimed water to irrigate ornamental plants***

Other project outputs include:

- a website which tells your almost everything about reclaimed water use in agriculture in Australia (www.recycledwater.com.au). To be updated shortly.
- ReWater, a quarterly newsletter on recycled water use in Australian agriculture. For the free issues, visit the website or contact us to record your email details.
- collaborating with the "Use of Reclaimed Effluent Water in Australian Horticulture: Stage 2" project funded by Land and Water Australia to improve guidelines for governments or councils thinking of developing a reclaimed water scheme.
- working to get a more consistent approach to state recycled water regulation and reuse in Australian horticulture. Part of this process has been the project's involvement in drafting new national guidelines for water recycling.
- A large component of the project has been production of resources to provide accurate information for horticulture and allied industries. Brochures include: 1) Facts about recycled water, 2) Quality Assurance Programs and Growing Crops with Recycled Water, 3) Guidelines for developing recycled water schemes in horticulture, and 4) Water recycling in Australia, for the general public.

Growers are recognising that reclaimed water offers many benefits with respect to supply and quality; it has also been gratifying to see changes in attitudes where reclaimed water is seen as the same, if not better, as any other water resource. These changes have been underpinned by this project and delivery of factually correct information to people interested in recycled water, preventing them from being misinformed.

The next phase of the project will deliver national education and training workshops combining information from successful projects - The Sustainable use of Reclaimed Water for Horticultural Irrigation on the Northern Adelaide, Use of Reclaimed Effluent Water in Australian Horticulture: Stage 1& 2, Reclaimed Water Study Tour 2001, and this project.

The project team would like to thank contributors to the project and HAL for their support.

For any queries about recycled water development, please contact Jim Kelly, Arris Pty Ltd .

*Project started: 2003*

*Duration: 4 years*

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## Crop management support

# for Tasmanian ware potato growers

**Simplot, in association with supporting potato growers in Tasmania, initiated the Crop Management Service (CMS) for 59 potato crops grown in 2003-04. CMS aims to increase yields and boost the international competitiveness of growers by subsidising uptake of new crop management technology and use of professional agronomists. VC funding was not available in the first season, but is expected for 2004-05, with CMS covering 97 ware potato crops.**

A steering committee has been established of six growers and two company representatives, who meet during the season to discuss CMS progress and direction.

Pooled data and agronomic research from the program was shared throughout the state, providing insight into crop management activities helping growers to increase returns without reducing sustainability.

Key findings from the first year include:

- Preventing moisture stress can increase returns by $4,000/ha.
- Higher sap nitrate levels correlate well with higher returns.
- Higher sap potassium levels correlate well with higher returns.

The collected data includes soil nutrition, soil moisture, scouting observations, soil and air temperatures, plant nutrition in the cropping period and yield/quality assessment. The data is analysed and supplied to all growers as a generic report. The service presents the findings to industry in the winter months, with more than 200 potato growers attending last year. The 2004-05 presentations are planned for August, with a similar turnout expected. Small group discussions for CMS growers allow detailed examination of results to help plan next season's crop.

Grower feedback about the service has been very positive, as they recognise the long-term advantages in boosting productivity.

*Project started: 2003*

*Duration: 4 years*

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# National cadmium minimisation strategy

**The National cadmium minimisation strategy arose from continuing concerns about accumulation of cadmium in agriculture.**

The strategy is overseen by the National Cadmium Management Committee (NCMC), which maintains a website to inform about the National Cadmium Minimisation Strategy, Best Management Practice and Australian publications relating to cadmium.

The site is used extensively, with about 2500 hits per month recorded and 440 Best Management Practice brochures downloaded. Interestingly, the web-site is accessed extensively by overseas users. In June 2005, 42% of users were from North America (Canada and the United States), 25% from Oceania (Australia, New Zealand, Papua New Guinea), 17% from Asia and 12% from Europe with the rest from Africa and South America.

A major Australianl government initiative is underway to develop guidelines to control fertiliser contaminants, including cadmium. Committee members have been actively involved. The initiative has three parts. The first, a publication, by CSIRO's Centre for Environmental Contaminant Research (CECR) is available at www.clw.csiro.au/cecr/publications.html. Approval and funding is being sought to fund the second phase.

The Committee has been working with the Australasian Soil and Plant Analysis Council (ASPAC) to give accreditation to laboratories skilled in conducting cadmium analyses in soil and plant samples. When this is finalised, the new list of proficient laboratories will be added to the NCMC web-site www.cadmium-management.org.au/news.html.

The committee continues to negotiate national and international changes to maximum limits for cadmium in foods and advise Australian regulators and associated industries.

It is seeking approval from its funders, the Fertiliser Industry Federation of Australia, the Grains Research and Development Corporation and HAL to use some underspent money to extend the term of the Committee by one year and complete some original aims.

This year, membership of the Committee has changed. Dr Trevor Gibson from NSW Department of Primary Industries (formerly NSW Department of Agriculture) was promoted and resigned from the Committee. He has been replaced by Dr Paul Milham (NSW DPI).

*Project started: 1999*

*Duration: Ongoing*

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Your Levy @ Work

# Maximising yield of small round seed for export

## *The old timer, Gibberellic acid, could still prove useful*

***Julie Plummer of the University of The Western Australia (left) and Ian McPharlin of the Department of Agriculture (right) with Masters student Ni Luh Arpiwi (centre) examine ways to increase small round seed yield of Atlantic and Granola.***

**Gibberillic acid, traditionally used to break seed dormancy, may have a new application as a way to increase several varieties' yield of the small round seed favoured by South East Asian markets.**

### The situation

Export markets in South East Asia prefer small round seed (SRS) of about 40 grams for planting. Larger seed may break down when cut in the hot tropical conditions, especially if not handled properly.

Australian growers need to maximise SRS yield to make a profit in this market especially if there is limited or no market for the larger seed. This is the case for *Granola*, the main fresh market variety in Indonesia and Sri Lanka. SRS for Atlantic, the main crisping variety in the region, is also preferred although Australian growers have some sales options at home for the larger tubers. Other varieties with potential are the Australian developed *Dawmor* and *Eben* (a Phillipines variety also called *Raniag*) crisp varieties and *KT3*, a fresh market variety developed in Vietnam.

### Growing practices – pros and cons

Growers may alter growing practices to maximise SRS, most commonly harvesting early or planting at a closer spacing than normal, or both. Both incur a financial penalty, that is, early harvesting means forfeiting yield and high density planting means extra cost for seed. The ideal system would be to change the size distribution of the seed towards higher yield of SRS without reducing total yield.

This project examined ways this might be achieved. From previous research the best candidates for this appeared to be the growth regulators. Judicious management of fertilisers may also be important.

### The key is stems and stolons

Gibberellic acid ($GA_3$) long used to break dormancy in potato seed had been reported to increase yield of small tubers in research work in the 1970s. It appeared to do this by increasing tuber number through increased stem and stolon number. The stolons or underground stems of the potato are the sites of tuber initiation.

We found $GA_3$ was best applied by dipping the freshly cut seed in a 20mg/kg $GA_3$ solution for 15 minutes and then air drying the treated seed before planting. Lower concentrations were often not as effective and higher concentrations may lead to plant and tuber distortion.

Our research with Masters students Ni Luh Arpiwi, Titik Kustiati and Associate Professor Julie Plummer of University of Western Australia over three years confirmed $GA_3$ increased SRS yield. Although results were variable between varieties, $GA_3$ usually increased SRS yield without significantly reducing total yield.

### Variety counts

For example SRS yield of *Atlantic* was increased by 32% using 10mg/kg $GA_3$ in an October planted experiment in Manjimup, WA, and by 427% using 20 mg/kg in an August planted experiment on the coast near Perth. Increases in the SRS yield of Granola with applied $GA_3$ were less than *Atlantic*, up 16% at 5-10mg/kg $GA_3$ and 34% at 20- 40mg/kg $GA_3$. $GA_3$ dipping appears to be more effective at increasing SRS yield in varieties that produce relatively few and larger tubers such as Atlantic compared with Granola that generally produces relatively high number and smaller tubers. The research also showed that variety and physiological age of the seed were important factors when using $GA_3$ to increase SRS yield. For example it was best to use physiologically young *Atlantic* and *Eben* but old *Dawmor* and *KT3* seed.

Our research verified that the increased SRS yield by $GA_3$ was associated with increased stem and stolon number more in *Atlantic* than *Granola*. However we found that an increase in stolon branching was probably a bigger factor in increasing tuber number than stolon number per se. Other good news was that applying $GA_3$ to the seed appears to have no carryover effects on the subsequent crop. $GA_3$ is currently not registered for use on potatoes but these results suggest that it should be.

### Other growth regulators

Paclobutrazol (PBZ) was also tested. It is a growth retardant, acts opposite to GA3 and is commonly used (as 'Cultar®') to reduce excess canopy growth and increase harvest yield in fruit crops. It is best applied to the foliage of potatoes after emergence but before tuber initiation. It is thought to increase SRS yield by increasing tuber numbers.

However responses were variable. For example, 250mg/L PBZ reduced SRS yield of Atlantic by 27% in one experiment and increased it by 79% in another. Increases in SRS yield of Granola with PBZ ranged from none to a 40% increase. More work is needed with PBZ, which is not registered for use in potatoes, to verify its practical value in increasing SRS and if there are carryover effects in subsequent crops.

## Fertiliser management

We decide to examine nitrogen (N) management as it is well documented that applied nitrogen can have a big influence on tuber size depending on variety.

Practically, nitrogen management of Atlantic for maximum SRS yield will require more precision than Granola.

Our results showed that maximum SRS yield usually occurred at a lower rate of applied nitrogen than needed for maximum total yield. So some yield is lost when fertilising for maximum SRS. For example, total yield was 11 to 15% less at the nitrogen required for maximum SRS yield in *Atlantic* (0 to 50kg/ha) and 0 to13% less in Granola (50 kg/ha) on gravelly loams in Manjimup, WA in 2000 and 2001. *Atlantic* required 100 to 200kg N/ha for maximum total yield and *Granola* 50 to 200kg N/ha.

Tuber number in *Granola* was less sensitive to applied nitrogen than *Atlantic*. For example, as applied nitrogen increases, *Atlantic* reduces its tuber number while tuber number in *Granola* is either unaffected or increases slightly with increases in applied nitrogen. So tuber size increases more in *Atlantic* than *Granola* with applied nitrogen.

## Acknowledgements

We have appreciated the willing support of industry in this project. In particular Mr Tom Fox (Lake Jasper Seed Company) of Pemberton and Mr Kon Peos (Peos Brothers) of Manjimup for providing certified seed for the experiments.

*Project started: 2002*

*Duration: 3.5 years*

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***Field experiment examining use of growth regulators to increase yield of small round seed***

VOLUNTARY CONTRIBUTIONS

# Arnott's snackfood trials, NSW

**The public potato breeding program has several new crisping varieties that may offer alternatives to the major fresh variety Atlantic.**

These trials confirmed that Variety 1 has potential to produce a high yield with reasonable SG and Variety 2 is showing good characteristics, notably high SG.

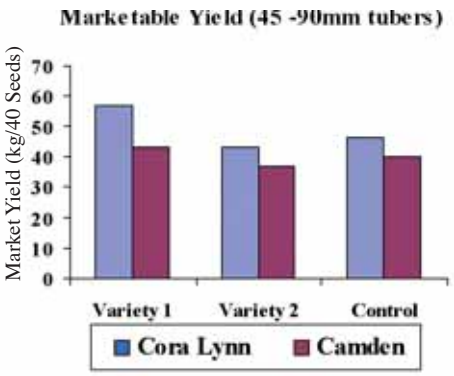
Seven new crisping varieties sourced from public potato breeding programs were evaluated against industry standards, *Atlantic* and *Pike*. Trials were grown at Camden, NSW (October 2004-February 2005) and Cora Lynn, Victoria (December 2004-May 2005) to evaluate the varieties' different environments and supply periods.

Criteria used in the evaluation were marketable yield (45-90 mm size range), specific gravity and crisp cooked colour. Other data collected in the evaluation process were stem numbers / seed piece planted at 35 days after planting; total number of marketable tubers; yield and number of tubers greater than 90 mm and less than 45 mm; disease incidence; physiological disorders and days to maturity.

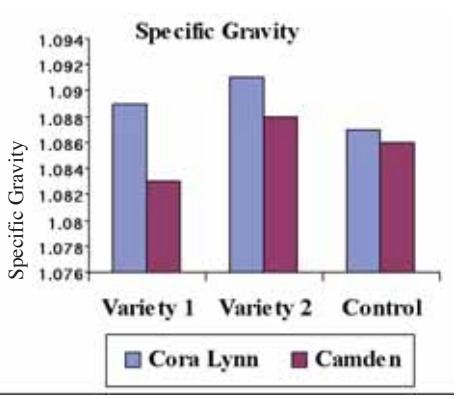


Crisping cook test for varieties one and two were acceptable and comparable with the industry standards in both trials.

Yielding higher than the industry standards, variety 1 had an excellent average marketable yield of 57kg/ 40 seeds in Cora Lynn and 43kg/ 40 seeds at Camden. Variety 2 showed good specific gravity at both sites.




