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October/November 2014

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Murphy**
Young Grower

Daryl Lohrey
A higher education

Biofumigation
The great debate

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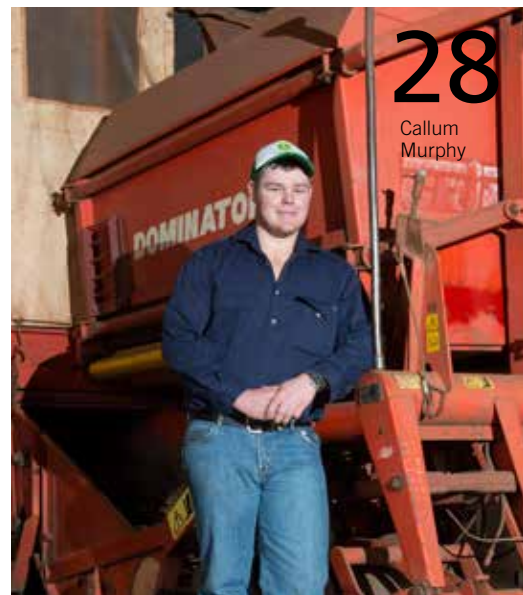
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AUSVEG Chairman and CEO messages



Geoff Moar

AUSVEG Chairman

There are many different aspects to growing a potato, from the type of varieties planted to the crop protection strategies put in place. As a net result of this, there is no universal solution to some of the challenges we face.

Add to this the multitude of factors affecting growers – there are different weather conditions and soil types to contend with, as well as the more pressing issues of pest and disease threats. This means that certain solutions may be suitable to some farms more than others.

One of the topics that has been debated quite significantly within the industry recently is that of biofumigation. This environmentally-friendly approach to crop protection is a concept that has graced the pages of this magazine in the past, and we have shared the stories of growers who have used it with success on their potato farms.

However, like many things in life, there are two sides to the story.

Examining both sides of the argument, it is clear that those who see the merit of biofumigation believe it is a clean approach to crop protection, with the main benefit coming from the use of a natural chemical within a plant to help fight soil-borne diseases. Alternatively, some industry experts believe the fault lies within the term 'biofumigation' itself and warn that growers should not assume that it will produce the same results of its chemical counterparts, as a range of factors must first be considered for it to work effectively.

I would suggest that those who are thinking of implementing biofumigation onto their farms would be wise to consider both sides of

the story, or at the very least, conduct their own due diligence before putting any kind of process into place.

That said, some of the greatest issues facing growers are not limited to the farm. For instance, how can we ensure that potatoes remain front of mind to the end consumer and target the habits that lead to their purchasing decisions?

To help answer these questions and many more, market research agency Colmar Brunton recently unveiled the Potato Tracker Report. This is a monthly, online tracking project for potatoes that will run across a 12-month period. The report covers a range of issues, such as the most popular varieties purchased by consumers, through to the triggers and barriers to purchase.

Colmar Brunton will be publishing updates from this project on a monthly basis, with the first round of results already available. The Potato Tracker Report is a valuable tool for growers to access relevant research and, if studied, could help ensure that your potatoes make it into the consumer's shopping basket.

Geoff Moar
Chairman
AUSVEG



Richard Mulcahy

AUSVEG Chief Executive Officer

The ramifications of the Russia Ukraine crisis have been widespread, not only in a political sense but also from an agricultural perspective.

Following Russia's announcement that it would ban potato imports, along with a variety of other produce from the EU and Australia, among other countries, potato prices in Europe have dramatically dropped due to exporters losing a key market. This has led to concerns that some countries may look to other export markets, including Australia, to offload excess produce.

Increased competition and inferior imported product in the local market could potentially place significant pressure on local growers, who continue to battle rising production costs. In times such as these, it is vital that Australian consumers maintain their support for Australia's potato growers and the far superior product they grow.

Despite this global pressure, it has been business as usual for potato growers during the busy spring season. Needless to say, AUSVEG has also been busy meeting and speaking with growers across the country during a range of different events that have taken place within the industry.

In September, representatives from Horticulture Australia Limited (HAL) and AUSVEG visited Tasmania, Victoria and South Australia to conduct a series of Potato Levy Payer's workshops. These meetings gave potato growers and processors the opportunity to discuss new R&D projects, ask questions and highlight their areas of concern.

The workshops were well-attended and the participating growers weren't afraid to take advantage of the opportunity to

meet face-to-face with industry representatives and share their views about some of the issues that matter to them.

In other industry news, a group of nine potato growers took part in the 2014 Potato Industry Study Tour, which gave participants the opportunity to visit their counterparts in some of the most productive potato growing regions in the world. This year, the United States and Canada were the destinations of choice, with participants travelling from the potato mecca of Idaho in the United States to the Canadian 'potato belt' of New Brunswick and Prince Edward Island.

Over an action-packed 10 days, the group visited fresh, processed and seed potato growing operations. Stepping away from the farm, the group also toured some of the country's most impressive packaging and distribution facilities, logistics operators and research stations to gain a valuable insight into how these entities operate.

Importantly, the group was given the chance to learn more about emerging R&D and network with international industry leaders, as well as their peers. There is no doubt the participants brought back plenty of new-found knowledge to share with their colleagues and perhaps apply some of the same techniques and processes to their operations in Australia. More details on their experiences will be published in a future edition of *Potatoes Australia*.

Richard J Mulcahy
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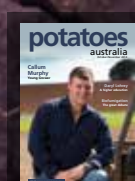
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**FRONT COVER:**

Callum Murphy

Photograph by Ian Wilson

The soil in which potatoes grow is home to many complex organisms, most of which are beneficial to the healthy development of potato crops. Unfortunately, at the same time, soil-borne pathogens can also be present, causing yield loss and a plethora of ongoing problems.

In this edition of *Potatoes Australia*, we speak with researchers from the Tasmanian Institute of Agriculture and South Australian Research and Development Institute, who discuss their work identifying crops that influence the amount of disease-causing organisms in the soil (page 32).

Also in soil-related R&D, we examine a report released by DAFWA on soil temperature in Western Australia, which investigates whether the state's potato growers are managing their soil temperature correctly (page 24).

The practice of biofumigation as a means to control soil-borne diseases in potato crops is a hot topic at the moment in the Australian potato industry. Its merits and drawbacks are discussed on page 18, where we speak to two members of the industry: researcher Dr Graham Stirling and potato grower Darren Long.

Looking overseas, Professor Richard Falloon and his colleagues from Plant and Food Research New Zealand have completed a field study identifying factors responsible for potato 'yield gap' in crops in Canterbury, New Zealand. A full report can be found on page 30. This edition also features a global update on potato news, from Vietnam to the USA (page 22).

Back home, market researchers Colmar Brunton have released a new report tracking the consumer habits and preferences around potato preparation and consumption. A run-down of the most notable findings can be found on page 10.

In our regular Grower Profile, we speak with Daryl Lohrey about how his decision to go back to university as a mature age student will underpin the future direction of his family's potato growing operation in Sisters Creek, Tasmania (page 16). In our Young Grower Q&A we catch up with Victorian fourth generation grower Callum Murphy, who speaks about the highlights of the 2014 Potato Growers' Study Tour to the USA and Canada (page 28).

Meanwhile, in the regular Potato Industry Extension



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Daryl Lohrey



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Managing soil temperature

Program update, we look over some of the latest news and exciting workshops that the program has planned for potato growers across the country (page 12). And finally, we give a run-down of the most recent

series of Potato Levy Payer's Meetings, which provided an opportunity for growers in Victoria, South Australia and Tasmania to ask questions and further their knowledge of current R&D initiatives (page 8).

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A typical potato field in Ballarat, Victoria.

Industry development takes root at regional meetings

A SERIES OF POTATO LEVY PAYER'S MEETINGS WERE HELD IN KEY GROWING AREAS THROUGHOUT THE SOUTHERN STATES OF AUSTRALIA IN SEPTEMBER, ATTRACTING A LARGE NUMBER OF POTATO GROWERS TO LEARN MORE ABOUT THE INVESTMENT OF THE NATIONAL POTATO LEVIES AND THE R&D PROJECTS THAT ARE CURRENTLY UNDERWAY.

When it comes to communicating the latest developments in R&D to the Australian potato industry, it is imperative for levy-paying potato growers to be given an opportunity to attend face-to-face meetings where these important discussions can take place. These meetings also provide a forum for growers to ask questions and ultimately update their current skillset and knowledge to further develop their businesses in the future.

From 15-18 September, four Regional Potato Levy Payer's Meetings were held across the southern states of Australia. The tour began in Devonport, Tasmania before continuing on to Ballarat, Victoria; Mount Gambier, South Australia; and finally wrapping up in Hahndorf, South Australia. The meetings featured industry and R&D updates from the Potato Industry Extension Program, AUSVEG and Horticulture Australia Limited (HAL), as well as presentations from key researchers and industry experts.

Attendees also had an opportunity to discuss R&D in the potato industry and the key issues facing the sector. This is a crucial element of Potato Levy Payer's Meetings, as growers can maximise the opportunity to give direct feedback to industry representatives and ensure that they continue to play a key role in guiding the future of their industry.

On the agenda

Devonport played host to the first Potato Levy Payer's Meeting which was held on Monday 15 September. During this session, Senior Research Scientist Barbara Hall from the South Australian Research and Development Institute (SARDI) gave attendees a detailed overview of the current knowledge and control options for Pink rot.

She explained that such a disease can be highly detrimental to crop yields, as it has the ability to not only kill the potato plant but also destroy tubers.

The next day in Ballarat, Jenny Witham, Managing Director of market research agency Colmar Brunton, discussed consumer perceptions and behaviour in relation to potatoes. She detailed the findings from Potato Tracker, an ongoing research project that communicates the consumer attitudes surrounding the purchase of potatoes.