*Variety 1 had excellent marketable yield*




*Variety 2 showed good specific gravity at both sites*

Further field trails are scheduled for summer 2005-06 to validate this year's results before deciding to bulk up semi-commercial seed stock.

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*KWRTrial crop; Trial harvest 05-05-2*

# Potato Cultivar Evaluation for Simplot Australia in Tasmania

**Trials have been conducted by the Tasmanian Institute of Agricultural Research in collaboration with Simplot Australia to identify new and improved varieties of potatoes suitable for processing into French fries, the main focus of the Tasmanian potato industry.**

In 2004-05 two field trials at Forthside Research Station, on the North West Coast, compared 22 new varieties with industry standards *Russet Burbank*, *Shepody* and *Ranger Russet*.

Three lines, evaluated in the advanced lines trial, displayed enough potential (through improved yields and processing characteristics) to be selected for agronomic testing with Simplot.

From the early generation trial, six lines were retained for further evaluation at Forthside Research Station in 2005-06. All had significantly higher processing yields than *Russet Burbank*, ranging from 119% to 169% greater than the industry standard.

From a field perspective, they scored well against the industry standards. In a scoring system which rated cultivars according to Simplot's requirements, *Russet Burbank* rated 5.5/10 and *Ranger Russet* 6.0/10. All six new genotypes scored over 6.0.

The aim is to take these six new genotypes on to a detailed comparison in 2005-06. The best selections will then proceed to agronomy profiling work with Simplot starting in 2006-07.

About forty percent of all lines evaluated in these trials were kept for their superior attributes compared to the industry standard *Russet Burbank*. Simplot Australia considers this a positive outcome for the project and believe the continuation of this work is justified. A new set of Australian Processing Potato Improvement Program lines will be tested at Forthside in 2005-06.

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***Early generation trial in flower, January 2005***

VOLUNTARY CONTRIBUTIONS

# New Potato Cultivar Evaluation for McCain Foods (Aust) Pty Ltd & Safries Pty Ltd

**Field experiments were conducted in commercial crops at Learmonth, near Ballarat in Victoria, Savernake, near Berrigan in NSW, Mingbool, near Penola in SA and a seed multiplication and assessment plot at Forthside Research Farm inTasmania.**

The Victorian trial was planted on Allan and Jamie Baird's property in late November and harvested early May, the Tasmanian trial at the Forthside research facility in late October and harvested late April. The South Australian trial was planted on Terry and Wayne Buckley's property in October and harvested early April, and the NSW trial was planted on John Doyle's property in September and harvested early February.

During the growing season, plots were assessed for emergence, vigour, maturity, pest and disease susceptibility. At harvest, plots were assessed for tuber characteristics including colour, texture, shape, distortion, eye characteristics, size and evenness. Each replicated plot was yield graded into various tuber size categories that related to processing parameters for French fry processing.

A field day for McCain Grower Group members, Department of Primary Industries (Vic) representatives and production personnel from McCain Food processing plant in Ballarat was held during harvest of the Victorian trial. Local growers and research personnel were invited to the other three trial harvest days.

Samples from each plot were removed after grading, with one sample from each plot assessed at McCain Foods (Aust) Pty Ltd or Safries Pty Ltd testing facilities for dry matter content and cooking ability. A storage sample was also removed from each plot at the Ballarat and Penola trial and held in commercial storage facilities. At three staggered intervals in the next seven months, a replicate of samples will be removed and tested for processing attributes.

The project has identified breeding lines that warrant further evaluation. These include cultivar 53, which has again shown its ability to out yield existing varieties with excellent tuber shape and attributes. Tuber size is small to medium with high tuber numbers that enable high yields to be achieved. Cultivar 53 has a longer maturity than current varieties, which may limit it to certain growing areas or times. Cultivar 66 performed well in the Riverina and Ballarat trials. In the Riverina trial, its yields were slightly above the standard varieties with a very high percentage of tubers in the processing size range of 75 – 340 grams. Cultivar 68 showed excellent processing attributes with high yields and good tuber characteristics in the Ballarat trial. It has a high percentage of tubers in the 170-340 gram weight range.

Evaluation and development of a new French fry variety is required before its commercialisation. The past two seasons have shown industry groups taking greater ownership in variety evaluation and commercialisation of new cultivars. Interest in the four variety trials conducted under this project has been very high.

McCain Foods (Aust) Pty Ltd, Safries Pty Ltd, McCain growers groups in Victoria, New South Wales and Tasmania and the Safries grower group in South Australia have all contributed to the project with matching funds from HAL and the Australian Government.

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***Harvesting the Ballarat trial***

# SA variety trials

VOLUNTARY CONTRIBUTIONS

The 2004-05 trials were not carried out due to the difficulty in finding a suitable site that would fit the physiological age of the seed. The seed produced in Victoria was eventually planted in Pinnaroo as an unofficial trial. Trials for 2005-06 will need to be discussed and a suitable site and willing growers found.

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VOLUNTARY CONTRIBUTIONS

# Fresh market variety evaluation, Thorpdale, Victoria 2004-05

**Thorpdale was again chosen for the second year of the fresh market variety trials in Victoria. This season, 28 varieties were evaluated, with 15 carried forward from the 2003-04 trial after a good performance. The new varieties tested were all from 2000 and 2001 trials, and this was their first time in a commercial planting situation.**

This year's industry sponsors were invited to submit their own varieties to trial, and Elders and Durkin Produce submitted two each which were assessed and compared with the other plantings.

The trials highlighted four stand out varieties, three of which had been trialed last year.

00-45-01 In the 2003-04 trial, it showed some scab resistance. With very bright skin, it is a bold tuber with good yield. The plants are attractive, with good emergence.

00-5-02 This variety impressed a number of growers this year with its bright skin, even shape and apparent good yield. It is early maturing with a nice, round shape and the plants have even emergence.

01-37-02 This variety has a nice round shape, smooth light red skin and yields well.

00-20-50 This variety also impressed some growers with its sample and shape after digging. It needs to be trialled at a wider spacing to get optimum yield. It has potential to outshine varieties currently on the market.

The standard varieties for comparison this year were *Coliban* and *Sebago*. Thirteen varieties from the breeding program in this trial out yielded *Sebago* and six of the 13 had a nice round shape and bold, bright skins.

The cultivars 00-20-50, 00-45-1 and 00-5-2 were trialled in 2003-04 with very good results. All three rated in the top 10 (based on yield, shape and emergence and maturity) last year and will be included in next year's trial. Next year, they will also be planted in bulk rows to test their commercial viability. A successful result in bulk testing will see the cultivars offered to sponsors for commercial use.

## Acknowledgements

Again, the participation of Thorpdale growers and our industry sponsors with support from HAL and matching Australian Government funds were crucial to the trials going ahead. A special thanks to Bill and Judy Robinson for allowing us freedom of access to the trial on their property, and for their staffs' invaluable assistance in harvesting the trial.

Our 2005 industry sponsors were Elders, Durkin Produce, Mancarella Packers, JC Cutbush & Co, Alannon Produce and Produce 1. Cummaudo farms generously donated the bags used for harvest.

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***Laura Bowles (AgChallenge) and Daniel Grayling (ViCSPA) taking growth observations at the trial***

***Thorpy Variety Trial 22 4 05 14: Growers and sponsors at the trial harvest***

VOLUNTARY CONTRIBUTIONS

# New potatoes on WA's horizon

**Selecting Australian breeding lines under local conditions has produced varieties that benefit WA consumers and growers. The breeding lines we have evaluated locally were bred by the Department of Primary Industry, Victoria and selected by the Department of Agriculture, Western Australia.**

**Three advanced breeding lines are in varying stages of development. They are:**

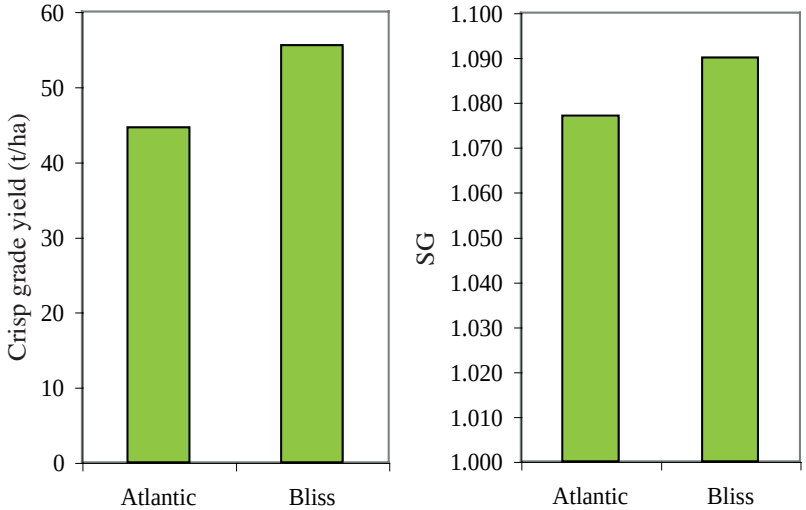
***A washed sample of White Star on freshly harvested tubers***

- **White star: winter fresh market**

*White Star* (97-38-2) has performed well in commercial tests in WA winter crops, delivering expected benefits. The line grew out of WA grower need for an improved winter variety that produced larger tubers than *Nadine* and *Delaware* with versatile cooking quality and tolerance to powdery scab.

Commercial tests produced 66 tonnes in 2004. Yields were similar to standard varieties but pack-out was superior. In 2003, *White Star* produced 82% Premium and Class 1 with just 9% Class 2, while *Nadine* produced 52% Premium and Class 1 with 21% Class 2. Importantly, *White Star* produced fewer small potatoes than *Nadine*. *White Star* had similar pack-out advantages again in 2004 with a 16 tonne sample providing 75% Premium and Grade 1. Packers where also happy with the way the potato came through the wash-pack operations.

| | *Atlantic* | *Bliss* |
|---|---|---|
| Crisp grade (t/ha) | 44.6 | 55.5 |
| Specific gravity | 1.077 | 1.09 |




***Average SG and crisp yield of Bliss and Atlantic grown in eight October - November planted experiments in WA***

Western Potatoes asked consumers to assess the taste of *White Star*. Nearly 90% rated *White Star's* taste as good to excellent, with 11% rating as average. This was better than the comparison variety which only rated 49% with good to excellent taste and 42% with average taste.

***Grade 1 sample of Billabong showing its even shape and shiny skin***

- ***Bliss*: high specific gravity and yield for crisping**

*Bliss* (90-2-6), a new crisp variety, offers better quality and yield and is a good example of the benefits improved varieties can provide. It has 24% higher yield in October/November plantings compared with *Atlantic* and much higher specific gravity.

Commercial experience has confirmed the advantages predicted from variety experiments. Farmers in WA who planted *Bliss* in December have found it has higher yield and specific gravity and fewer internal disorders than *Atlantic* and are keen to test the variety commercially. *Bliss* is being grown for the export market where its high yield and good quality help increase the competitiveness of the WA potato industry.

- ***Billabong*: summer fresh market?**

*Billabong* (95-37-12) is our least advanced line in commercial testing. It was selected in a summer grown fresh market demonstration where it had good appearance, like *Nadine*, but with more versatile culinary quality. Tubers are oblong with cream skin, light yellow flesh and shallow eyes. *Billabong* had good bloom, with 68% of tubers shining after two weeks of storage compared with 16% of *Nadine* tubers and no *Delaware* tubers.

Farmers attending this demonstration voted *Billabong* the top contender with 28 votes compared to *Nadine's* 10.

*Billabong* had its first commercial test in the summer of 2004-05. Packers were concerned about the shelf life of *Billabong* and thought skin set may be a problem. We will re-test *Billabong* next season with another advanced line, Auski.

## Acknowledgements

Funds for the WA work were provided by the Department of Agriculture, WA, HAL and the Potato Growers Association of WA. Commercial testing courtesy of the Bendotti, De Campo, Grubelich, Humphrey, Pessotto, Ryan and White families.

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***Farmers inspecting a commercial sample of Billabong at Pemberton Packers***

# Our home-grown Australian breeding program

**The question is often asked - why do we have an Australian breeding program? The answer is to breed varieties that better suit our needs.**

Many varieties have been brought in from overseas with varying degrees of success in the marketplace.

Unfortunately our needs are not always met by overseas varieties. If we want varieties bred to suit our markets and growing environment and we cannot source them from overseas, we need to fund a breeding program focused on what we require.

An Australian breeding program can screen varieties under local conditions that can have particular advantages, as our climate can be hotter and we have less fertile soils and a shorter growing season (120 days here versus 150 days elsewhere).

Disease priorities for the Australian industry can also differ. Some diseases, such as Tomato Spotted Wilt Virus, are not regarded as a high priority in many overseas breeding programs and yet are quite important for the Australian industry, particularly for processing potatoes. Overseas' bred varieties may also not be resistant to local strains of some of our diseases.

## The breeding process

The following is a simple overview of the breeding process at Toolangi. A lot of work goes into breeding a new variety.