The Potato Tracker is a great initiative which will provide growers with the information they need to understand the drivers behind potato purchases, which can help to ensure that growers continue to meet consumers' current needs. During this session, Ms Witham outlined the first wave of findings and explained that there will be monthly reports for the remainder of the 12-month project (see page 10 for more information).

The Mount Gambier workshop, which was held on Wednesday 17 September, attracted potato levy-paying growers in both South Australia and western Victoria. Mrs Hall was once again one of the

presenters, but this time spoke about the control of nematodes on a potato farm.

The final meeting held in Hahndorf, South Australia on Thursday 18 September, featured a presentation from Tasmanian Institute of Agriculture Industry Development and Extension Office Sue Hinton, who gave a detailed overview of irrigation efficiency for potato crops.

AUSVEG and HAL would like to thank the speakers and participants for taking the time to attend these events and ensure that key information is communicated between industry representatives and levy-paying potato growers. This project was funded by HAL using the Processed Potato Levy and matched funds from the Australian Government.



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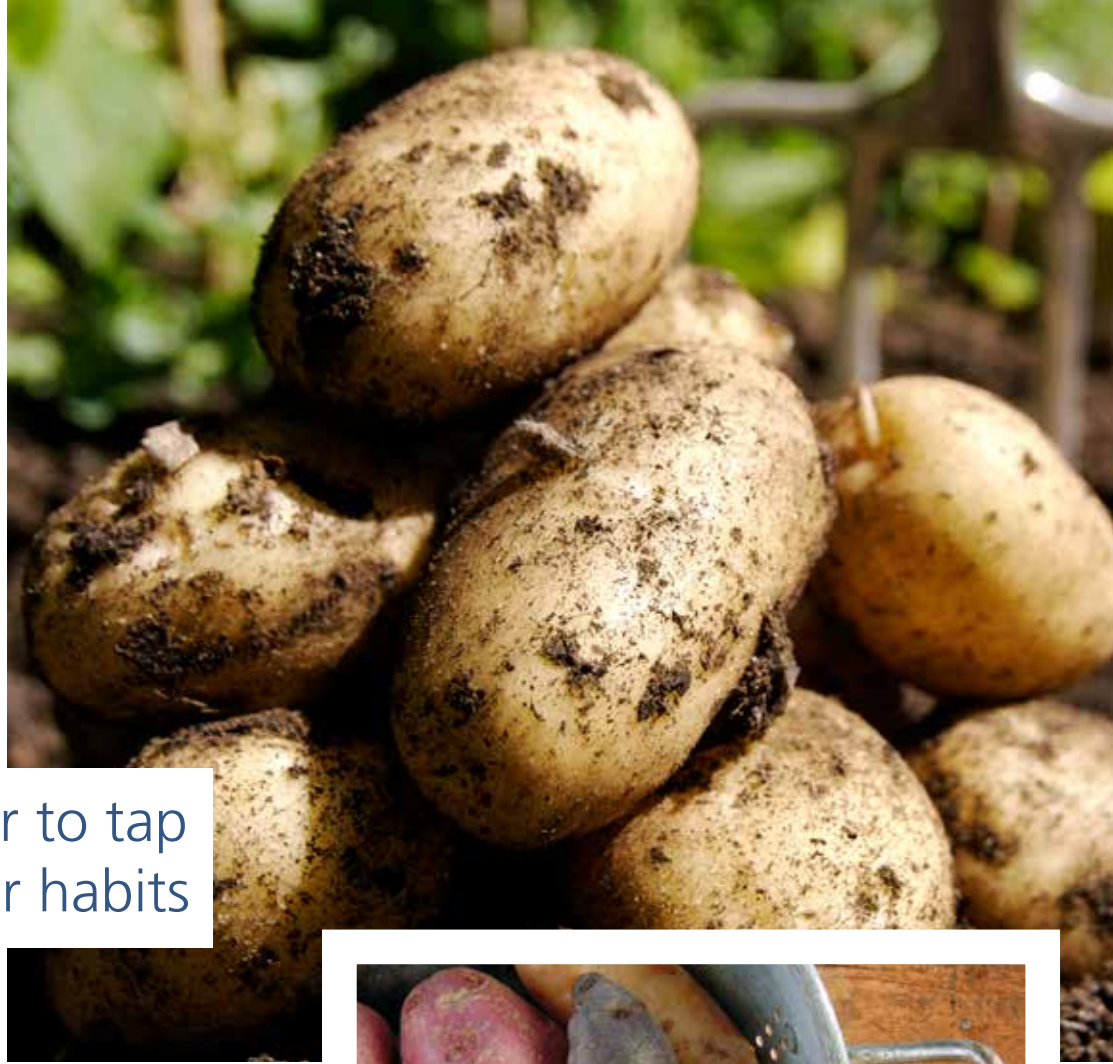
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Potato Tracker to tap into consumer habits

THE FIRST ROUND OF FINDINGS FROM THE POTATO TRACKER REPORT HAS BEEN RELEASED BY MARKET RESEARCHERS COLMAR BRUNTON, AS PART OF A NEW RESEARCH PROJECT INVESTIGATING CONSUMER HABITS AND ATTITUDES TOWARDS POTATOES.

It is important that the Australian potato industry better understands the needs, habits and attitudes of consumers so it can continue to deliver a quality product that meets market demand in the future. In order to address current consumer needs and overall market trends, a dedicated research program was developed to help growers understand the decisions that consumers make when purchasing potatoes.

Colmar Brunton, the market researchers behind the vegetable industry's Project Harvest reports, were contracted to create a monthly online tracking project for potatoes across a 12-month period.

In total, 347 Australians completed the online questionnaire, with respondents representing all states and territories, as well as both rural and metro areas. Respondents

were aged 18 years or over, purchased fresh vegetables in the last fortnight, purchased potatoes in the last month and were the main or joint grocery buyer in their household.

The project also investigated new potato-related products released locally and overseas in the last three months. Claims made by the product and packaging types were listed, highlighting innovative new products that could act as inspiration for further development of potato products in Australia.

Insights and recommendations

The report found a number of useful insights. Sixty-six per cent of consumers purchase potatoes because they are easy to prepare and cook with – convenience is a major trigger to purchase. Unprompted and prompted awareness of potato



varieties is relatively high, which means that opportunities exist to further differentiate between types of potatoes based on cooking technique.

It was recommended that retailers should highlight the potatoes which are best suited for boiling, mashing, or roasting

at the point of sale.

Consumers purchase potatoes three times a month on average and consume them once every two days. They also expect potatoes to stay fresh for over two weeks. This poses an opportunity to highlight the longevity of freshness and

optimal storage methods, both on packaging and in store. This is expected to increase consumers' perceptions of value for money.

Looking at potato trends worldwide, there is substantial potato innovation overseas; however only two per cent occurs domestically. The potato industry should investigate viable new potato products, such as snacks and meals that meet consumers' triggers to purchase – for example, convenience, taste and versatility, according to the research.

Varieties

The vast majority of consumers are able to recall the type of potatoes they regularly purchase. Desiree is the most common potato variety bought, typically purchased by half of all consumers. Dutch Cream and Kennebec are also commonly purchased. The top five varieties purchased are:

1. Desiree – 47 per cent.
2. Dutch Cream – 21 per cent.

3. Kennebec – 20 per cent.
4. Sebago – 17 per cent.
5. Coliban, Nadine, Kipfler – 16 per cent.

Triggers and barriers to purchase

The top triggers to purchase are convenience and ease of preparation. Consumers also buy potatoes because they taste great (60 per cent of respondents), to complement other food (53 per cent), or because they are versatile (52 per cent).

The main barrier to purchase is the perception that people are consuming enough potatoes for their needs. Consumers also responded that they want a variety of vegetables (18 per cent); they have weight management or diet concerns associated with eating potatoes (16 per cent); or that they

consider potatoes expensive (11 per cent).

Cooking preferences

Carrots are the most favoured accompanying vegetable to potatoes, with 85 per cent of respondents indicating as such. Carrots are followed by green peas (59 per cent), pumpkin (51 per cent) and broccoli (48 per cent).

In terms of cooking methods, potatoes are cooked in a variety of ways. Consumers favour mashing, roasting and boiling their potatoes. Potatoes are typically cooked in Australian cuisine, both traditional and modern, while British and Indian cuisines are also popular. Dinners and everyday meals are the main consumption occasions, which may be due to the ease of use and convenience of potatoes.