## Step 1 – What varieties are needed

The breeder works with the different processors and fresh groups to determine what they are looking for in a new variety. This information helps the breeder to determine what parents will be used for the crosses.

## Step 2 – Controlled pollinations (Crosses)

Once the parents for the season's crosses are identified, their tubers are grown in large pots in glasshouse conditions. The tubers are planted and managed in a way to curb tuber production and promote plant growth and flower production.

Pollen from one parent is then used to fertilise flowers of the other parent. The flowers mature forming fruit which contain the seeds for the next generation. The fruit is collected at maturity and the seed stored for use.

# Our home-grown Australian breeding program (continued)

## Step 3 – Glasshouse seedlings

Seed from the crosses are germinated and then established in glasshouse pots. About 25,000 seedlings are grown in 8 cm pots. The plants are allowed to grow through to maturity. A single mini tuber is collected from each pot. Not all plants will produce a tuber, but the aim is to have about 20,000 tubers for the following season's field seedlings crop.

## Step 4 - Field seedlings

Tubers collected from glasshouse seedlings are planted in the field at wide spacing. This first field generation crop (G1) contains about 20,000 plants, each one genetically unique. At maturity, the plants are harvested individually by fork to keep them separate. Tubers from each individual plant are examined and about 1,500 are selected to advance to the next season. All tubers from these individual plants are collected to get the most tubers for planting the following season in selection plots.

## Step 5 - Selection plots

The 1,500 selections are planted as short rows for the second field generation ($G_2$), using all available tubers collected from the past season. The plots are harvested and displayed on the ground for selection of more promising types. Those selected on plant type, maturity, tuber characteristics, disease incidence, yield and cooking performance advance to the following season's comparative trials.

## Step 6 - Comparative trials

The performance of the most promising 180 to 200 selections from the past season's selection plots are compared to industry standard varieties in the third field generation ($G_3$). The selections are assessed on emergence, maturity, tuber characteristics, disease incidence, marketable yield, specific gravity, cooking performance, taste, greening and bruising.

Industry representatives are invited to view the harvest of these trials as they will be offered the better selections for evaluation.

To enable the most appropriate varieties to be selected, information provided to evaluators has been improved with digital images of all selections and more detailed performance data from trials. New information on disease resistance, bruising, taste and texture of selections are now also provided to evaluators to assist them in their decision making.

Screening for disease resistance is also carried out at this stage in separate trials. Currently the program screens for powdery scab. New techniques are being developed and introduced for common scab, Tomato Spotted Wilt Virus, potato cyst nematode and powdery scab.

## Step 7 - Evaluation

The groups and companies that have entered into formal arrangements with VicDPI on behalf of the industry are then supplied seed to use in district evaluation trials.

Advanced selections from the breeding program are now available after four years or three field generations ($G_3$) compared to eight to12 years in other programs.

For the last two years, elite processing selections have been evaluated by four processing companies, while elite fresh selections have been evaluated in three states.

## The rule book

The rules for the evaluation and commercialisation of new varieties are laid out in two business models, one for the fresh industry and one for the processing industry.

If you have any questions on the breeding program or becoming involved in the evaluation of new varieties you can contact me at Toolangi on the number below.

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Your Levy @ Work

# Breeding potatoes for improved quality and efficiency

**The future competitiveness and profitability of the Australian potato industry depends on a supply of new varieties suitable for Australian conditions and markets and resistant to local strains of important diseases.**

The past year has been busy as the breeding program evolves to better meet industry needs. The strong involvement of the Breeding Program in the new Processing Potato R&D program highlights the importance industry places on producing better varieties and provides opportunities to further enhance breeding activities in Australia.

Over the past season, the program ran a controlled pollination program using 40 parent cultivars to produce the next generation of seed. About 25,000 seed were germinated, sown and grown on in our glasshouse to produce the hybrid mini tuber population. We grew and hand harvested just over 21,000 field seedlings (1st generation). In the 2nd field generation we grew close to 1,000 selections in short row plots. We conducted eight 3rd generation replicated trials; three fresh, four French fry and one crisp, and we grew all the 3rd generation selections and parent cultivars (about 400) in a seed multiplication site. We ran a powdery scab resistance screening trial and reported comprehensively on the 3rd generation trial results.

Advanced selections are now available for industry evaluation after the 3rd field generation or four years. This highlighted the need to screen selections for important criteria by the end of the 3rd field generation. Over the past season, we have developed new screening techniques to allow us to do this for resistance to powdery scab, bruising, greening and sensory aspects including taste and texture. We are currently developing methods to screen for resistance to Tomato Spotted Wilt Virus, common scab and potato cyst nematode (PCN).

In developing these new screening methods, we have formed good relationships with the potato breeding program at Crop & Food Research in New Zealand, the Scottish Crop Research Institute (SCRI) and the International Potato Centre (CIP). This means that the National Potato Breeding Program will be applying the world's best methods to screen for resistance against local strains of diseases.

The program has been operating under the principles of the fresh and processing industry business models for two years. In that short time, several industry evaluation trials have produced selections that are superior to current commercial cultivars. The Victorian Department of Primary Industries has now received interest from members of the fresh and processing sector to commercialise new cultivars.

**Early generation field screening is conducted at Toolangi for three field generations, before the advanced selections are handed to relevant industry groups for evaluation. This now makes the program a world leader in releasing selections to industry for evaluation, as selections are handed over after only four years, compared to 8-12 years in other programs.**

The National Potato Breeding Program is run by the Victorian Department of Primary Industries (VicDPI) on behalf of industry with funding from the potato levy and the Australian Government through HAL and VicDPI.

*Project started: 2003*

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## Genetic engineering
# of crops without foreign DNA

**A new technique to genetically modify crop cultivars without introducing DNA from unrelated species has focused international attention on the research of a group of New Zealand scientists.**

They have developed a technique where everything used in the process of genetic modification is derived from the target plant species or a closely related species. It is an advance which has been widely welcomed by the international biotechnology community.

Research leader Dr Tony Conner of Crop & Food Research, says genetic modification (GM) has traditionally used systems to transfer new genes into a plant using DNA from highly divergent species, such as bacteria.

Dr Conner's team has now constructed a system in which all the DNA transferred originates from the target species. Although produced using molecular techniques, the resulting plants do not contain any foreign genetic material from unrelated species, bacteria included.

The scientists have successfully constructed such a system for potatoes and petunias, and have designed virtual systems for a range of other plants including tomato, rice, apple and onion.

While this new technique is particularly valuable in crops propagated vegetatively such as potatoes, fruit trees, cassava and sugarcane, it will also have a role in the breeding of major crops such as maize, soybean, rice and wheat.

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**Potato genetic improvement through the breeding and evaluation program is an important part of Australia's potato research effort.**

The breeding program is managed by the Victorian Department of Primary Industries (Vic DPI) on behalf of the Australian potato industry. Funding for the program comes from VicDPI, the levy and Australian Government.

Varieties from the breeding program are evaluated by state grower organisations (fresh), processing companies (processed) and other groups as by negotiation.

In the case of the processing industry the evaluation trials are funded by processing companies and through Voluntary Contribution (VC) support from the Australian Government.

The fresh industry trials are funded by industry groups and in the interim, supported by the levy and the Australian Government. Once the state programs are established it is envisaged that funding will revert back to a VC arrangement as for the processors.

The evaluation process is governed by business plans for the processed and fresh industries. The breeding program is governed by a contract between HAL and VicDPI.

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# Potatoes: winning with an integrated approach

**Baked, boiled, mashed or chipped – however you eat them, potatoes form an important part of our diet. But once infected with powdery scab, potatoes suffer from reduced yields, are unattractive to buyers and difficult to process.**

Providing potato growers with integrated control solutions for the disease has been a long-term goal of Crop & Food Research scientists. This has involved using the combined expertise of plant pathologists, plant breeders, molecular biologists and soil scientists, with extensive collaboration by the vegetable industry and overseas researchers.

Potatoes are a major world food crop, exceeded only by wheat, rice, and maize in world production for human consumption. Powdery scab is also internationally significant.

Research leader Richard Falloon says the disease has become a major concern to the New Zealand potato industry over the past decade. It can severely reduce plant growth and productivity, and reduces tuber quality, making potatoes unfit for the fresh vegetable market, processing, or as seed potatoes.

In the early 1990s, chemical companies and New Zealand's VegFed worked with scientists to develop disease control strategies using pesticides for a quick fix. Since then, research has increasingly focused on achieving more sustainable solutions and taking broader environmental issues into consideration. Integrated pest and disease control includes traditional and molecular plant breeding, crop rotations and management and targeted use of pesticides.

Molecular technologies are being developed by John Marshall and colleagues for sensitive detection of the powdery scab pathogen in soil. This will provide the information growers need to help them decide whether it is safe to plant potatoes.

Breeding for disease resistance has played a key role. Plant breeder Russell Genet is using traditional techniques to produce a range of breeding lines with different levels of resistance to the disease. These lines are being incorporated in breeding programs, and the availability of powdery scab-resistant cultivars, such as Red Rascal, means that farmers can use these when the disease threatens.

Molecular scientist Jeanne Jacobs has begun to use gene technology to identify and isolate genes which may confer resistance, and this too feeds into Crop & Food Research's breeding programs. Other genetic technologies may also have a place, with scientists investigating methods to introduce disease resistance from new sources.

Professor Falloon says current research directions involve developing a better understanding of the effect of the soil environment on survival of the powdery scab pathogen. "We are interested in what effect crop rotations and the soil environment have on its survival," he said. Crop & Food Research soil chemist Denis Curtin is making good progress in this area.

Professor Falloon says taking an integrated approach to powdery scab should result in a number of different effective control measures, allowing growers to adopt integrated management of this damaging and economically important disease.

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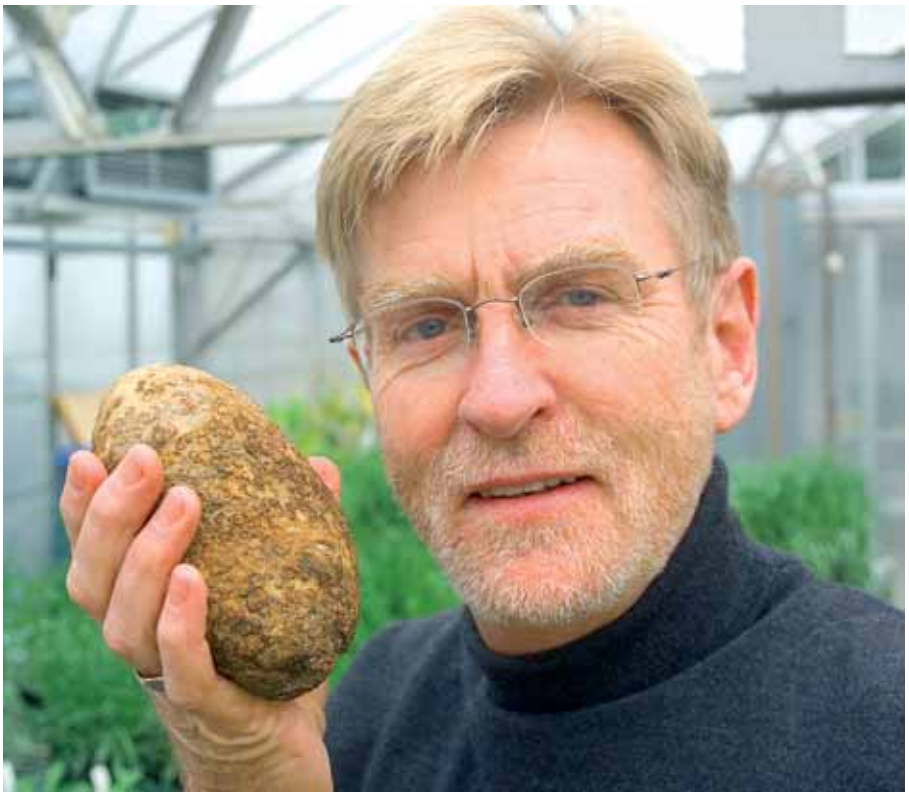
***Richard Falloon says powdery scab has become a major concern for the NZ potato industry in the past 10 years***



# How much is too much common scab on processing tuber seeds?

**An increasing number of seed crops are not certified due to a relatively low tolerance for common scab based on the percentage of infected tubers. Changing the certification system to use disease severity rather than disease incidence as a measure could result in major savings in seed production. This project examines the effect of initial common scab levels on crop disease levels and determines an achievable and meaningful common scab tolerance level that better reflects crop performance and is fair to seed producers and buyers.**

Trials so far have shown that common scab is more likely to be transmitted from one generation to the next when tubers have more than five lesions. The seed certification process is unlikely to pick up which lines transmit common scab as the current seed certification process makes no distinction between a tuber with one lesion or ten lesions. Further, with inconsistencies in seed grading and sampling, the certification process may not accurately pick which lines transmit common scab.

A more reliable measure of the likelihood of transmission of the disease is the level of common scab on seed tubers at the time of harvest of the seed crop. This harvest measure correlates with the level of common scab on daughter tubers. Grading out infected seed above an acceptable threshold of scab in infected seed lines had little or no affect on the level of common scab transmitted to daughter tubers. This indicates that the level of common scab in seed lines before grading appears to be the main way to determine the amount of disease in the resulting crop.