This project is funded by Horticulture Australia Limited (HAL) using the Fresh Potato Levy and matched funds from the Australian Government. Project Number: PT13015

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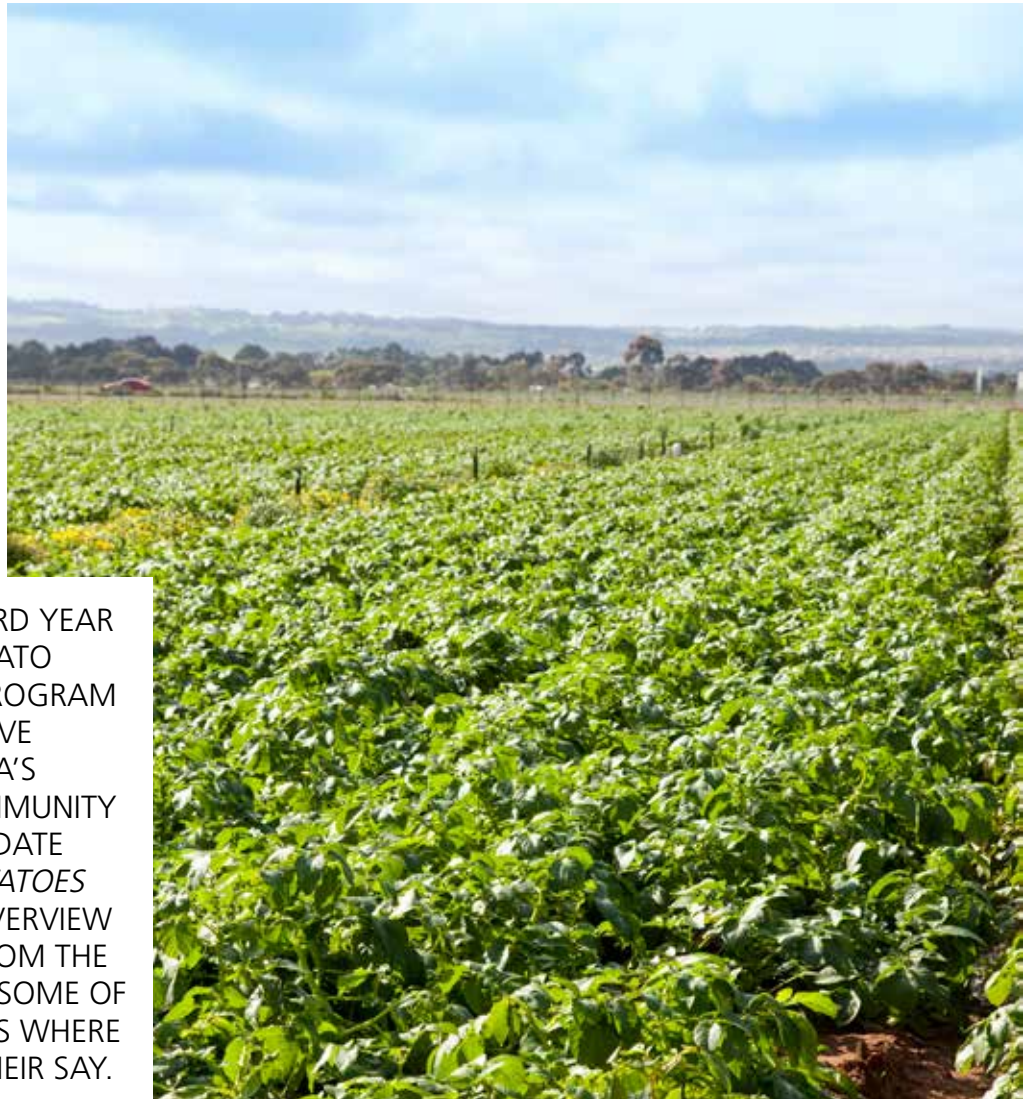
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Alistair Walmsley-Cotham, potato grower from Peebinga has been using AquaBoost on pivot-grown potatoes for two years said; "With AquaBoost, we have noted better wet-up and moisture retention and more uniform pack-out."

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The latest news from PIEP



NOW WELL INTO ITS THIRD YEAR OF OPERATION, THE POTATO INDUSTRY EXTENSION PROGRAM IS CONTINUING TO EVOLVE AND PROVIDE AUSTRALIA'S POTATO GROWING COMMUNITY WITH THE MOST UP-TO-DATE R&D INFORMATION. *POTATOES AUSTRALIA* GIVES AN OVERVIEW OF THE LATEST NEWS FROM THE PROGRAM, AS WELL AS SOME OF THE RESEARCH PROJECTS WHERE GROWERS CAN HAVE THEIR SAY.

The most recent R&D workshops in the Potato Industry Extension Program have recorded impressive attendance numbers, and the next round of events around the country are set to build on this enthusiasm with an exciting range of topics on the agenda.

Upcoming workshops in South Australia and Western Australia will feature special guest expert Claire Hodge, who is a Technical Executive at the UK Potato Council.

Ms Hodge will be making a special trip to Australia to gain insight into the local potato industry and she will share the latest developments from our British counterparts in the workshops. Ms Hodge will also give an overview of a project recently completed by the UK Potato Council that studied the best handling practices to minimise damage to potatoes.

These workshops are designed to not only present growers with R&D outcomes

in a concise and useable manner, but also allow growers to have face-to-face interaction with researchers and industry experts. The workshops allow for an interactive environment that induces communication between the industry's key stakeholders.

The following Potato Industry Extension Program workshops will be taking place around Australia:

Mt Barker, South Australia
Monday 27 October

Pemberton, Western Australia
Thursday 30 October

Warragul, Victoria
Wednesday 12 November

Further details on these workshops will be forwarded to growers in due course. To register your interest in the workshops please contact AUSVEG at info@ausveg.com.au or call (03) 9882 0277.



Potato virus Y is usually spread by aphids. Photo courtesy of Whitney Cranshaw, Colorado State University, Bugwood.org

PVY grower survey

As reported in the previous edition of *Potatoes Australia*, a study into Potato virus Y (PVY) is currently being undertaken to determine and dissect the Australian potato industry's knowledge of PVY and identify current gaps that need to be

addressed.

PVY is a serious issue in potato crops, causing yield and quality losses, while also affecting seed potato certification. The disease is usually spread by aphids, but it is also believed to be transmitted between the leaves of potato plants that may come in contact with each other.



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*Steven Moffatt
Moffat Carrots, Australia*

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PVY is widespread in some potato growing regions of Australia and has been identified as one of the major problems for potato growers and seed producers.

To assist with gaining knowledge on PVY, a grower survey has been put together by project leader Brenda Coutts, Plant Virologist at the Department of Agriculture and Food Western Australia (DAFWA).

The aim of this survey is to better understand the current status of PVY across Australia and the grower practices used

to control PVY. The results will help provide recommendations for future research on PVY that will provide the most value to the Australian potato industry.

To complete the survey, please visit www.surveymonkey.com/s/potatovirusY.

Berrigan workshop and Farm Walk

It was a little early for the famous Berrigan races, but that didn't stop more than 25 potato enthusiasts from travelling to the heart of the New South Wales Riverina region to attend

the Potato Industry Extension Program's workshop and Farm Walk on Tuesday 5 August.

A blanket of frost gave way to blue skies and crisp temperatures as participants descended on "Claredale", the property of local potato grower and Berrigan identity John Doyle.

During the workshop, participants listened to presentations from AUSVEG representatives and leading industry experts from around the country. These presentations also prompted some lively discussions on modern growing practices, management techniques and technologies, as well as particular issues affecting local potato growers.


Industry experts such as Biological Crop Protection Principal Scientist Dr Graham Stirling discussed nematode management in potato crops, and also raised some interesting questions about the effectiveness of biofumigation in potato crops (see page 18 for more information). Michael Rettke, a Senior Research Officer at the South Australian Research and Development Institute (SARDI) also spoke about its DNA diagnostics soil testing service 'PreDictaPt'.

Adama Market Development Manager Alistair Crawford then addressed participants with information on crop protection, particularly the issues surrounding crop rotations on potatoes. Finally, Russell Fox, a local agronomist from I.K. Caldwell, wrapped up the session with an overview on crop management practices focusing on Target spot, Potato moth and Potato virus Y. Following the workshop, participants were taken on a short tour of John's farm and impressive facilities.

This project is funded by Horticulture Australia Limited (HAL) using the National Potato Levies (Fresh and Processed) and matched funds from the Australian Government. AUSVEG would like to thank all participants and presenters who attended the workshop, as well as John Doyle for hosting this event.



The group of participants at the Berrigan workshop.

 For more information about the Potato Industry Extension Program, contact AUSVEG:
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Tillage and tutorials have very little in common – except if you're Daryl Lohrey, of course.

Born and bred as a potato grower, Daryl recently brought the two concepts together to further the development of his family's farming operation that is nestled among the rolling hills of Sisters Creek on the north-west coast of Tasmania.

This third-generation grower has gradually built up Lohrey Pastoral to become the successful business it is today. Daryl, along with his wife Susie

and their son Daniel (who helps in between studies at school), currently run three enterprises: processing potatoes for Simplot and McCain, which weigh in at around 5,000 tonnes per year, a seed potato program and a cattle fattening operation.

"Even when I was in high school I wanted to be a farmer. I always wanted to have a successful business and be self-sufficient," Daryl recalls.

"I made some general improvements after taking over the farm. I built dams, increased

the irrigation infrastructure and improved the fertility of the soil. Before long I was growing a lot of crops with very average results, so I decided to focus on a couple of enterprises that had the potential to have good returns and were suited to the environment on the north-west coast of Tassie.

"I began to specialise in potato growing – I was lucky to be born in an area that was very suitable for potatoes in terms of soil, weather and water availability. I learnt as much

as I could about potato growing and even now I'm still learning things."

Back to school

Given these changes, you could argue that Daryl always had an inherent sense of business acumen. For instance, his passion for growing seed potatoes once pushed him to help introduce major changes to potato seed handling in Tasmania and, as a result, he is often called on to give

presentations on seed handling and physiological ageing of seed potatoes to growers throughout his home state, as well as Victoria.

Not one to settle in his comfort zone, Daryl decided there was still more learning to be done – both for the long-term benefit of his farm and also in his roles as a grower representative on the Industry Advisory Committee for Processing Potatoes, a representative on the EnviroVeg committee and a member of the Tasmanian Potato Council.

Undeterred by age or the fact that he hadn't borrowed a text book since high school, Daryl took a place at the University of Tasmania in 2010 and set to work completing a Masters of Business Administration in Agricultural Innovation.

"I came to the realisation that possibly, even within farming, higher education had a place," he says.

"The degree gave an insight into how other people think and how others make decisions – particularly in the world of government and corporations. I guess one of the biggest things confirmed to me was the fact that farming and doing business in the world is all about relationships with people. Central to this is to have good relationships with our suppliers and our customers."