Mancozeb and fludioxinil (Maxim) reduced the transmission of common scab and powdery scab from infected seeds onto daughter tubers. The level of scab control shown by fludioxinil was better or similar to that of mancozeb.

*Project started: 2002*

*Duration: 3 years, 2 months*

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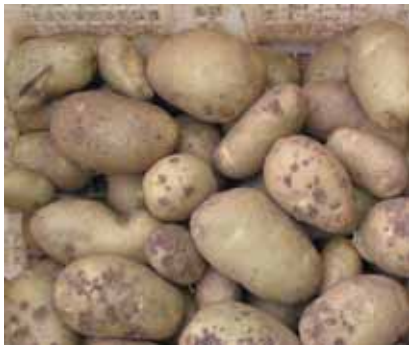
***Trial at Abottsham***

***Treatment 1 – Daughter tubers produced from untreated seeds (used 100% infected seeds with common scab with severe 20% surface coverage)***



***Treatment 2 – Daughter tubers produced from untreated seeds (used 100% infected seeds with common scab with severe 20% surface coverage)***

***Treatment 3 – fludioxinil (Maxim) treated seeds with an almost un-noticeable level of common scab infected tubers***

# Potato cyst nematode management in New Zealand

**As Australian growers grapple with the spread of potato cyst nematode (PCN) in Australia and the difficulties of the official control program, it is timely to hear how some other countries are dealing with PCN. Ron Gall, Executive Officer of Veg Fed, discusses the New Zealand situation.**

New Zealand has had PCN for more than 20 years and still manages to have a viable and competitive potato industry. PCN (*Globodera pallida* and *Globodera rostochiensis*) is managed through the application of good agricultural practice by individual growers. There are no longer any regulatory programs in place to control or eradicate PCN, with the exception of our export certification program. Growers use long rotations between crops (typically five years or longer), plant certified seed (grown in PCN free production sites), and use PCN resistant varieties. Almost all varieties of seed potato sold for commercial production are resistant to *G. rostochiensis* and several have partial resistance to *G. pallida*.

Until 1988, we did have an official PCN eradication program similar to Australia's. This involved "scheduling" of infected land, movement controls, and restrictions of sale of potatoes from scheduled land. However in 1988 there was a major change in Government policy towards only funding programs deemed to be public-good activities (that is, those where the main beneficiary was the general public). The potato industry was deemed to be the sole beneficiary of the PCN eradication program and the industry was required to meet program costs. The potato industry declined to fund the program, and it was terminated soon after that.

Our export certification program for seed and ware potatoes is based on the production of potatoes from pest free places of production. This program meets the requirements of international standards established under the International Plant Protection Convention. Growers register and enter into compliance agreements with our Ministry of Agriculture and Forestry, they must control movement of potentially infected equipment onto properties. Production sites must be surveyed to confirm absence of PCN, and growers, packers, and exporters must have labelling and inventory systems to ensure that only potatoes from the compliance program are exported. Only production sites where PCN has never been found can be entered into the program.

The export certification program has also been incorporated into the domestic seed potato certification program. All production sites entered for seed potato certification must also be registered for, and comply with, the requirements of the export certification program. This ensures that seed stocks are certified as PCN-free.

These robust programs, combined with good grower practices, have resulted in an industry that is managing PCN without regulatory intervention. Clearly New Zealand growers would prefer not to have PCN in New Zealand, but the current industry program meets the industry's needs and still allows our potatoes to be exported to many markets. The robustness of our programs was recently demonstrated with the granting of access for table potatoes into Taiwan.

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## WA surveys

# potato cyst nematode status

**A project supporting a state-wide survey for potato cyst nematode (PCN) has begun in Western Australia.**

Despite continued testing, PCN has not been found in Western Australia since 1989. After 16 years of freedom from this pest, extensive surveys of potato production regions will be undertaken to substantiate the PCN-free status of the state.

Worldwide, programs to eradicate PCN have rarely been successful. However, there are strong indications that WA is already free of the nematode as it has not been detected since 1989. A small and isolated infestation on 15 hectares (20 kilometres south of Perth) was eradicated, and subsequent quarantine, testing and monitoring protocols have remained in place.

The PCN survey is funded by HAL with support from the Potato Growers' Association of WA and the Western Australian Department of Agriculture.

Substantial benefits are likely to result from international market recognition of Western Australia's Area Freedom status.

New markets have already been identified in the Middle East and South East Asia, and the expectation is that Area Freedom status will reduce costs to growers, the industry and state for testing, surveillance and quarantine programs.

Researchers anticipate the project will provide the opportunity to further promote the benefits of seed potatoes sourced from WA for important markets such as Indonesia, Sri Lanka, Thailand, and Mauritius.

Sites at Munster and Wattleup on the southern boundary of Perth where PCN was detected in the late 1980s will be intensively surveyed. Soil samples for testing will also be taken from all grower properties within five kilometres of those original sites.

In other phases, 50% of remaining properties in the Perth potato-growing area will be sampled, followed by 25% of all other potato-growing areas (including seed producing areas)of Western Australia.

New Zealand expert in PCN biology and detection, John Marshall, will collaborate on the project.

Some 2000 ha of potatoes are grown annually in Western Australia, producing 10,000 tonnes of seed potatoes and 87,000 tonnes for domestic consumption, processing and export.

While PCN has never posed a production constraint to potatoes in the state, past detection of this pest has significantly influenced marketing and export.

*Project started: July 2005*

*Duration: 2 years*

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***Technical Officer Sarah Collins (left) and Nematologist Dr Vivien Vanstone at work in Agriculture WA's Plant Nematology Laboratory, South Perth.***

# The Potato Industry and Biosecurity

***Biosecurity* means a set of measures designed to protect a crop, crops or a sub-group of crops from Emergency Plant Pests (EPP) at national, regional and individual farm levels.**

## Background

As an island continent, Australia has remained relatively safe from the Emergency Plant Pests (including insects and disease), which are found elsewhere in the world. This benefits plant industries including the potato industry, by giving growers a valuable competitive advantage in securing market access and maintaining reduced production costs.

The current level of strict quarantine is an essential part of protecting Australia's potato industry from new pests but will not provide total protection. The potential for new pest incursions from near neighbours and increasing international movement of passengers, cargo and mail is an ongoing threat to Australia's favourable plant health status. EPP's could cost the potato industry millions of dollars through job losses, reduced export opportunities and increased control costs, which is why effective pest management is essential in protecting Australia's economy.

## Potential pest threats to the potato industry

There are a number of pests that affect potato crops around the world that are currently not present in Australia. For example, Bacterial ring rot which affects the whole plant, leaves stems and vegetative organs. It can result in total yield loss, cause decay of potatoes in storage and loss of markets due to trade restrictions.

## Plant Health Australia

Plant Health Australia, (PHA) is a public company that works with industry and government to coordinate, develop and implement plant health policies and management systems that improve Australia's ability to respond to serious plant pests. PHA is currently working with representatives from the Australian Government, AUSVEG, state and territory governments, HAL and other experts to develop a national biosecurity plan for the potato industry.


## Industry Biosecurity Planning

An industry biosecurity plan, (IBP) involves actively identifying the pests that could impact the industry, analysing the risks of these pests, and laying out procedures to reduce the chance of these pests reaching our borders. This results in a list of high priority EPP's.

Industry biosecurity planning also involves developing procedures to minimise the threats posed by these EPP's even if they do reach our borders. Through this pre-emptive planning process the potato industry will be better placed to maintain domestic and international trade, negotiate access to new markets and reduce the social and economic costs of pest incursions to both growers and the wider community.

As the potato industry has experienced already with Potato Cyst Nematode, developing a national response strategy once an unwanted pest is present is fraught with difficulty.

## What can you do?

There are several practical steps growers can take to ensure better biosecurity for their individual business and the wider industry. Growers can start by doing a biosecurity assessment of their property using the farm biosecurity checklist, and considering which strategies would minimise risks to their operation.

## Checklist

- Do you have information signs placed at the entry gate to demonstrate your hygiene/biosecurity measures?
- Do you maintain secure boundary fences?
- Do you provide movement controls (people and vehicles and wash down areas/footbaths to prevent spread of pests onto your property?
- Do you have designated parking for visitors?
- Do you provide on-farm transport for visitors?
- Has visiting machinery been cleaned correctly?
- Do you purchase certified seed and ensure all seed


Spotted anything unusual**?**

If you spot anything unusual on your crop, check it out and call the Exotic Plant Pest Hotline on 1800 084 881

LOOK. BE ALERT. CALL AN EXPERT. **1800 084 881**

purchased from other properties is free from pests that may affect the long-term viability of your farm?

- Do you ensure yourself and employees are adequately trained in correct use of chemicals for pest control?
- Do you provide training and awareness for all farm employees?
- Do you use quality assurance and/or best management practice systems?
- Have you sought advice from a farm consultant in developing and implementing a biosecurity plan for your farm?
- Have you been to an overseas farm or a suspect area? **Wash your clothes, boots and hair, and declare your international visit to quarantine!**

PHA urges producers to develop and maintain their vigilance, and to take action if they spot anything unusual in their crops by reporting it immediately to the Exotic Plant Pest Hotline on 1800 084 881.

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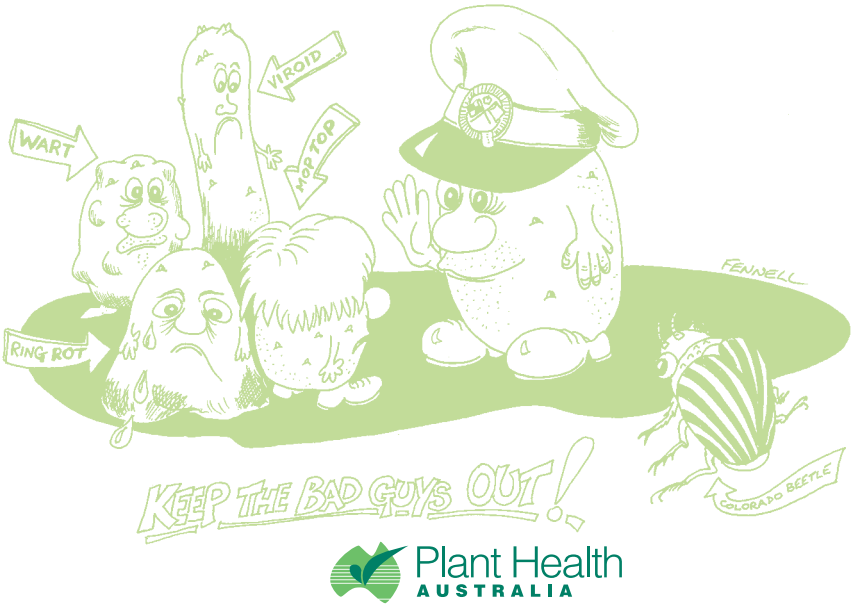


Plant Health AUSTRALIA

### The Bottom Line

- Industry, government and the community are all responsible for maintaining Australia's plant health status
- Prevention is the key
- Simple biosecurity measures will assist in protecting the industry and help keep crops free of pests as well as preventing movement of pests between regions.

[i] Emergency Plant Pest (EPP) is a known exotic plant pest; a variant form of a plant pest already established in Australia, or an entirely new serious plant pest, all of which would have an adverse economic impact at a regional or national level if established in Australia. An EPP may also be a plant pest that is being officially controlled in Australia but requires a significant emergency response to ensure that there is not a large scale epidemic of regional or national significance.

# Predicting and detecting soil-borne diseases of potatoes

Your Levy @ Work

**The project has developed DNA-based soil diagnostic tests for the soil inhabiting organisms (pathogens) that cause common scab, powdery scab, Rhizoctonia canker and black scurf, Verticillium wilt, black dot and silver scurf of potato plants and tubers. The advantages of DNA tests are that they are quick, reliable, provide a measure of the amount of the organism present and specific to a particular disease organism, including its strain.**

Many conventional tests are impractical, being labour intensive and cumbersome, taking several weeks or months to complete and often requiring several extra tests to confirm the identity of a specific disease strain.

DNA-based tests mean the research into developing disease management strategies will now be much more efficient and targeted. Scientists have the tools to track populations of disease organisms in the soil and see how they may change with crop rotations, seedbed preparation methods, nutrient levels and various organic and chemical treatments applied to the soil. As we learn more about the behaviour of the disease organisms, we will be better able to predict disease risk and identify more effective disease management options.

The tests will be refined and become an integral part of the research and development being conducted in the Processing Potato R&D program (see page 22) over the next five years.

DNA-based tests and decision support tools will eventually become part of a commercial service for potato growers to help manage potato crops for maximum profit. These tests can be partially automated, allowing large numbers of soil samples to be processed. Single soil tests will provide results on the disease risk associated with all the targeted disease organisms present in a particular field.

*Project started: 2001*

*Duration: 3 years*

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# Solution to common scab at hand

**A solution to common scab is likely within five years, with the successful introduction of common scab resistance into commercial potato varieties.**

This project has used tissue culture to select resistant clones of common processing and fresh market potato varieties. Broad scale testing of the more than 700 selected potato clones is underway with many lines showing high disease resistance.