New approach

It is clear that the three years spent in the world of higher education have helped Daryl and his family view their existing potato growing operation in a new light. Apart from keeping on top of the constant threat of pests and diseases, Daryl is also acutely aware of the wider issues at play.

"Whether we like it or not, globalisation has finally arrived in the last few years. The potato industry has changed for the long-term and we just have to embrace it," he says.

"However, when you are looking for new things to

try and change all the time, sometimes you forget about the fundamentals of potato growing. To fix this, we need to remind ourselves about getting the basics right and not allowing them to be a limiting factor. I guess that's what we do all the time – identify what the major problems are and trial a different approach each year."

Sustainability is also an area

that Daryl is very passionate about. He says that while many growers are criticised for high input/high output farming, he believes this approach is a contributing factor to the long-term sustainability of the farm.

"I think sustainability is in most farmers. We all try to do the right things and hand over the farm to future generations in a better condition than

we received it. I often wonder what improvements will be left for Daniel to do – but I guess he will continue to find ways to do things better, as have I. Potato growing will always have challenges to meet," he says.

"In terms of our impact on the land, I see high input/high output farming to have a better ecological impact on the earth, so long as we're not wasting products. To me, it's a more efficient process. Higher yields mean less land being used.

"However, there is still work for us to do to continually improve our productivity and our cost of production. Compared to the rest of the world, Australia is a high-cost producer – but it's also high quality produce. So long as consumers still want high quality produce, there will still be a market for Australian-produced potatoes. I think the future is quite bright."

For now, Daryl and his family are content with growing a successful potato crop that is the direct result of the strategies that have been put in place. The added benefit comes when a harvest beats one of Lohrey Pastoral's existing records.

"The thing I enjoy the most about growing potatoes is watching them bulk up to a high yielding crop. The highest yield we had this year was 85t/ha and that was a record for us. When things like that happen, it's encouraging to know that we are still able to make improvements and do things better."



Photographs by Belle Young.

The great biofumigation debate

THE TERM 'BIOFUMIGATION' IS NOT NEW TO MOST POTATO GROWERS. HOWEVER, OPINION IS DIVIDED ON ITS EFFECTIVENESS IN POTATO CROPS. *POTATOES AUSTRALIA* SPEAKS TO TWO INDUSTRY EXPERTS TO OUTLINE BOTH SIDES OF THE ARGUMENT, PARTICULARLY WHEN USING BRASSICAS AS A COVER OR ROTATION CROP FOR POTATOES.

Biofumigation is an environmentally-friendly approach to crop protection in which plant (i.e. natural) chemicals are used to fight soil-borne diseases.

It works by harnessing the natural chemical agents of a plant to suppress weeds, fungal pathogens and nematodes. Often, brassicas with high glucosinolates are grown as a green manure crop and then incorporated into the soil.

Recently, biofumigation has been used both locally and internationally to reduce cropping rotations and boost overall yields. In the potato industry, it is often used in conjunction with specific potato varieties to help tackle some of the most troublesome diseases including Rhizoctonia, Powdery scab and Common scab.

For this debate, *Potatoes Australia* has outlined the viewpoint of potato grower Darren Long who has successfully implemented biofumigation on his potato crop in Tasmania. Alternatively, we have also presented the argument of Dr Graham Stirling, an experienced nematologist who is concerned that the term 'biofumigation' creates the unrealistic impression that the process will produce results that are equivalent to chemical fumigants.

AGAINST

After decades of research and several books to his name, it's

safe to say that Dr Graham Stirling knows a thing or two about the control of nematodes. Currently, he is the Principal Scientist of Biological Crop Protection, a Brisbane-based company providing research and diagnostic services in nematology, plant pathology and soil biology to Australia's agricultural industries.

Recently, Dr Stirling has been hesitant to recommend biofumigation, particularly in terms of its capacity to control nematodes. Some of his most pressing concerns are outlined in his recent book, *Biological Control of Plant-parasitic Nematodes* (2nd edition).

According to Dr Stirling, the term 'biofumigation' implies that the active ingredients in the process are volatile and act in much the same way as broad-spectrum fumigants such as methyl bromide, 1,3-dichloropropene or metham sodium. However, Dr Stirling argues that isothiocyanates (the chemicals released from decomposing brassica residues) are not gaseous at ambient temperatures and principally move through soil by diffusing in the water phase.

"The need to pulverise the soil under wet conditions to release the nematicidal ingredients is the main problem with biofumigation, as that is the worst thing anyone can do to a soil. It destroys soil structure and depletes soil carbon," he said.

"Growers should be aiming



“The ‘fumigation’ component of the word ‘biofumigation’ gives growers the wrong impression about what is likely to be achieved.”

- Dr Graham Stirling.

to do the opposite: build a healthier soil by improving its physical condition and increasing carbon levels.”

Field tests

Another one of Dr Stirling's concerns is that, while laboratory tests show repeatable levels of suppression of nematodes using biofumigation, the results are much less consistent when the same tests are applied with brassicas in the field.

"Results from field trials over many years have shown that biofumigant crops do not produce the consistent results achievable with commercial fumigants," he said.

"One major drawback is that brassicas are often hosts of the nematode being targeted, for example Root-knot nematodes.

"Therefore, there is always the danger that nematode populations will increase rather than decrease.

"Nematodes will also survive in the soil below the amended layer and later migrate back into the treated zone. The need to completely pulverise the brassica tissue to maximise isothiocyanate release, and the requirement for large amounts of water to move the isothiocyanates down the soil profile, are also important practical constraints."

A combined approach

Despite these concerns, Dr Stirling supports the use of brassicas as a rotation or cover crop for potatoes. However, the benefits obtained will depend on the suite of pathogens being targeted. Also, he recommends that growers undertake

“ It’s not a silver bullet, but it’s provided us with a market edge as far as what we do. ”

- Darren Long.



An example of biofumigation brassica before incorporation in a potato field.

than a fumigant crop.”

He suggested that potato growers who are considering biofumigation on their farms should develop a whole farm management plan in the process, and possibly combine a number of management strategies that work effectively together. In situations where nematodes are likely to be an important pest, growers are advised to consult a nematologist to discuss the resistance of particular biofumigant crops to local species of Root-knot or Root-lesion nematode.

a good disease resistance. As a result we no longer have large disease pressure, including Rhizoctonia or Powdery scab.”

Keeping soil structure healthy

It is often noted by critics of biofumigation that the act of pulverising brassica tissue in order to maximise isothiocyanate release can destroy soil structure, which is unwanted. In response, Mr Long said that this step is actually not the issue.

“Incorporation can be undertaken in dry, good conditions and then irrigation applied, or during seasonal rains if the timing allows for the release of isothiocyanates. We’ve gone away from using rotary hoe-style implements and we now use a high-speed mulcher,” Mr Long said.

“The timing has to be good. The soil can’t be too wet. The science between releasing isothiocyanates, pulverising and keeping it flush with moisture can be difficult. If the soil is too wet, it can do more damage than good.”

FOR

Darren Long runs MG Produce, a successful family-based, fresh market enterprise located in Sheffield, Tasmania. Mr Long’s operation is a glowing example of the effective use of biofumigation as a means to manage diseases in potato crops. Using biofumigation as an integrated approach has “changed (his) whole approach to potato growing”, he said. Mr Long uses a variety of brassica called ‘Caliente’, which is a mustard green with the highest glucosinolate release currently tested. He has also started using a variety called Nemat which is a new brassica variety that targets nematodes to break their life cycle.

“To sum up, it’s effective as a disease control measure. It really comes down to soil health and soil conditioning. Using brassicas, with a fibrous root system, has meant biomass is easy to grow and it’s provided us with a whole environment that has suited what we’re doing,” he said.

“You could say it’s a new form of green manuring to the uninitiated. It’s easy to grow, and there are no real pests associated with it. The isothiocyanates are present in the plant and are not attractive for insects or stock to feed on during the growing season. It provides a break crop that pests and diseases find difficult to host and breed on, providing



Dr Graham Stirling during a recent presentation on nematodes in potato crops.

experiments to determine whether additional benefits are obtained when the brassica tissue is pulverised rather than being handled like any other rotation crop.

“When used to improve soil carbon levels and change the suite of soil-borne pathogens that are present in the soil, brassicas in the rotation can

provide benefits. The problem is that the ‘fumigation’ component of the word ‘biofumigation’ gives growers the wrong impression about what is likely to be achieved,” he said.

“There may be situations where brassicas are a useful component of the rotation sequence, but they should be considered a rotation rather

Trial and error

Mr Long is very much aware of the drawbacks of biofumigation; he stresses that growers who are considering implementing the approach should be realistic about their expectation that it will be a cure-all for disease management.

“You have to consider the organic carbon and structure in the soil, which is hard to do in a broad-acre environment. The agronomy can be hard to get right. It’s a cash crop so you have to be careful. There’s no test to say ‘you did it right’ and we don’t get similar results one year to the next.”

After several successful years using the biofumigation approach, Mr Long has plenty of advice for growers.

“Make sure you do thorough research on varieties and seed availability. Allow plenty of time, because brassicas sit hot in the soil, and the glucosinolates can burn potato seed if it’s planted too soon after,” he said.

“It’s not a silver bullet, but it’s provided us with a market edge as far as what we do.”



with Scott Mathew

Crop protection: Choose your products wisely

WITH A WIDE VARIETY OF CROP PROTECTION PRODUCTS AVAILABLE ON THE MARKET, SOME POTATO GROWERS MAY FIND IT DIFFICULT TO CHOOSE A SUITABLE SOLUTION FOR THEIR NEEDS. SCOTT MATHEW, TECHNICAL SERVICES LEAD AT SYNGENTA, EXPLAINS SOME OF THE DIFFERENCES BETWEEN A GENERIC PRODUCT AND A R&D-DRIVEN SOLUTION, AND WHY DISCERNING GROWERS SHOULD CONSIDER A PRODUCT'S FORMULA, AS WELL AS ITS COST, BEFORE MAKING THEIR FINAL DECISION.

With tight margins and increasing consumer demand for high quality produce, Australian potato growers need confidence that the products they are using will perform with minimum residues and a low environmental impact.

Sometimes, selecting products that will deliver effective crop protection can be a headache and a common point of discussion is: why do products that contain the same active ingredient vary in price?

Once an active ingredient that has been created and developed by a R&D company

reaches the end of its patent period, other manufacturers can produce a product containing the same active ingredient and sell it under a generic product name.

While generic products contain the same active ingredient, the way they are produced and formulated can be very different; resulting in dramatic effect on performance.

Crop protection products produced by R&D companies typically contain a combination of the active ingredient(s) and adjuvants to improve efficacy, mixing,

spreading, sticking, safety and storage life.

In contrast, generic products are sometimes manufactured to price specifications rather than quality specifications. Such products can be produced by third-party companies in lower-cost countries, working under less stringent production, manufacturing quality and environmental standards.

With a strong focus on price, generic suppliers typically do not make the same level of investment as R&D companies in formulation technology and manufacturing capability. In this case, it ultimately impacts on their product quality, consistency, compliance and environmental performance.

So, what are some of the ingredients that R&D companies add into a crop protection drum that may not appear in generic formulations? See Table 1 for the different components that are present in a typical Suspension Concentrate (SC).

R&D companies invest in years of research and testing to balance these components and create a quality formulation that optimises the performance of the active ingredient. For confidence in crop protection performance, investing in products manufactured by R&D companies can help you to achieve peace of mind and possibly discover the next great crop protection innovation.

Table 1: Components of a typical Suspension Concentrate

COMPONENT	FUNCTION
Active ingredient (AI)	The most important ingredient in any formulation, but often not soluble in water, making formulation vital.
Appropriately sized particles	If the AI particle size is too large they can clog nozzles, settle out in the drum or spray tank, and reduce the efficacy. If the AI particles are too small they can cause crop damage.
Wetting agent	Sticks to the AI particles to help them go into water.
Dispersant	Stops all the AI particles from sticking together.
Suspension agent	Stops the AI particles from settling out in the drum.
Preservative	Stops microbes, which can digest other ingredients, from developing.
Anti-foam	Reduces foam in the spray tank which can strip surfactants off the AI and make it unstable in water.
Anti-freeze	Maintains formulation quality in freeze thaw situations.
Adjuvant	Assists the AI to penetrate a leaf cuticle or outer skeleton of an insect to enhance product efficacy.
Buffering agent	Controls the pH, which is important if the AI is sensitive to pH extremes.
Rainfast Technology	Sometimes built into the formulation to reduce wash off by rainfall or irrigation (e.g. BRAVO WEATHERSTIK®).
Water quality	Poor water quality can reduce product performance and shelf life.

Q

For more information or to ask a question, please contact your local Syngenta Territory Manager, the Syngenta Advice Line on 1800 067 108, visit www.syngenta.com.au or email Potatoes Australia: info@ausveg.com.au. Please note that your questions may be published.

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Potato news around the world

POTATOES AUSTRALIA PROVIDES A SNAPSHOT OF SOME OF THE LATEST RESEARCH PROJECTS, NEWS AND EVENTS FROM POTATO INDUSTRIES ACROSS THE GLOBE.

Belgium

The potato industry body for Belgium, Belgapom, has teamed up with local research organisations to develop a potato monitoring system called 'iPot'. The system, which aims to increase the efficiency of potato production, combines data assembled via drones and satellites.

Belgium is the biggest exporter of frozen potato products in the world, but production is not at full capacity, according to Belgapom. The platform will integrate weather data, soil maps, growth models, field observations, aerial photos and satellite images. This is expected to ensure a more efficient monitoring of potatoes in the field, including growth, quality risks and expected yield.

Source: Belgapom

Germany

From 3-4 September, around 10,000 potato industry members and growers descended on Hannover, Germany for PotatoEurope 2014. Attendees came from more than 60 countries throughout Europe, Asia, North and South America and Africa, giving the event a distinctly international feel.

Attendees had the opportunity to gather information about seed varieties, machinery and equipment for production and processing, management, trade opportunities, fertilising strategies and plant protection.

Event organisers said the positive international reception underlined very clearly the great potential of the potato for future global food security.

Next year's PotatoEurope event will take place in Belgium.

Source: PotatoPro

Russia

The ban on importing British fruit and vegetables into Russia has been lifted, allowing seed potatoes to be exported once again.

Russia imposed a ban on all Australian, US and EU meat, fish, dairy, fruit and vegetables in response to sanctions imposed on Moscow over the continuing Ukraine crisis. However, an agreement has recently been made to lift the ban because of a need for the British potato seed to cultivate crops grown locally, given Russia's complex climate.

"Although there are political problems at the moment, we're hoping that these will be resolved. We're looking for a long-term solution for our exporters and also for the farmers in Russia to be able to import good quality seeds and novel varieties which they very much need," UK Potato Council Head of Seed and Export, Robert Burns, said.

Meanwhile, Russian authorities recently rejected 30 metric tonnes (MT) of potato shipments entering the country from Belarus, as they did not adequately indicate the country of origin.

The 30 MT of potatoes did not have either a phytosanitary certificate or any information on the country of origin, forcing Russia to reject the shipment bound for Moscow.

In light of these events, there is growing concern in Australia that European potatoes previously planned for export into Russia may find their way into the Australian market and create pressure on local growers.

Source: *Voice of Russia UK and FreshFruitPortal.com*

Vietnam

A farming operation in Da Lat, Vietnam has produced its first tonnage of potatoes grown without soil using hydroponic technology.

The soil-less potatoes were grown in order to keep a flood of Chinese imports at bay. Langbiang Farm director Tran Huy Duong began seeking out a new way to increase the quality of his potatoes in mid-2012, after Chinese imports were transported to Da Lat, disguised as locally-grown potatoes. The potatoes were disguised by being covered with the Da Lat region's distinctive red dirt upon arrival in the local area. The Chinese imports were able to flood the local market during the rainy season, when Da Lat farmers traditionally do not grow potatoes.

Mr Duong wanted to have the Da Lat potatoes recognised by their thin, soft and clean skins, rather than their dirt-covered skins. This was the catalyst for adopting the hydroponic technology.

After two experimental crops, Langbiang Farms was able to produce the first 10 tonnes of product.

"We can control the contents of nutrition from the fertiliser, and thus avoid heavy metals and pesticide residues," Mr Duong said.

"The productivity of potatoes grown under hydroponic technology is 30 per cent lower than the traditional method of outdoor crops, but the prices are 1.5 to two times higher because they are considered high-tech agricultural produce (in Vietnam)."

Source: *Fresh Plaza*

United States

The U.S. Potato Board (USPB) has published new research that shows an association between higher intakes of potassium and lowered incidence of stroke among post-menopausal women.

The U.S. Department of Agriculture's Dietary Guidelines for Americans (DGA) lists potatoes as the fourth most potassium-dense food behind baked sweet potatoes, tomato paste and cooked beet greens when intake is calculated on standard consumption amounts. The flesh of one baked potato that is about 156 grams in weight contains 610 milligrams of potassium, according to a DGA chart. The recommended daily potassium intake for adults, according to the DGA, is 4,700 milligrams per day.

The researchers reviewed data from more than 90,000 women between 50 and 79 years of age who were tracked for outcomes over an average of 11 years.

The outcomes that were checked in the data analysis were for ischemic strokes (blood-vessel blockage), haemorrhagic strokes (blood-vessel rupture), both types of strokes combined, and all causes of mortality. To varying degrees in those categories, the results showed benefits from higher potassium intake. The research focused on searching for an association of factors rather than determining causation, but previous laboratory studies have demonstrated that potassium strengthens interior walls of blood vessels and also improves blood flow.

Source: *Michigan Potatoes*



Hot potato: Managing soil temperature in WA fields

Irrigating a potato crop can reduce soil temperature, but timing and frequency is important.

GIVEN THE CRITICAL ROLE THAT SOIL TEMPERATURE PLAYS IN POTATO PRODUCTION, THE DEPARTMENT OF AGRICULTURE AND FOOD WESTERN AUSTRALIA SET OUT TO FIND THE BEST WAY TO MANAGE THE ISSUE. *POTATOES AUSTRALIA* EXAMINES THE FINDINGS OF RESEARCHERS ANDREW TAYLOR AND IAN MCPHARLIN.

Temperature is a key factor in the production component of the potato supply chain. It influences a number of key aspects of production including tuber initiation, physiological age and yield.

Currently, a large amount of research on the effect of temperature on potato production comes from northern hemisphere production systems, which show that high air and soil temperatures can cause yield loss. A 2007 review, *Adaptation of Potato to High Temperatures*

and *Salinity* by David Levy and Richard E. Veilleux, concluded that the optimal soil temperature for yield was 15-18°C.

Yields are reduced at higher soil temperatures, particularly if associated with air temperature at or above 30°C during the day or 23°C at night. Tuber initiation is particularly susceptible to the effects of temperature, with significant delays occurring at air temperatures of 25°C in comparison to crops grown at 20°C. Harvesting of tubers above 18°C soil temperature,

under moisture stress, can lead to increases in Black spot bruise.

WA research

Since 2007, staff from the Department of Agriculture and Food Western Australia (DAFWA) have recorded soil temperature using probes and soil moisture (%v/v) as well as time-domain reflectometry (TDR) units at 0-15cm and 15-30cm under potato crops.