## The problem

Common scab poses one of the greatest economic constraints to Australia's French fry industry and is an important disease worldwide. Although not directly affecting tuber yields, disease lesions greatly reduce tuber value and demand extra processing steps during production. This means crops with severe disease are often rejected by processing companies and those with moderate disease downgraded to ware quality, bringing about substantial losses to producers. Conservative estimates of losses due to this disease in Tasmania alone are about $3.66 million a year.

Management of common scab has proven extremely difficult in Australia and overseas.

Chemical seed treatments can be effective if the field has low scab levels but is less useful where high disease levels exist. Soil treatments are generally less effective.

Similarly, most cultural management strategies have had limited success. Some are difficult to implement using current cropping practices and may in time exacerbate other problems. For example, increased irrigation at tuber initiation can increase the amount of powdery scab and black leg and lowering soil pH, can limit the success of rotation crops.

Biological control has potential, but cost effective commercial control is yet to be demonstrated.

## Rapid solution

Incorporating this disease resistance into the potato is an obvious long-term goal to improve the sustainability of potato production. The best existing commercial varieties have only partial resistance and using traditional breeding to select new traits such as resistance to common scab is extremely difficult. Perhaps for this reason, relatively little effort, until recently, has been invested in selecting for common scab resistance in breeding programs here or overseas.

The answer to common scab may lie in plant tissue culture technologies. Use of plant tissue culture cell selection offers a quick way to extend resistance to existing commercial cultivars without the genetic re-assortment associated with traditional breeding crosses. It makes it possible to keep the desirable characters and market acceptability of the original variety while introducing the disease resistance trait.

In the case of common scab, the focus in this research has been on a toxin, Thaxtomin A, produced by the bacterium responsible for the disease. Without this toxin, common scab can not develop.

Using tissue culture, researchers have successfully selected Thaxtomin A-tolerant potato cells from popular commercial varieties. These cells grow into potatoes that also resist the toxin and greatly reduce sensitivity to common scab. In all other ways, the cloned potatoes are the same as their *Russet Burbank*, *Atlantic*, *Desiree*, *Pontiac* and *Shepody* parent varieties.

## Testing

Researchers have started broad scale screening of over 700 lines grown from these cells for toxin tolerance and disease resistance. From those tested to date (over 160 lines), about 20% had superior disease resistance (both in amount of tuber surface covered and depth of lesions formed) than the parent varieties.

The findings have provided proof of concept for the new method and researchers anticipate that scab tolerant clones of current commercial varieties will become available to industry in the next five years.

### Role of auxins in common scab disease

Glasshouse and field studies from the UK showed foliar applied auxins reduced common scab. Researchers in this study confirmed this idea, and demonstrated that the foliar applied auxins reduce disease by interfering with the action of the toxin. This finding that may lead to development of extra disease control strategies for common scab.

This work has now become incorporated into the Processing Potato R&D program.

*Project started: 2001*

*Duration: 3 years*

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***Typical tubers harvested from a disease trial of common scab tolerant Russet Burbank clone (A380) compared to the diseased parent clone***

# Potato Tuber Necrotic Ringspot Disease - Potato Virus Y$^{-NTN}$

**Potato Virus Y (PVY) is an important plant virus worldwide, spread by aphids and infected tubers. It is not harmful to humans but may reduce crop yields.**

PVY has been seen in Australian solanaceous crops: tobacco, capsicum and tomato for many years. It is rarely seen in Australian potato crops largely because of our stringent seed certification schemes.

## Symptoms

All PVY strains can cause mottling of leaves, with symptoms varying with cultivar and weather conditions. Symptoms are more severe in the presence of viruses PVS or PVX.

Leaves of plants with PVY can vary from having no symptoms to severe yellow mottling. Dead areas usually start as patches or rings and gradually expand to affect the whole leaflet. Leaflets may collapse or remain on the plant. In addition, severe wrinkling of leaves or brown streaks on leaf veins, petioles or down the stem may be seen.

Tuber symptoms of the NTN strain of PVY can cause irregular, pinkish rings on the skin that kill the tissue and eat into the tuber or crack the skin.

There is concern overseas about increasing plantings of *Shepody* and *Atlantic* cultivars, as these can be symptomless carriers providing a hidden source of virus for sensitive cultivars.

Plants with secondary PVY°, that have been produced from infected seed, can be dwarfed as well having mottled and wrinkled leaves.

## Disease Spread

PVY is transmitted by aphids in the field and in storage if the tubers have produced shoots.

Many species of aphid can transmit PVY and the most efficient is the Green Peach Aphid (*Myzus persicae*). Aphids feeding on infected plants can acquire PVY within seconds and immediately transmit it to healthy plants. Therefore, chemical control with insecticides is too slow to prevent the spread of this virus.

It can take up to 14 days for the virus to reach the tubers so haulm topping immediately following an aphid infestation may limit the impact on tubers.

Infected tubers can also harbour the disease. Fortunately, PVY virus is not thought to be transmitted through cutting or on machinery.

Several strains of PVY occur in Australia

- PVY$^{O}$ - is the most common but does not appear to produce symptoms in potatoes under Australian conditions. In other parts of the world, more severe symptoms are seen due to different cultivars and climate.
- PVY$^{C}$ - also occurs in Australia.
- PVY$^{N}$ - has been the subject of recent eradication campaigns in New Zealand and Canada. This strain has been found in Australian tobacco crops but not yet in potatoes.
- PVY$^{NTN}$ - a subtype of PVY$^{N}$ first reported in Eastern Europe in 1980 and in Australia in 2003. More severe leaf symptoms are associated with this strain during hot weather. Tuber necrosis, where tissue dies, is first seen at harvest and can develop further during storage.

## Potato varieties showing resistance to PVY

*Agira, Amorosa, Carlingford, Charlotte, Foxton, Hertha, Inova, Kennebec 2, Maris Piper, Merrimack, Mondial, Monona, Osprey, Pentland Crown, Ranger Russet (Amisk), Saginaw Gold, Symphonia* and *Trent*

For a full list of varieties contact:

Sherilyn Lauder, DPI Toolangi Phone: (03) 5957 1200

## What to do

Control the virus source:

- use disease-free certified seed tubers
- rogue out virus infected plants early
- remove aphid hosts such as wild mustard, wild radish, nightshade & volunteer potatoes.

Control the virus vector:

- scout crops for aphids
- topkill seed fields early to avoid late infection
- consider resistant varieties.

*The article is based on a VegCheque farmnote.*

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## Understanding the enemy:

# Root Knot Nematodes

**Much more needs to be known about a serious potato pest, *Meloidogyne fallax*, a type of root knot nematode first reported in Australia in 2001.**

Although its impact is now confined to the processing industry, if left unchecked *M. fallax* poses the risk of reaching epidemic levels either alone or in combination with some other soil-borne pathogens like *Verticillium* or *Fusarium* because it makes plants more susceptible to these pathogens.

Tubers with typical *M. fallax* symptoms have been observed at harvest in South Australia and also in processing areas in the North Island of New Zealand.

At the moment, there is no recorded information from Australasia about this pest. We need to know more about its spread, host range and extent of damage to assess the risk it presents to industry.

No detailed research has been done on the nematode's distribution and level of infestation. We know little about how it is spread although it is likely to be through planting infected tubers or in soil spread from infested fields by cultivation, harvest, irrigation or natural drainage.

In Europe, *M. fallax* was first recorded in 1992 and was placed on the list of quarantine organisms nine years later. It was also declared a serious threat to potato production at the World Potato Congress, Amsterdam, in 2000.

## The hidden pest

Root knot nematodes live in soil, plant roots and tubers. They are hardly visible with the naked eye as they are less than 1 mm long. Complete identification is only possible using a high-powered microscope or by biochemical and molecular techniques.

The life cycle of *M. fallax* is similar to other root knot nematode species.

The female is white and pear-shaped when mature while juveniles and males are transparent and worm-like. Juveniles hatch from eggs in the soil or in infected roots or tubers. Once in the roots of their host plants, they establish, feed and mature in the outer layer of the root.

Females become surrounded by a jellied egg mass and stay deeply embedded in infected tubers, often surrounded by brown tissues. Development from egg to adult takes 3-4 weeks. The root knot nematodes overwinter as eggs, and occasionally as young, in infected roots, tubers or soil.

## Symptoms

Above-ground symptoms are rare but during heavy infestation, plants may be stunted and yellowing.

More typical symptoms include galls of varying sizes on roots and tubers, depending on the variety and severity of infestation. The tuber galls are small, raised lumps that occur above the developing nematode, giving the tuber skin a rough appearance.

Galls may develop singly on tuber surfaces, be scattered around an eye or grouped together. Sometimes it is difficult to spot infestation in freshly harvested tubers, but after a few months in storage the egg sacs darken and are obvious as brown spots in the outer layers of cut tubers.

*M. fallax* may also produce galls that look like warty outgrowths, sometimes with roots, on carrots.

## Control

So far there is no direct information on control methods for *M. fallax* but those used for other root knot nematode species may be helpful. These include using resistant plant varieties, crop rotation, flooding, drying and use of antagonistic plants.

In one of the field experiment in the Netherlands, the *M. fallax* population was reduced by 95% during bare fallow for one year. In general, sanitation and use of disease-free material are strongly recommended as control measures.

## Acknowledgements

VegFed supported a preliminary investigation of this pest in New Zealand potato crops

in the 2004-05 growing season. On going studies will be partly supported in 2005-06 by the Foundation of Research Science and Technology New Zealand Biosecurity program.

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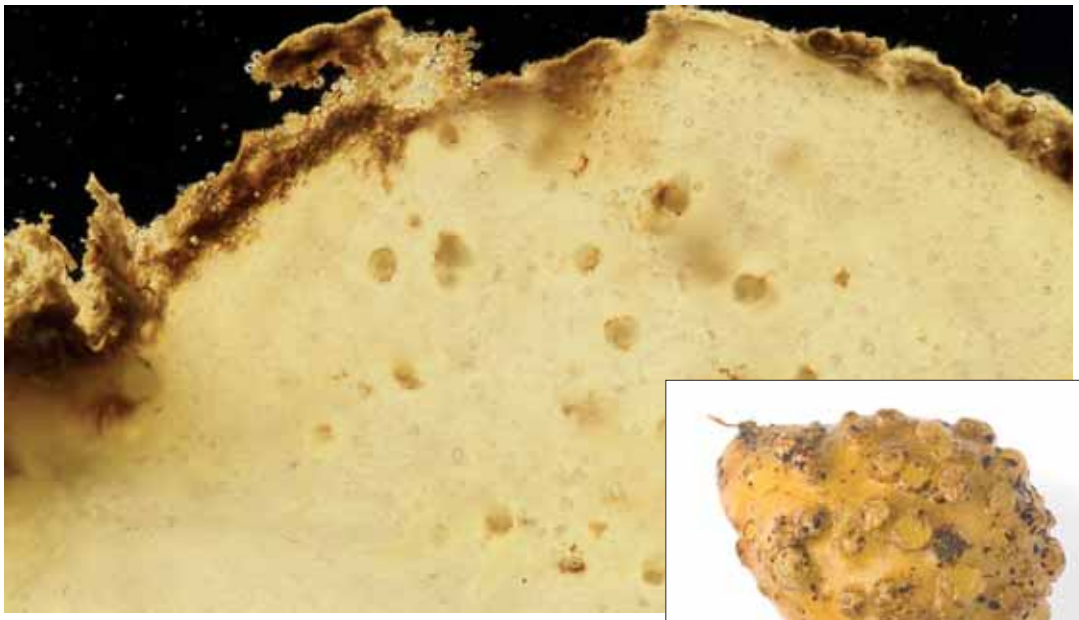
***Fig 1: The female is white and pear-shaped when mature***



*Left: Fig 2: Females become surrounded by a jellied egg mass and stay deeply embedded in infected tubers, often surrounded by brown tissues*



*Right: Fig 3: The tuber galls are small, raised lumps that occur above the developing nematode, giving the tuber skin a rough appearance*

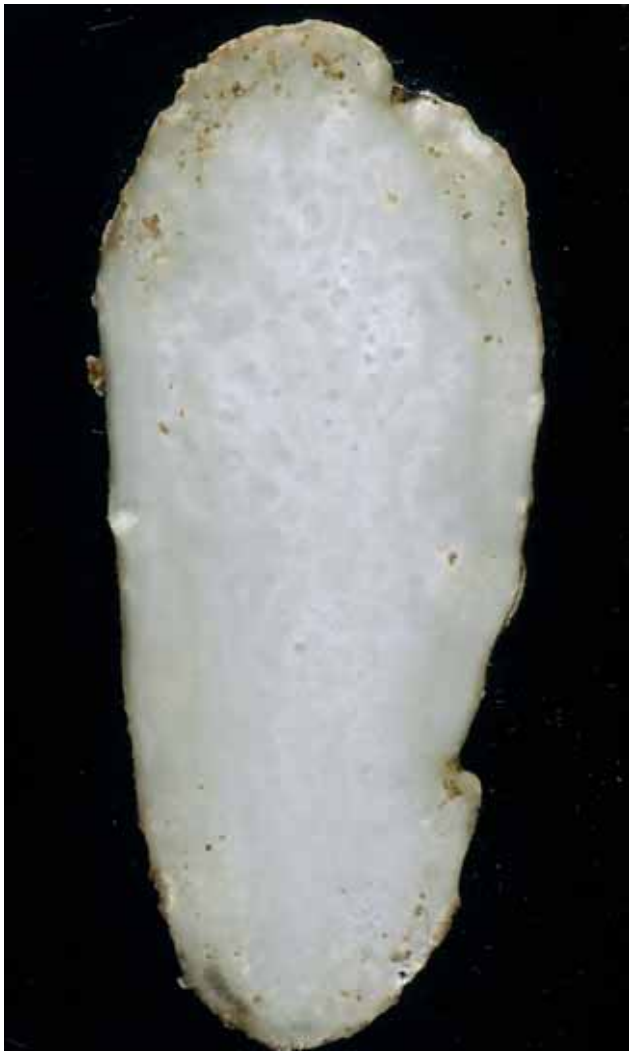


*Fig 4: Infestation under the skin*

# Coming to grips with black dot

**Research on black dot in the past few years has shed new light on many aspects of this fungal disease. The work hasn't provided any simple or magic cure to control the problem, but it has provided new information that can be incorporated into management strategies to minimise the problem.**

## Recommendations from here and overseas

### Tuber seed treatments

Seed lots are often heavily infected with black dot. Tuber seed should be examined for black dot and, if found, treated with the fungicides Maxim or Amistar.