The probes were placed in

65 potato crops in production areas from Dandaragan in the north to Albany in the south. Soil moisture data was used in irrigation management of the crops. Soil temperature was recorded hourly for the life of the crops at 30cm soil depth. The combined data from all crops showed soil temperature exceeded 22.5°C for 22 per cent of the crop growth period (see Figure 1).

For crops grown in the summer months of December, January and February, the percentage of

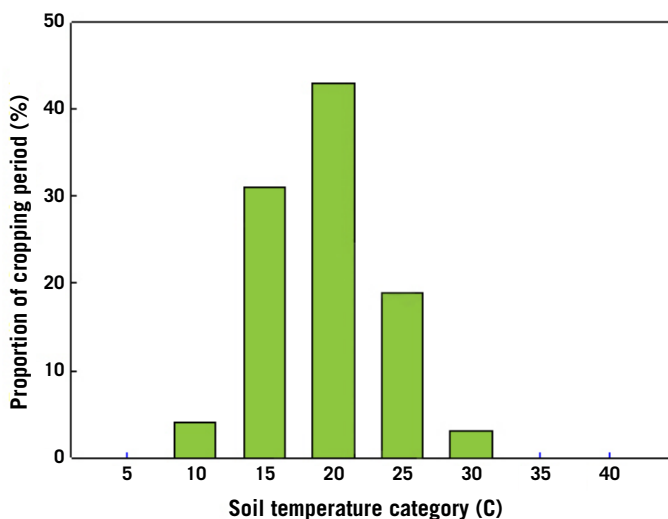


Figure 1: Proportion of cropping period at soil temperatures for 65 combined potato crops from 2007-14 (total hours 152,825). Labels are the midpoint e.g. 20°C is the range 17.5-22.5°C.

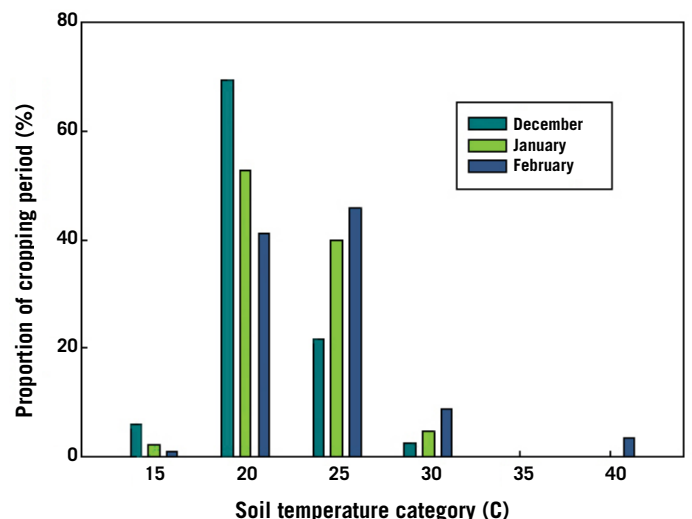


Figure 2: Proportion of cropping period at various soil temperatures for crops grown in December (22 crops/10,797 hours), January (29 crops/17,089 hours) and February (30 crops/18,466 hours). Label numbers are midpoints e.g. 20°C is the range 17.5-22.5°C.

time above 22.5°C was higher than that of the combined data, being 26% in December, 45% in January and 58% in February (see Figure 2).

Digesting the facts

So does this mean that WA potato growers are not managing their soil temperature correctly? The short answer is no. Apart from changing planting and harvesting times, reducing soil temperature once the crop is in the ground can only be achieved through irrigating to keep the soil moist.

A regression analysis on one site showed irrigating had a significant effect on reducing soil temperature from November to March in the south-west at 0-15cm and 15-30cm soil depths (see Figure 3). However, as the growers were irrigating to the water holding capacity of the soil (determined through a pre-plant soil test), if they were to irrigate further it would have created run-off and conditions would have become favourable for tuber rots. The negatives of further irrigating to reduce soil temperature would have therefore outweighed any positives gained.

The best option is to manage

irrigation optimally, i.e. prevent under or over irrigation. This involves getting the correct irrigation scheduling, frequency and duration to overcome these problems. Work is continuing in this area.

Points to remember

If growers are limited in their options to minimise soil temperature during the demanding heat of the Australian summer, there are other management factors that can be considered apart from irrigation. For instance:

- Varieties can differ in their heat tolerance, so growing a variety with greater heat tolerance during summer months should be considered. For example, Desiree has a high heat tolerance.
- Soil temperature at tuber initiation is critical, so knowledge of your crop development and management of soil temperature at this time could be the difference in overall yield.
- There could be an increased level of Black spot bruise at harvest if care is not taken

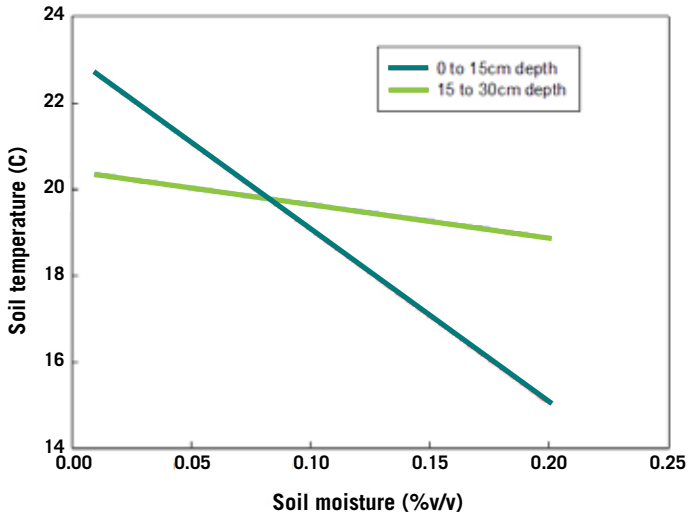


Figure 3: Increasing soil moisture (X) reduced soil temperature (Y) at both the 0-15cm depth ($p < 0.001, Y = 23.09 - 40.23X$) and at the 15-30cm depth ($p < 0.001, Y = 20.42 - 7.72X$).

- with chain speeds and drop points.
- The tubers will have a greater physiological age, measured as degree days from haulm kill, than those grown in cooler conditions. This can impact storage decisions.

Given the differences in growing conditions of potatoes around the globe, care needs to be taken in extrapolating results from different growing regions.

The importance of managing soil temperature should not be overlooked as an agronomic factor in a grower's potato crop.

i For further information, contact: DAFWA www.agric.wa.gov.au



Mark Stanaway from DAFWA sets up a time-domain reflectometry unit and temperature probes in a potato field in Manjimup, Western Australia.

Getting the best out of seed

POTATOES AUSTRALIA SPEAKS TO AMERICAN RESEARCHER DR GARY SECOR ABOUT HIS PRESENTATION DURING A RECENT CONFERENCE IN SOUTH AUSTRALIA. DR SECOR DISCUSSED SOME OF THE BEST MANAGEMENT PRACTICES THAT GROWERS CAN PUT INTO PLACE TO MAXIMISE SEED PERFORMANCE.



Using disease-free, certified seed potatoes is common practice for potato growers. However, even certified seed can sometimes run the risk of contracting a disease, particularly if enough care is not taken during planting, handling, storage and transportation.

Dr Gary Secor, an experienced researcher and Professor of Plant Pathology at North Dakota State University, believes that best management practices should be strictly followed at all stages of the process to give seed potatoes the chance to reach their potential.

"Start with good seed. Seed treatments cannot perform miracles by turning poor seed into good seed, or rescuing poor seed," he said.

"To buy the right seed, the seed lot selected should be the right variety of the right market, physiologically young, free of disease and stored properly."

While there are many factors that affect seed performance – including variety, storage, transport and handling – Dr Secor suggests that physiological age should also be taken into account.

"Physiological age is a measure of stress, health and metabolism, not time. It is influenced by the growing environment and handling of the seed," he explained.

"The more heat, handling and stress can increase the physiological age of the seed."

Handling seed

Dr Secor suggested that, when handling seed, growers should protect the product from very low temperature exposure and disinfect all trucks and handling equipment. It is also essential to manage loading to prevent cuts and bruising, as seed bruising or damage is the number one cause of seed decay due to bacterial soft rot.

"Load seed gently as it is cold and bruises easily, which then creates an easy entry site for disease," he said.

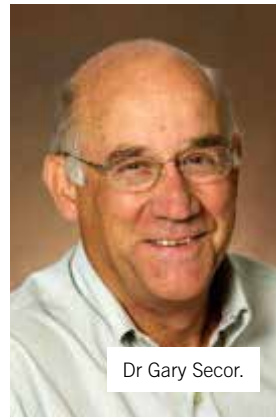
"It doesn't stop there. During transport, continue to warm seed gradually, provide fresh air and educate the driver. Then unload seed gently to avoid the same problems.

"After unloading, the most important consideration is to provide favourable conditions to heal any wounds that occurred during loading, transport and unloading.

"Pile the newly arrived seed out of the direct sun and weather, no more than six feet (approximately 1.83 metres), provide humidity and oxygen and continue to warm the seed gradually to 10°C."

Seed treatments

While seed treatments are an essential component of an integrated management plan, it is important to remember that they do not control, manage,



Dr Gary Secor.

reduce or suppress diseases such as Common scab, Powdery scab, Brown rot or Ring rot.

"If you have seed that is free of disease, or don't care about seed disease, then you may not need a seed treatment," Dr Secor explained. "You could also pre-cut, cut and store cut seed for some days before planting. If you have to pre-cut seed, ensure that all wound healing requirements are met.

"If disease control is important or necessary, then you may want to consider a seed treatment with a fungicide. However, the most common cause of poor stands and emergence is bacterial soft rot. Seed treatments, whether dust or liquid, do not directly control bacterial seed decay but indirectly can increase bacterial seed decay if they are not used correctly."

Points to remember

According to Dr Secor, potato growers would do well to follow the three main points of planting: get good seed, handle it carefully and watch for disease.

His recommendations to minimise decay and disease involve ensuring that the seed and soil are the same temperature and to handle seed gently at all times. Also, it would be helpful to avoid wet conditions and encourage quick emergence.



For more information on the best management practices for seed potatoes, please contact North Dakota State University Professor of Plant Pathology, Dr Gary Secor. Email: gary.secor@ndsu.edu

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Q&A Young grower profile

Name: Callum Murphy

Age: 19

Location: Dunnstown, VIC

Works: A.P Murphy & Sons

Grows: Innovator, Atlantic and Russet Burbank for the french fry industry.



Dunnstown,
Victoria

How did you first become involved in the potato industry?

I grew up on the family farm – I am a fourth generation potato farmer. For as long as I can remember I have helped my father Greg and grandfather Leo, who is coming into his 71st potato season. You could say it's in my blood.

What is your role in the business?

My work entails ground preparation, planting, irrigation, harvesting and other day-to-day jobs on the farm.

What do you most enjoy about working in the potato industry?

I really enjoy the satisfaction of seeing a potato crop grow from planting to harvest. Even though there are challenges along the way it is really satisfying to see a good quality crop at the finish, and to be working in a family business.

What are the biggest challenges that you face as a grower?

The biggest challenges as a grower are high input costs, like fuel, fertiliser and electricity.

As we are in the french fry industry, the high Australian dollar has a negative impact as it makes imports cheaper, as well as subsidised product from European countries.

These pressures make it hard for young people to want to get involved in the industry.

What do you see as some of the greatest threats facing the Australian potato industry?

Some of the greatest threats to the potato industry are cheap imports and diseases coming in from other countries, such

as Zebra chip which would have a huge impact on the french fry industry.

Where do you see opportunities for growth in the Australian potato industry?

I see opportunities for growth in the industry if imports were reduced and we could contain our costs by the use of better higher-yielding and environmentally-friendly varieties.

If you weren't working in the potato industry, what would you be doing?

If I was not working in the potato industry, I would still be working on a farm somewhere as I enjoy the lifestyle of being outdoors rather than being in an office.

Where do you see yourself in five years?

I see myself in five years still growing potatoes with improved technology and varieties at a competitive price.

What did you gain from participating in the 2014 Potato Growers' Study Tour to the USA and Canada?

I was impressed with the large scale of farms and equipment in America. Unfortunately many of the U.S. practices such as the six row planters would not suit some of our hilly terrain. We also had the opportunity to see some potatoes affected by Zebra chip which we don't want to see here.

What was the highlight of the tour for you and why?

The highlight of the trip was meeting the other growers that went on the tour as well as speaking to growers in America and Canada. Seeing how the growers operate in America on such a huge scale, and then seeing the growers in Canada and Prince Edward Island on a scale similar to our own.



Photographs by Ian Wilson.

Striving for maximum potato yields in Canterbury, New Zealand



A group of researchers examine a potato crop during the field study.

POTATO YIELDS IN CANTERBURY, NEW ZEALAND, HAVE REMAINED STATIC AT 50-60 TONNES PER HECTARE (T/HA) (PAID YIELD), A LEVEL OF CROP PRODUCTION THAT IS BECOMING UNECONOMIC. AS COMPUTER-BASED MODELLING PREDICTS THAT YIELDS OF 90 T/HA ARE THEORETICALLY POSSIBLE, A FIELD STUDY WAS CONDUCTED IN THE 2012/13 GROWING SEASON BY THE NEW ZEALAND INSTITUTE FOR PLANT AND FOOD RESEARCH LTD TO IDENTIFY FACTORS RESPONSIBLE FOR THE POTATO "YIELD GAP".

Eleven commercial potato crops were included in the study. These were planted with either Russet Burbank or Innovator cultivars, in paddocks that were previously with or without potatoes in the last 10 years. A representative site was chosen in each crop after planting. Soil structure, the presence of soil-borne pathogens, and crop characteristics were measured. Every 10 to 14 days throughout the season, each crop was checked for growth and development, and any inconsistent areas were marked for later assessment. Yields were measured at the end of the season.

Fertiliser trials were established in four of the crops. Normal rates of nitrogen, phosphorus and potassium, double these rates, and a calcium treatment, were applied. Further applications of nitrogen during the season, as part of commercial practices, were also doubled for some treatments. Yields were

measured at the end of the season.

Three measures of tuber yields were used for each crop. These were "potential yield" from a yield simulation model (using 2012/13 climate data), and "paddock yield" from the whole paddock as measured by the grower. These two were expressed as paid yield (not including tubers less than 67 mm). The third measure was "plant yield", the gross yield per plant (all tubers). This was used to compare yields between individual healthy or unhealthy plants.

Results

A yield simulation model, conducted for each season from 2002 to 2013, showed that the 2012/13 season gave the greatest potential yield at all sites, and this was used as a baseline. High winds damaged some crop canopies in January 2013, which probably reduced final yields.

Averaged over the 11 crops,

potential yield was 87 t/ha and paddock yield was 54 t/ha (see Figure 1). Russet Burbank and Innovator produced similar yields. There was no effect of previous potato crops on the yield difference, but initial soil pathogen amounts were greater in paddocks where potatoes had been recently grown.

The yield gap between the potential 87 t/ha and paddock yield ranged between 20-42 t/ha (see Figure 1). Yield gaps were greatest where water uptake was restricted in the plants, because of damage to roots and underground stems by diseases, and through poor soil structure and compacted layers limiting soil water storage. Yield was also reduced because foliar diseases caused premature canopy death, ending the final tuber bulking stage.

Diseases were important factors associated with variability of "plant yield" within individual paddocks (see Figure 2), and soil compaction produced variability between paddocks. Plants that were less severely

affected by soil-borne diseases and without soil compaction yielded up to the equivalent of 90 t/ha. Where plants were affected by these diseases and the soil was compacted, yield was reduced to less than the equivalent of 30 t/ha.

All 11 crops had Stem canker symptoms. Six crops also had root galls caused by *Spongospora* infections, and root-limiting compacted soils (see Table 1). Five crops were affected by the two soil-borne diseases and soil compaction. Four crops had shortened canopy duration, five had significant wind damage, and four had irrigation problems, highlighted in the particularly dry 2012/13 season.

Fertiliser trial results

The fertiliser trials found that there were no significant effects on yields from doubling the nitrogen rates over those used normally. Small yield gains came from doubling the rates of phosphorus and potassium in some cases, but there were

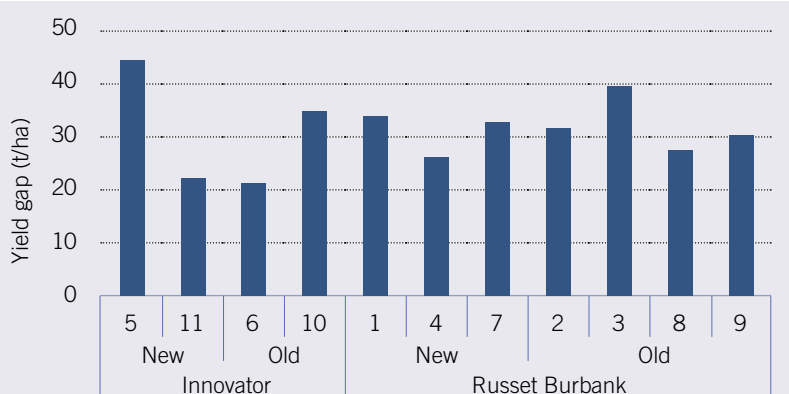


Figure 1: The yield gap (t/ha, fresh, tubers > 67 mm) between potential and paddock yields for 11 monitored Canterbury potato crops of Innovator or Russet Burbank, planted into new or old paddocks.



A Canterbury potato crop surveyed in 2012/13.



Spongospora root galls on potato plants.

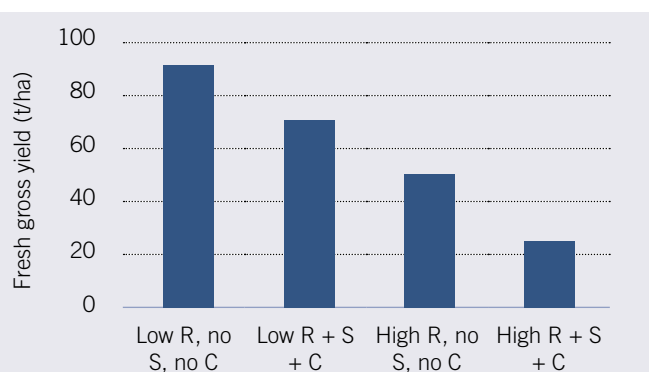


Figure 2: Averaged plant yield-equivalent from targeted areas (affected by different factors) in 11 Canterbury potato crops. R = Stem canker incidence; S = Spongospora (root galls); C = Soil compaction.

no strong effects. There were also no significant responses to additional calcium.

Findings

- Current yields of processing potatoes were 20-40 t/ha less than potential.
- Soil-borne diseases (Rhizoctonia stem canker, Spongospora root infection) were prevalent, probably restricting water uptake and causing premature canopy death.

- In 11 surveyed crops, healthy plants produced close to potential.
- Paddocks not previously growing potatoes (new) had less pathogen inoculum than those with potato cropping histories (last 10 years; old). However, previous cropping history did not predict soil-borne disease incidence or severity.
- Soil compaction reduced water-holding capacity and root growth.
- Current fertiliser rates are

near optimum for growth and production.

- Other factors (e.g. seed tuber quality, irrigation efficiency) could also limit yields.