Seed tubers should be free of soil before treatment and fungicides applied so they are spread evenly over the tuber surface.

### Soil preparation

The black dot fungus survives in soil for at least 13 years. Soil fumigation with either Metham or Telone kills the fungus in the soil but treatments are expensive and not always reliable. Fumigated soil should only be planted with disease free tubers. Moleboard ploughing to a depth of 30 cm has also reduced black dot overseas.

In non-infested soil in new areas, only clean or fungicide treated seed tubers should be planted.

### Weed control

The black dot fungus also survives on weeds such as fat hen (*Chenopodium allium*), black night shade (*Solarium nigrens*), skeleton weed (*Chondrilla juncea*), and heliotrope (*Heliotropium europium*).

These weeds should be controlled in the year after harvest and at least 12 months before planting.

### Variety selection

Most common potato cultivars are susceptible to black dot. Coliban is highly susceptible. Early or thin-skinned cultivars are generally more susceptible.

### Planting

The black dot fungus is most active at around 25°C. Planting (and harvesting) at times when soil temperatures are less than 25°C will reduce the level of disease development.

An in-furrow application of Amistar at planting can reduce disease levels. Amistar can be sprayed onto the soil in front and behind the seed tuber to create an envelope of treated soil.

### The growing plant

Black dot develops from infected seed or soil and can show up on stems and stolons 6-8 weeks after planting.

The black dot fungus can also infect potatoes through damaged foliage, particularly after leaves have been damaged during sandstorms. The effect of fungicides on control of this stage of the disease has not been tested.

### Harvest

Tubers should be harvested as soon as possible after maturity to avoid long storage periods in the soil.

The number of irrigations between haulm desiccation and harvest should be limited, as irrigation washes spores from aboveground infected stems onto the tubers.

Removal of haulms or applying Amistar one week after desiccation reduced black dot infection in some experiments.

### Crop rotation

Crop rotation with non-host crops has the potential to reduce soil levels of black dot, but may be of limited value particularly if infected tuber seed is planted.

Biofumigant (green manure) crops such as Indian mustard may be useful in reducing soil levels of black dot.

There is no easy answer to control of black dot. Research so far has not discovered a magic bullet that can be used for control but rather shows that an integrated approach is needed, incorporating many of the strategies discussed.

*Project started: 2001*

*Duration: 3 years*

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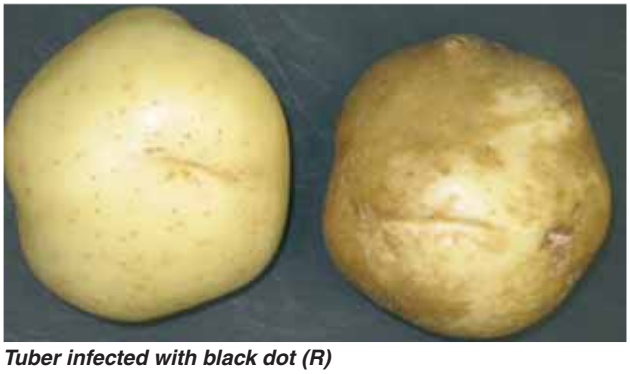
***Black dot infection on tubers***



***Tuber infected with black dot (R)***

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SUMITOMO CHEMICAL

# Packaging and storing premium fresh white washed potatoes

**The production of chlorophyll in tubers when exposed to light and high temperatures leads to greening of potatoes, which is a major problem for growers, packers, retailers and consumers alike. This research looked at ways to slow greening using different coloured films. In a separate trial, researchers sought to find the temperature that would best enhance fresh potato appearance from the potato packing shed to the consumer's plate.**

## Coloured Packaging Trial

Potatoes are highly susceptible to greening in the well-lit, non-refrigerated display areas located in supermarkets. Recent studies have shown red and blue lights speed up potato greening. We looked at using packaging to test whether light shone through coloured films onto potatoes would slow greening.

Green coloured films almost tripled the time it took for *Coliban* potatoes to reach an unacceptable potato appearance, while red, blue and yellow films were only marginally better then no cover at all.

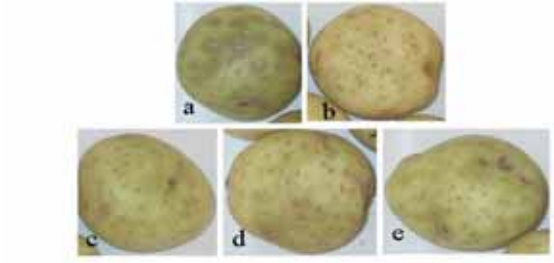
Plastic films greatly reduced the amount of light permeating through to the *Coliban* potatoes.

Light penetrating the green, red and blue coloured plastic was similarly low, but potato greening under green films took longer than under red or blue films.

Potatoes under no cover and wrapped in red, blue and yellow films looked greener then those in green film after eight days.

**Days for *Coliban* potatoes to reach an unacceptable green appearance after being stored at 20°C under fluorescent lights for an initial period of 14 hours and then with a daily light exposure of 4 hours.**

| Coloured film | Days to reach an unacceptable green peel appearance | Amount of light penetrating packaging (Lux) |
|---|---|---|
| No Cover | 5 | 778 |
| Green | 14 | 50 |
| Red | 6 | 51 |
| Blue | 6 | 96 |
| Yellow | 6 | 386 |

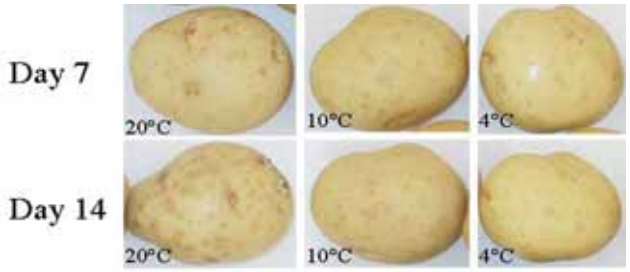



***Potato appearance after 8 days storage at 20°C with daily light periods with no cover or in coloured films (a) no cover, (b) green, (c) blue, (d) red and (e) yellow films.***

## Storage Temperature Trial

From Australian packing shed survey results collected in 2003, fresh potatoes are known to be subjected to temperatures ranging from 4°C to room temperatures throughout the supply chain. This survey finding was concerning as fluctuations in potato supply and storage temperatures have been reported to cause unnecessary stress and impair potato physiology. In response, a storage temperature trial was performed to find the optimum supply and handling temperature that would result in the best potato appearance after 21 days in storage. Temperatures trialled included 4°C, 10°C and 20°C.

Potatoes were held in the dark at between 80-90% relative humidity with visual appearance being the main quality factor assessed.




***Potato appearances after 7 and 14 days in storage at 20°C, 10°C and 4°C.***

After 7 days in storage, the potatoes held at 20°C and 10°C appeared similar, with minimal discolouration over that time. Potatoes held at 4°C had not changed from their initial fresh, white appearance.

At 14 days storage, potatoes held at 20°C were beginning to sprout and were not as visually appealing as those held at 10°C or 4°C, with discoloured patches clearly present around lenticels.

When bags were removed from storage, condensation formed in bags that were held at 4°C, but not in those held at 20°C or 10°C.

## Recommendations

Potato packaging needs to be completely opaque to prevent potato greening, as even minute levels of light eventually cause potatoes to turn green. This said, consumers prefer to have some visibility of the potatoes through the packaging. This work has shown that green packaging is more effective at reducing greening of potatoes than other coloured films, which offered limited beneficial effects in this regard. Education of Australian consumers about the benefits of the green packaging would be a challenge, because who would trust a green package when we all know potatoes turn green, but the end result could be enough to sway consumer perceptions.

Fresh, white, washed potatoes retained their appearance longer when stored at 4°C or 10°C than at 20°C, highlighting the importance of having a refrigerated supply chain for this product. If handling fresh, white, washed potatoes at 4°C, the optimum temperature, it is important that this temperature is maintained right through the supply chain. Condensation will quickly form on the surface of chilled (4°C) potatoes if exposed to air at normal room temperatures (20°C), which will encourage rots. Consequently, if the temperature cannot be ensured at all times, potatoes are better handled through the supply chain at 10°C to avoid condensation while maintaining the appeal of the potatoes. However, where the supply chain is lengthy, fresh, white, washed potatoes should be handled and maintained at 4°C. Do not store below 4°C as chilling injury may result.


## Acknowledgements

Thanks to the Australian packing sheds involved in this project. Your contributions to this project have been greatly appreciated. Funding from the potato levy and Australian Government is also gratefully acknowledged.



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# Communication update

**The current Communication Program ends in December or soon after, so a full report of activities will be provided in the December 2005 or March 2006 edition of Eyes on Potatoes.**

A Communication review will provide a foundation for development of a new Communication Program to begin next year.

## Potato Archives

Potato Archives provides a library of past information generated from the levy R&D program that has been published in Eyes on Potatoes, Potato Australia or as a HAL Final Report. The information will be available on CD or through the industry's new internet site. For those with slow internet connections, the CD may be a bette r option.

Potato Archives is close to completion. For those interested in advanced notice of its availability, please contact me with the following details.

**Email** lwalters@saff.com.au

**Subject** Potato Archives – Please send ordering details

Leave the message as a blank. Your email will be stored and when details are available you will be notified by email.

## Internet service

The industry's new password protected internet site will provide specialised services that can be updated easily. It will provide an important communication tool for the potato industry.

For those interested in advanced notification of when the service will be available, please contact me with the following details.

Your Levy @ Work




**Email** lwalters@saff.com.au

**Subject** Internet service – Please send details for gaining entry.

As for the Potato Archives, you will be contacted when details are available.

## Back issues of publications

Anybody still interested in getting back issues of Eyes on Potatoes and Potato Australia, please contact Trish Dempsey (Phone – (08) 8100 8726 or by email - pdempsey@saff.com.au). Remaining stocks are about to be disposed of and copies of some editions have already been exhausted. So speak now or forever hold your peace!


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***Technology Transfer Manager***
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VOLUNTARY CONTRIBUTIONS

# Economic contribution of horticulture to Queensland

**Employment levels in Queensland's horticulture industry grew at double that state's average in the past decade, according to results of a comprehensive report commissioned by peak lobby group Growcom.**

The ***Economic contribution of horticulture to Queensland*** report showed the value of horticulture production in Queensland almost doubled in the same period.

The report contains information needed to demonstrate the credentials of the horticulture industry as a key driver of the economy and a major employer in regional Queensland.

## Queensland industry

Horticulture is an intensive agricultural industry that is very successful. Employment levels grew by 56% between 1991 and 2001 which was twice the state's average. In the same period, jobs in agriculture increased by 6%.

The total value of fruit, vegetables and nuts produced in Queensland in 2001 was $1.4 billion, $733 million for fruit and nuts and $641 million for vegetables. This represents one third of the total value of national fruit and vegetable production.

A statewide snapshot in 2001 shows there were 3,960 enterprises producing $1.4 billion worth of fruit and vegetables from a total of 92,710 hectares. These operations employed 18,394 people, which was 56% more than 10 years previous.

Fruit and vegetables as a proportion of the total value of all crops has risen sharply from 34% to 40.5 % between 1993 and 2001. Every 10 hectares of land generates a $153,000 contribution to gross state product, up to $300,000 in sales and three full time equivalent jobs.

In the eight year period from 1993 to 2001, the value of fruit and vegetables produced in Queensland increased by 78% (74% for fruit and 83% for vegetables). This outstripped the growth in area under production during the previous 10 years by 80%.