Advice

Based on this study, researchers have the following advice for growers:

- Plant potatoes in soils that have high water-holding capacities, good drainage and no root restriction zones.
- Choose paddocks that have

had long periods (at least 10 years) without potatoes.

- Carry out soil testing for pathogen DNA to indicate disease risk.
- Match crop nutrient requirement with supply, possibly reducing some fertiliser inputs.
- Select disease-free seed tubers with high vigour for strong plant growth.

This research was guided by Sarah Sinton, Professor Richard Falloon and Dr Hamish Brown, with assistance from Craig Tregurtha, Alex Michel, Steven Dellow, Dr Farhat Shah, Dr Sarah Pethybridge, Dr Jeff Reid and Dr Bruce Searle. Duncan McLeod (Seed & Field) and the potato growers and their agronomists are thanked for allowing access to crops.

Paddock	Factors
1	Rhizoctonia stem canker (R sc), Spongospora root galls (S rg), soil compaction, uneven irrigation (waterlogging and dry spots), wind damage
2	R sc, S rg, soil compaction, shortened canopy duration, uneven irrigation (waterlogging and dry spots), wind damage
3	R sc, S rg, soil compaction, waterlogging, wind damage
4	R sc, wind damage, seed or psyllid problem
5	R sc, diseased canopy with low vigour, wind damage
6	R sc, S rg, soil compaction, uneven irrigation
7	R sc, three spans of irrigator malfunctioning, wind damage
8	R sc, S rg, soil compaction, shortened canopy duration
9	R sc, S rg, soil compaction
10	R sc, shortened canopy duration
11	R sc, shortened canopy duration, poor seed quality

Table 1: Factors contributing to yield reductions for each of the 11 Canterbury potato crops included in this study.

i The project was funded by Potatoes New Zealand, the McCain Foods growers group, Ravensdown Fertiliser and Plant and Food Research.

For further information, contact Sarah Sinton. Email: sarah.sinton@plantandfood.co.nz

Monitoring soil-borne potato pathogens: Tasmania and South Australia



DR LEIGH SPARROW OF THE TASMANIAN INSTITUTE OF AGRICULTURE AND MICHAEL RETTKE OF THE SOUTH AUSTRALIAN RESEARCH AND DEVELOPMENT INSTITUTE RECENTLY CONDUCTED A STUDY WHICH MONITORED THE CONCENTRATIONS OF SOIL-BORNE POTATO PATHOGENS IN TASMANIA AND SOUTH AUSTRALIA, AS PART OF THE AUSTRALIAN POTATO RESEARCH PROGRAM PHASE 2 (APRP2).

Farmers use crop rotations to minimise the build-up of crop diseases such as Powdery scab, Common scab, Black scurf and Stem canker, which are soil-borne diseases of particular concern to Australian potato growers.

From 2005-13, the Tasmanian Institute of Agriculture (TIA) and the South Australian Research and Development Institute (SARDI) monitored the concentrations of the pathogens that cause these diseases by analysing the topsoil from 28 farm paddocks in northern Tasmania and 15 in south-east South Australia each year.

Testing process

DNA fingerprinting tests specific to each organism were used. These tests were done by SARDI, which now offers soil tests, such as PreDicta Pt. During the project, the pathogen DNA concentrations in the crops that were grown in the monitored paddocks were

studied to identify whether there was an increase or decrease in the amount of disease-causing organisms in the soil.

Potatoes were grown at all sites in both states in the first year. In Tasmania, 14 sites were planted with a second potato crop later in the study and 14 other land uses were recorded on at least one occasion, with poppy, pasture, carrot, ryegrass and cereals (mainly wheat and barley) being the most popular.

In South Australia, seven of the 15 sites were planted with a second potato crop during the monitoring period and one was planted three times with potato. Other crops grown once at some sites in South Australia included lucerne, lupin, canola and broad bean.

The findings

All of the organisms assessed were present in at least some paddocks, with the most prevalent being *Spongospora subterranea* (the cause of

Powdery scab), which was found at almost every site in every year. At a number of paddocks, the DNA of *Rhizoctonia solani* AG3 (a cause of Stem canker and Black scurf), *Streptomyces scabies* (the cause of Common scab) and *Spongospora subterranea* was only found after the first potato crop was grown, strongly suggesting that the pathogen had been introduced on the potato seed tubers used to plant those paddocks.

None of the crops grown in the paddocks consistently caused concentrations of disease organisms to fall. The growing of ryegrass, poppy and carrot was associated with subsequent increases in *Rhizoctonia solani* AG3 DNA in Tasmania, suggesting that these crops may host this pathogen.

Carrot has been shown elsewhere to help *Rhizoctonia solani* AG3 survive in the absence of potato. Poppy, which is very widely grown in Tasmania, was also associated

with a subsequent increase in the DNA of *Rhizoctonia solani* AG2.1, a strain that has been linked to Stem canker and deformed tubers in potato. Replicated experiments to better define the role of these crops as hosts of *Rhizoctonia solani* are warranted.

The concentration of *Spongospora subterranea* DNA increased greatly each time potatoes were grown. While the DNA concentration fell between one potato crop and the next, it did not fall enough for the risk of Powdery scab to change. If potatoes continue to be grown in these paddocks, even with five years between each crop, growers will most likely continue to face a high risk of Powdery scab.

What this means for growers

It is clear that *Spongospora subterranea* is very persistent in soil. Computer modelling showed that more than five



Soil samples are taken from one of the 28 sites in northern Tasmania.

years between potato crops is needed for the risk of Powdery scab to reduce. Most growers will therefore need to choose less risky paddocks if available, or choose cultivars that are less susceptible to Powdery scab. Further, they should also keep their soils from becoming too wet at the time of tuber initiation, as damp conditions are known to favour this disease.

The behaviour of *Spongospora subterranea* can be contrasted with that of *Rhizoctonia solani* AG3, which increased in soils in both states after the 2005-06 season when potato was grown at all sites. However, it became less prevalent towards the end of the study, particularly in South Australia. This suggests that, in the absence of potato, *Rhizoctonia solani* AG3 does not persist as strongly as *Spongospora subterranea*.

The researchers thank the participating growers and Robin Harding, formerly of SARDI, who was responsible for the South Australian monitoring until 2011.

This project was funded by Horticulture Australia Limited

(HAL) using the Processed Potato Levy, matched funds from the Australian Government and voluntary contributions from the A&L Canada Laboratories and the New Zealand Institute for Plant and Food Research Ltd.

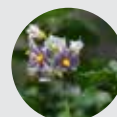
THE BOTTOM LINE

- Always use clean certified seed, especially on new ground.
- PreDicta Pt is an important tool to monitor concentration of soil-borne pathogens.
- The evidence suggests that, once infected, it can take up to 10 years for *Spongospora subterranea* (Powdery scab) DNA in the soil to decline to low-risk levels.



For further information on APRP2, contact:
AUSVEG
Phone: (03) 9882 0277
Email: info@ausveg.com.au
Project Number: PT09026
Aii

CALENDAR of events



27 October 2014

Potato Extension Program workshop

Where: Mt Barker, South Australia

What: Expressions of interest to attend this workshop are now open.

Further information: Please contact AUSVEG on (03) 9882 0277 or email info@ausveg.com.au

30 October 2014

Potato Extension Program workshop

Where: Pemberton, Western Australia

What: Expressions of interest to attend this workshop are now open.

Further information: Please contact AUSVEG on (03) 9882 0277 or email info@ausveg.com.au

12 November 2014

Potato Extension Program workshop

Where: Warragul, Victoria

What: Expressions of interest to attend this workshop are now open.

Further information: Please contact AUSVEG on (03) 9882 0277 or email info@ausveg.com.au

28-30 July 2015

9th World Potato Congress

Where: Beijing, China

What: The World Potato Congress is dedicated to supporting the global growth and development of the potato.

Further information: www.potatocongress.org



Stu Jennings

Now that the weather is starting to warm up, we recently asked our Facebook members what they were up to in their part of the world.

Most, like me, were planting or working ground to be planted, while up north in the Atherton Tablelands, it seemed that they were in

harvest season. Everyone has their own way of doing this but the idea is still the same: put potato seed in the ground, so it will grow.

It's great that I can simply ask a question on the YPP Facebook page and find out what people are up to. This is why we started the Facebook page; it's a great way to see that you are not alone and it's fantastic when people are posting amazing pictures of what they are doing. All of us enjoy checking out what like-minded people are doing.

On another note, the Victorian town of Thorpdale is preparing to bring back the Thorpdale Potato Festival. This is a great way to promote our product and our local area. Put Sunday 8 March 2015 in your diary, so you don't forget to come along and celebrate potatoes with us on a big scale.

New competition

YPP is pleased to announce the latest Photo Competition that we are running – once again sponsored by our friends at Adama. We had a great response when we ran our first competition earlier in the year and now we are upping the stakes a little.

GoPro
Be a HERO.



Your challenge this time, should you choose to accept it, is to once again submit photos of day-to-day farm life doing what you do best – growing spuds. The catch is that this time we want to know what is happening in the photo too, so in a few words (50 or less) describe what we are looking at and what makes it special. There will be extra points if you can make us chuckle and the winner will be chosen from all entries received up until 15 December 2014.

The prize up for grabs is a beautiful new GoPro Hero 3+ Black edition bundle from Adama worth over \$500 which will be delivered to the owner of the winning entry just in time for Christmas. You'll need to enter via the YPP Facebook page so if you are not already a member, jump on board. You also need to make sure that the photo is a decent size – preferably 3MB or better – so keep your phone or

camera setting at a high enough resolution and don't forget to put in your clever commentary as well.

Happy snapping!

Stu

www.youngpotatopeople.com.au



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