Horticulture is the mainstay of many regional communities in Queensland. The farm gate value of horticulture products is only the start of a chain reaction that has a ripple effect as impacts progressively extend to more and more sectors.

This is a dynamic, sophisticated growth industry that requires high input from growers. It's a high risk investment with a high labour content and relies on a high use of technology to be successful.

## Value of the report

Growcom will use the results to influence government about the importance, strength and size of our industry. We will continue to lobby government to find solutions to key issues negatively impacting on the industry which would improve the future prospects for horticulture.

Common regional trends and issues affecting production identified in the report were biosecurity threats, water availability and security of access, labour availability and cost, business sustainability issues, development of export markets and development of the value chain.

Growcom plans to update the information every three years. The report does not include data for casual labour which is a significant contributor to the total workforce.

## Largest growing regions

In 2001 there were around 1,460 enterprises growing vegetables and 2,500 growing fruit. The average area under production per holding was 22 hectares for fruit and 26 hectares for vegetables.

In the 10-year period to 2001, there was strong growth in area under production (an increase of 44%). The largest areas were:

- **the Coastal Wet Tropics** accounted for 14% of the total area under fruit and vegetable production in Queensland, but 23% of the area growing fruit. The principal commodities grown in this region (in terms of value) are bananas, watermelons and papaw.
- **Lockyer/Fassifern** had 14% of the total area under fruit and vegetable production, but just less than one third (32%) of the total area used for growing vegetables in the state. Main commodities include lettuce, tomatoes, potatoes and sweet corn.
- **Cooloola/Sunshine Coast** accounted for 13% of the total area used for growing fruit and vegetables (19% of the total area used for growing fruit and 5% of the total area growing vegetables). Key commodities are pineapples, strawberries, macadamia nuts and avocados.

## Strongest growth regions

- **Central Inland** (around Emerald), an increase of 265% (albeit from a small base), with fruit and vegetables increasing their share of total crops value from 2.8% in 1993 to 8.5% in 2001. Recent developments related to the citrus canker outbreak and actions that may follow place this growth in question for the future.
- **Atherton Tablelands**, an increase of 229%, with fruit and vegetables increasing their share of total crops value from 23.2%to 64.9%, mostly on the back of increases in mango and banana production.

- **Wide Bay**, an increase of 139%, with fruit and vegetables increasing their share of total crops value from 35.7% to 58.1%, which was driven by growth in macadamia nut production.

## Most significant commodities

*Fruit, value & major production area*

- bananas, $345 million, Coastal Wet Tropics
- mangoes, $64 million, Atherton Tablelands
- mandarins, $57 million, Central Burnett
- pineapples, $44 million, Cooloola/Sunshine Coast
- avocados, $39 million, Wide Bay
- strawberries, $32 million, Cooloola/Sunshine Coast
- apples, $22 million, Granite Belt.

*Vegetables, value & major production area*

- tomatoes, $135 million, Bowen and Wide Bay
- capsicums and chillies, $60 million, Bowen
- potatoes, $47 million, Atherton Tablelands
- lettuce, $43 million, Lockyer/Fassifern
- mushrooms, $36 million, West Moreton
- french beans, $32 million, Lockyer/Fassifern and Cooloola/Sunshine Coast.

A copy of the report can be obtained by visiting the Growcom internet site at – www.growcom.au.

*Project started: June 2004*

*Duration: 6 months*

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VOLUNTARY CONTRIBUTIONS

## Seed management service for Tasmania

**The Seed Management Service (SMS), started in 2002-03, covered 31 seed potato crops. In 2003-04, the number of paddocks grew to 48, but a reduction in seed grower numbers in 2004-05 saw the number drop to 23 crops.**

SMS combines and analyses key production data from multiple seed potato crops. The collected data includes, soil nutrient levels, soil moisture status (every four hours), tissue nutrient levels, scouting observations, soil and air temperatures (every two hours), and yield/quality assessment

SMS aims to:

- promote new and improved technology for seed potato crop management
- encourage widespread use of agronomists and consultants
- combine and analyse key data on seed crop production (irrigation, nutrition, pests and diseases) for the benefit of all seed growers.

### Outcomes

- Data collected over two seasons (with the third season's data to be completed soon) has revealed the impact of fertiliser inputs on yield. Total nitrogen fertiliser rates of 170 and 280 kg/ha can produce similar yields.
- Top-dressing 40-50 kg nitrogen/ha maximises return.
- Applying 200-250 kg phosphorus/ha maximises return.
- Higher soil potassium levels increase return, but higher potassium fertiliser levels do not improve return.
- The impact of timely irrigation has been calculated using soil moisture monitoring equipment, with well watered paddocks yielding 12 T/ha more yield than poorly watered paddocks.

A steering committee representing growers directs development of the service. SMS has been well received and supported by industry.

Winter has proved a good time to present the findings to all seed growers, and small group workshops held with SMS growers assist with planning for next season's crop.

*Project started: 2002*

*Duration: 3 years*

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***Left: An isolated seed potato crop in southern Tasmania***

Your Levy @ Work

## Effects of potato seed characteristics on breakdown seed-piece and poor emergence

***Fusarium dry rot on cut seed from a poor seed line versus a well healed cut surface from a healthy seed line***

A feasibility study was conducted to investigate whether specific gravity, nutrient elements, skin firmness, wound healing, susceptibility to dry rot and other measurable skin properties could be indicators of seed quality and field performance. In total, 60 seed lines, consisting of 58 *Russet Burbank* and two *Ranger Russet*, were examined in laboratory and field studies.

A positive yield relationship exists between percent of large tubers from a field trial and total nitrogen and phosphorus levels in laboratory tests.

There was a decreased susceptibility to Fusarium dry rot of tubers with increased total nitrogen and magnesium, and better skin firmness.

Calcium levels in tuber seeds had no direct effect on skin firmness. The specific gravity of the seed tuber was related to its potassium level, but had no direct impact on later potato yield.

*Project started: 2003*

*Duration: 2 years*

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***Serve-Ag Research Pty Ltd***
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VOLUNTARY CONTRIBUTIONS

# Improving virus control in seed schemes in WA

**The Western Australian potato industry is keen to ensure its seed quality is of the highest standard. In the past, serious disease outbreaks have occurred that concern the domestic industry and pose a threat to emerging export markets.**

This project introduced a way of detecting the level of virus in generation three (G3) seed more objectively than through field inspection,. Results from this and previous projects have confirmed the high health status of Western Australian seed potatoes. The project also highlighted where further improvement could be made at grower, seed scheme and state levels and has implications for improving the national standard of certification of seed potatoes.

## This project found

In 2003-04, of 6,892 generation two (G2) sown plants sampled close to senescence, the rate of viruses present was acceptably low in both seed schemes. The new objective measure compared favourably with the visually determined national standard for virus in generation three seed, which is 0.1% (one plant in a thousand) virus infected for seed for further multiplication and 1.0% for certified seed for sale. Results were: potato leaf roll virus (PLRV) 0.14%, tomato spotted wilt virus 0.03%, potato virus Y (PVY) 0.03%, potato virus S (PVS) 0.12% and potato virus X (PVX) 0.52%. The PVY find resulted in steps being taken to eradicate the disease in WA.

Australian seed certification schemes rely on visual identification of viruses. As many viruses are difficult to distinguish by symptoms alone, virus testing significantly enhances the effectiveness of the seed certification system by identifying and counting infection levels. Appropriate virus management strategies (Eyes on Potatoes, March 2004) can then be employed.

PLRV, the most important virus affecting seed potato crops in Western Australia, was found to be under control in both seed schemes. However, PLRV was still detected at five of fourteen seed growers crops tested. This underlines the need for growers and the seed certification service to maintain vigilance and an effective management strategy.

When aphid monitoring and virus testing are applied in addition to National Certified Seed Scheme procedures, all major viruses found in WA were successfully controlled.

Results of monitoring showed that pest pressure and the need for action varied between regions, within regions and on individual farms.

Collation of the results from this and previous projects shows that some growers had recurring problems with the same virus.

## Recommendations

Virus testing become a permanent component of the seed schemes in Western Australia and be used for later generations as well as for generation two sown crops.

Virus testing be considered for adoption by the National Standard for the Certification of Seed Potatoes to show the viral health of certified seed and improve the effectiveness of our National seed certification system.

Future research should develop a cost effective, rapid, quantitative PCR test and sampling procedure to measure virus level in dormant tubers. The current choice of testing leaf material gives estimates of virus levels in tubers or requires several weeks for tuber dormancy to break before testing can be done.

Introduce tolerances for PVS and PVX in the Registered Seed Scheme to speed eradication of the viruses.

Weekly reports of pest abundance and recommended actions help keep pest numbers below levels that could affect the quality and yield of crops. Seed growers should have access to this information either by monitoring themselves or employing a crop inspection service.

*Projects started: July 2002*

*Duration: 2.5 years*

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***e mbholland@agric.wa.gov.au***

***Mark Holland inspects WA seed crop***

VOLUNTARY CONTRIBUTIONS

# Technical support a direct link to seed performance in export markets

**Technical support helps seed market development by finding ways to improve seed performance. We found that excess copper levels reduce potato yield in Sri Lanka and that late blight is also a major constraint. After confirming these results we will be able to plan strategies to overcome these constraints. This information will help Sri Lankan farmers grow our seed to its full yield potential and so promote Australian seed sales.**

Potatoes are an important crop in Sri Lanka. They are often grown on small terraced landholdings and yields are low at 16t/ha. There is evidence that 40t/ha is possible if major yield limitations are overcome. If crops grown from Australian seed can produce these yields, Australian seed will be a very attractive product for this market. To help reach these yields, we wanted to identify yield limitations in Sri Lanka.

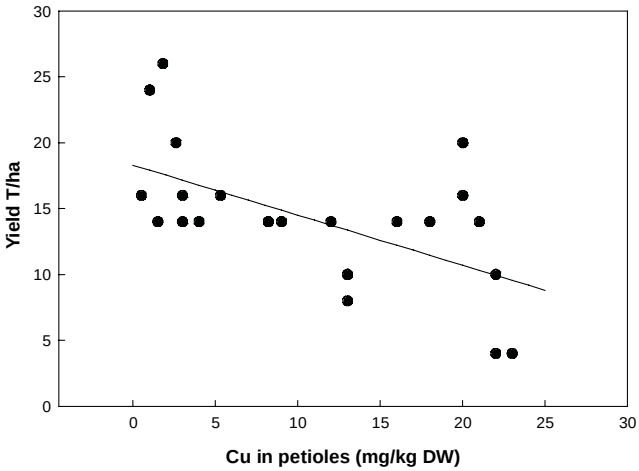
## Yield rankings

We surveyed *Granola*, at 30 different sites in the highlands of Sri Lanka, over the wet and dry season in 2004. We collected information using a questionnaire and through measurements such as petiole nutrient levels. Growers also identified pests and diseases during seed storage and planting. Yield was used to rank growers into three groups: low yield, medium yield or high yield.

Crops in the January planted wet (Maha) season were grown at Nuwara Eliya (2000m) while crops in the June planted dry (Yala) season were grown at Welimada (1000m).

## High copper lowers yield

We found a significant yield reduction with increasing concentration of copper (Cu) in the petioles in the wet season but not in the dry season. The high concentration of Cu (more than16 mg/kg) in wet season petioles is likely to be toxic and is probably due to many years of copper fungicide and fertiliser applications to potatoes and rotation crops such as tea.




***Yield versus copper concentration in petioles for Sri Lankan wet season crops. We think that many years of applying copper fungicides and fertiliser may be causing toxic levels to accumulate in some crops.***

## Late blight identified

Late blight was the most prevalent disease in wet and dry season crops. Late blight is the most damaging disease of potatoes in Sri Lanka, with A1 and A2 mating types present - its control is paramount for increasing yield. Farmers with the highest yields in both crops often reported more disease than farmers producing the lowest yields. We think this apparently contradictory situation can be explained this way. Growers who are able to correctly identify specific disease symptoms will report more disease. They will also be able to implement more effective control practices than farmers who don't recognise disease and so produce greater yields than the less knowledgeable growers.

Both findings from the project will improve seed performance.

Funds for this project were contributed by the Department of Agriculture, WA, Western Potatoes, CIC Agri Businesses and Horticulture Australia Ltd. Trevor Wicks is thanked for his expert assistance with this project.

*Project started: November 2003*

*Duration: 19 months*

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***Field Officers Sampath and Manjula (centre) of CIC Agri Businesses survey the crop with farmers at Nuwara Eliya.***

Your Levy @ Work

# Ensuring our public varieties keep performing

*Jan & Laurie Shaw from Beech Forest help Roger Osborn in a mid term assessment of verification plots at DPI,Toolangi*

**Commercial potato growers need vigorous true to type seed tubers to have the best chance of achieving high yields of quality potatoes.**

To ensure the Australian potato industry has ongoing access to high yielding lines of public varieties, ViCSPA maintains and refreshes its collection. This service has been funded by the potato levy since the year 2000.

The collection represents years of selection and improvement of many traditional public varieties by skilled seed growers. It is audited twice a year to ensure world's best practice procedures are in place.

As such, it is the reference collection of public varieties for all seed potato certification schemes in Australia and is held *in vitro* (in an artificial environment – see picture) at the Primary Industries Victoria's research centres at Knoxfield with a duplicate collection at Toolangi. The Department of Primary Industries Water and Environment, Devonport, also holds some public varieties *in-vitro*.

## Minimising off-types and mixes

The project minimises the risk of off-types being multiplied in seed schemes and each year refreshes the in vitro cultures of five vigorous varieties, some of which have been in culture for many years.

Since 2000, 20 field varieties have been reselected to refresh the *in vitro* cultures.

Each year, six to 10 mini tubers from each production batch of each variety from all accredited laboratories have been planted in field plots to check that the plants produced

*FH Bruton & Sons' Nooksack crop at Trentham (grown from the in vitro public variety collection)*

***Strong, healthy, even Coliban crop grown by D &Y Pike Pty Ltd at Neerim Junction, derived from the in vitro public variety collection***

were true to type. The plots help isolate off types or mutations and variety mixes. In this final year of the project, 241 plots were grown. During growth and at harvest, the plots were closely checked for variations. Several mixtures were identified throughout the project. Rapid identification of mixtures prevents large quantities of the wrong variety or two blended varieties being multiplied for seed.

Each year, plants of five varieties are selected in the field for re-testing (re-indexing) for diseases and to ensure they are the correct variety. Varieties are checked by DNA fingerprinting or protein testing of tissue cultures.

Other checks ensure each variety is free from *Bacillus*, a bacteria, which can contaminate cultures. Varieties passing the tests are then added to the in-vitro collection.

The aim is to refresh the whole in-vitro collection every eight to ten years and ensure the best types and vigorous seed of each public variety are available to industry through the certified seed schemes in Victoria, South Australia, New South Wales, Tasmania and Western Australia. ViCSPA has ensured the availability of new selections of each variety by funding their distribution to accredited laboratories or facilities.

## About ViCSPA

ViCSPA is a government-approved independent organisation that provides certification services for the Australian potato industry. As well as caring for the variety collection, it accredits processes and facilities producing minitubers and micro tubers for Australian Certified seed schemes, and inspects fields and tubers for its 100 member growers. Each year, about 2,000 hectares of crop is certified.

We would like to acknowledge:

- the ten ViCSPA accredited laboratory facilities that annually provide the minitubers and micro tubers
- Roger Osborn, ViCSPA Accreditation Officer, for detailed growth notes and comparisons and auditing the *in vitro* collection
- staff at the Department of Primary Industries at Toolangi for helping with field plots and at Knoxfield for re-indexing
- the many seed growers for their time and expertise in reviewing the plots.

The collection will continue to be maintained under a new levy project starting in July 2005

*Project started: 2000*

*Duration: 5 years*

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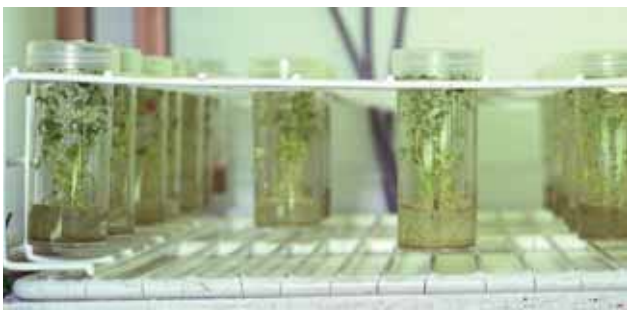


***Plants held in vitro at Knoxfield***

Your Levy @ Work

# Potato seed handling and storage - a best practice manual for Australian growers

**A survey of current Australian practices and a review of international information have resulted in a best practice manual for potato seed handling and storage management.**

Seed potato handling and storage requirements have been researched extensively, especially in Europe and the US. Research findings have been published in scientific, technical and grower journals. Most publications take for granted a high level of knowledge of plant physiology, technological awareness and easy access to state of the art technology. The amount of time it would take for single operators to gather and evaluate existing information form all its sources and adopt or adapt it to a specific operation is generally prohibitive.

This comprehensive manual includes handling, hygiene and disease prevention information. It is designed so it can be easily updated or extended. An emphasis has been placed on operational planning, documentation of desirable standards and technologies, record keeping, preventive /corrective actions, and understanding of potential risks.

Relevant technological specifics described by different information sources have been included. They may not always be completely transferable to each different handling and storage chain components; however, the principle requirements of seed potatoes remain the same and most technologies are adaptable to a wide range of situations. For this to occur, an effort has been made to present relevant information in a way that makes it easy to find and use for individual operators.

A prerequisite of this manual was to re-define "seed storage". It was felt that industry and research focus on crop production issues and the in-store period. Other 'seed life stages and issues' received less attention, even though they can have a significant influence on outcomes of handling and storage. We came to the conclusion that seed storage management starts at harvest and ends at planting. It includes planning, documentation and communication.

## Extensive survey

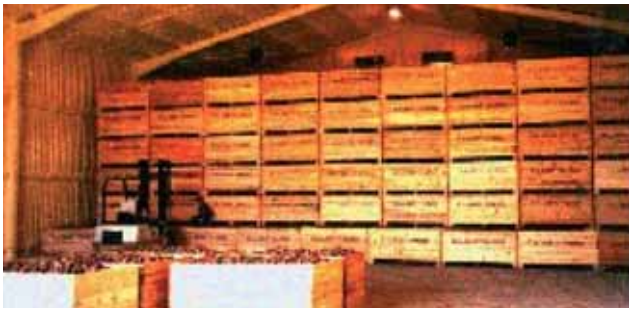
The project team surveyed seed potato storage operations and persons associated with the seed potato industry (processing and ware potato growers, consultants, IDO's, processors) in Victoria, Tasmania, New South Wales, South Australia and Western Australia. Store visits and discussions with a wide range of people provided a good understanding of the variability of seed potato handling chains from seed potato paddock, over several handling, transport and storage steps to the next seed or commercial paddock.

The manual focuses on the following issues.

- What can go wrong - risks associated with different activities
- How to prevent problems, risk management – how to prioritise and focus on issues that potentially cause the biggest losses/problems
- What to monitor to identify and prevent problems
- Specifications - which are the optimum storage and handling conditions to aim for, and how to go about it
- How to get as close to specifications as possible under given operational circumstances

The guidelines and references cover the following operational steps: harvest, holding in the paddock, transport and intake, curing, storage, grading, cutting, and seed transport from store to commercial or seed grower.

Brief checklists highlight the most important considerations for each step and operator. Self-assessment tables for different operators involved in seed potato handling and storage are included to allow them to prioritise areas of improvement in their part of the chain. Optimum conditions and potential risks for each operational step are listed in an easy to follow table format. Further references, diagrams, photos and assessment sheets are available in separate sections of the manual in support of the specifications and descriptions in the operational tables. A glossary, a troubleshooting guide and a list of reading material are included to complete the information.



***Internal view of loaded potato box store with large roof space important for crop inspection and even air distribution***

Industry concerns and requirements addressed in the manual

- Smaller seed tubers and more uniformity in tuber size and quality needed
- Better storage practices by some operators desirable
- Better hygiene in some cutting operations desirable
- Effective disease management throughout the chain needed
- Injury prevention (bruising, cuts etc) needs attention
- Greater understanding and control of physiological age (P-age) required
- Better lines of communication between buyer and seller needed (e.g. bin labels, 'seed history record')
- Timely information provided from commercial growers to seed growers/storers about requirements

*"Seed storage management starts at harvest and ends at planting."*

- Better traceability and information about seed history needed throughout the chain
- Store operators need a better understanding of curing, store capacity, ventilation/airflow temperature and humidity effects on seed
- Better transport conditions or control of conditions (temperature, condensation control) required

The manual is currently with HAL in the form of a final report. It is waiting for publication as a grower manual, following a review by industry stakeholders .

*Project started: 2001*
*Duration: 3 years*

***DORIS BLAESING***
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***e dblaesing@serve-ag.com.au***

***A Dutch curing system. Air is forced through the bins by fans, similar to forced air cooling.***

## Optimising production and storage for seed potato physiological quality

Seed certification ensures good quality with respect to disease, but variations in physiological age or physiological condition of seed between certified seed lots can result in big differences in crop performance and yield. This project identified production and storage treatments that most affect seed physiological quality and subsequent crop yield.

Trials in this and other Australian projects confirm that yield differences of more than 25% can occur between seed lots.

***Differences in physiological condition between certified seedlots***

Timing of haulm kill in the seed crop has little effect on quality. However, planting date of the seed crop affected seed performance in a recent trial, with seed from a November planting in Tasmania out-yielding seed from December and January plantings when grown out in the following season. In-ground storage for up to two months after haulm death did not affect performance of the crop grown from that seed in the following season.

***Sprout branching disorder***

Poor ventilation in storage, leading to build up of carbon dioxide, tended to decrease seed quality, but the effect was small. Some evidence exists that exposure to high carbon dioxide concentrations at critical times during storage may lead to the sprout branching disorder noted in Tasmania in recent seasons.

Importantly, differences in seedlot performance are not consistent between locations. In one trial involving five seedlots assessed at two locations, the worst performing seedlot at one location produced 62 t/ha (compared to an average 69 t/ha for the other four seedlots) but performed well at the second site with 73 t/ha (compared to an average 72 t/ha for the other four seedlots).

Seed growers and store managers should not take the blame for poor seed performance – the conditions under which the seed is planted and grown have as great an impact on yield potential in the crop.

### Recommendations from the research

Stresses such as high soil temperatures and low soil moisture levels in seed crops usually age seed and should be avoided. Adequate ventilation in seed stores is also desirable based on evidence that sprout branching can be induced by high carbon dioxide exposure.

*Project started: October 2002*
*Duration: 3 years*

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VOLUNTARY CONTRIBUTIONS

# A win both ways

## - Building West Java crisp capacity and Australian seed sales

**Australian Atlantic seed potatoes perform well in Indonesia when freshly imported or as once-grown saved seed. This means the Indonesian seed potato scheme could be augmented with seed from Australia to the benefit of both countries' potato growers. The seed will only perform well if the crops are well managed. Australian seed suppliers can help achieve this with direct agronomy support or by supporting projects like this one to conduct trials to optimise crisp potato yields there.**

PT Indofood is a large Indonesian processing company with three crisp factories in Java. The plants have been running under capacity because there is a shortage of local crisp potatoes. This is because *Atlantic* does not yield as well as the table variety Granola and so crisp crops are less attractive to farmers. We wanted to see whether *Atlantic* crisp processing production in West Java could be improved using Australian seed potatoes to the mutual benefit of both countries.

Last year we reported that West Australian *Atlantic* seed potatoes produced relatively high yields of 29 t/ha in Java during the dry season. These yields will make crisp processing more attractive to farmers. Round seed produced a crisp yield of 29 t/ha, cut seed 25 t/ha. The highest crisp yield recorded was 37 t/ha from round seed grown in a farmer's demonstration. In West Java, average potato yield is 15 t/ha -20 t/ha.

### Young versus old

This year we compared Australian seed grown once in West Java with freshly imported seed. The freshly imported seed comprised young and old seed from WA plus freshly imported seed from Scotland. The old seed was harvested five months before the young seed. There were considerable delays in export and distribution of the seed due to quarantine changes. Plantings did not happen until nearly 12 months after the old seed was harvested. Thus the old seed was senile and the young seed old!

Nevertheless yield and emergence rates of the "senile" WA seed showed that seed potatoes from WA grow robustly in Java, even when very old. It would be expected that younger seed would perform better still and it did. The even fresher Scottish seed, imported from a recent October harvest, had significantly higher total yield than both the WA "senile" and younger seed. The higher yield of the Scottish seed was probably due to its younger age compared with the WA seed. This again indicates that younger imported seed may perform better in West Java

However, the Scottish seed did not have significantly better yield than the Australian seed grown once in West Java, which shows that imported seed bulked once in West Java may perform as well as imported seed.

Potential therefore exists to augment the West Java seed potato system with imported Australian seed. West Java grows 28,000 ha of potatoes which needs, when use of saved seed is considered, 10,000 tonnes of seed per annum. West Java produces just 2,400 tonnes of seed per annum.

### Acknowledgements

Funds for this project were contributed by the Department of Agriculture, WA, Western Potatoes, PT Indofood and Horticulture Australia Ltd. Trevor Boughton of the Western Australian Trade Office, Indonesia, has also provided valuable assistance.

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*(Photo: T. Boughton, Western Australian Trade Office Indonesia)*

***Demonstration plot of Atlantic growing at Garut, West Java from Western Australian seed potatoes***

*(Photo: T. Boughton, Western Australian Trade Office Indonesia)*

***Harvesting demonstration plot of Atlantic at Garut, West Java, grown from Western Australian seed potatoes***

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# Potato Planters

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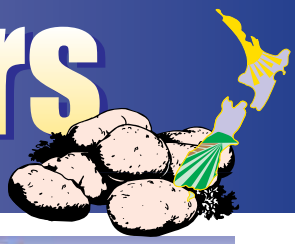

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