2020 **Field Walk**

2020 Field Walk Notes

Canterbury - 11th February, 1.30pm-4pm, Plant and Food Lincoln

1. TPP research update - Jessica
2. Emissions / Nitrate leaching project – Chris Claridge, Dirk Wallace & Iain
3. FEP – Chris on behalf of NZGAP
4. Potato breeding project PFR Germplasm lines – Steve Lewthwaite
5. MBIE Maximising Irrigation Project – Dirk Wallace
6. PMTV update – Iain
7. Inspector training course trial plots – Iain (Jessica & team)
8. John Sarup presentation – spot farms in UK nitrates/emissions (topic TBC)

Pukekohe - 13th February, 2pm-4.30pm, PFR Pukekohe

1. TPP research update - Iain
2. Emissions / Nitrate leaching project – Chris Claridge, Andrew Barber & Iain
3. FEP – Andrew Barber will make brief plug for NZGAP
4. Potato breeding project PFR Germplasm lines – Steve Lewthwaite
5. MBIE Maximising Irrigation Project – Dirk Wallace
6. PMTV update – Iain
7. Powdery Scab – Peter Wright – confirmed
8. Inspector training course trial plots
9. John Sarup presentation – spot farms in UK nitrates/emissions (topic TBC)

Manawatu - 14th February, 2pm-4.30pm, Chris Pescini's farm

1. TPP research update - Iain
2. Emissions / Nitrate leaching project – Chris Claridge, Luke Posthuma, Fernando Avendaño & Iain
3. FEP – Chris/Iain will make brief plug for NZGAP
4. Potato breeding project PFR Germplasm lines – Iain
5. MBIE Maximising Irrigation Project - Iain
6. PMTV update – Iain
7. Inspector training course trial plots – Iain
8. John Sarup presentation – spot farms in UK nitrates/emissions (topic TBC)

Summary of Topics

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1. Tomato potato psyllid (TPP) work at Plant & Food Research (PFR)

This work is part of the PFR Potato Residue-free Pest and Disease Management Research Programme, funded by MBIE Strategic Science Investment Fund (SSIF).

a) Cold TPP going hot (led by Dr Jessica Dohmen-Vereijssen)

This is a more fundamental science project investigating previous observations that psyllids not containing the bacterium *Candidatus* Liberibacter solanacearum (CLso) being reared on capsicum plants will become positive after many generations on tomato plants. The project will complete in March and so far we have not seen the phenomenon occur. This information needed to be obtained to understand the TPP-CLso interaction.

b) Extracting CLso from phloem (led by Dr Falk Kalamorz)

The aim is to isolate and grow CLso in a petri dish, this will be the first step towards more detailed understanding of the functioning and pathogenicity of CLso and will give us the tools to directly manipulate the bacteria. Extracting CLso from the phloem of a tomato plant and proliferation of the isolated CLso-cells outside of a host. Currently, the CLso bacterium cannot be grown in a petri dish and with all the detection work we are conducting, the DNA is always contaminated with insect or plant DNA. The techniques we develop will also be transferable to other pathogens with a similar lifestyle.

c) Bacteria communication (led by Dr Grant Smith)

This PFR-supported research is focused on unravelling how bacteria which reside in the plant's vascular bundle communicate with each other. Currently, we don't understand how CLso coordinates the invasion and infection of its host plants. If we can understand how the individual bacteria coordinate their attack on the plant we can propose and develop novel disease control options. From the work too date we have some ideas about how disease might be caused, and we are considering how to test and validate these ideas. If we can identify a point of intervention, we can then consider how to best deliver these tools via, for example breeding or biochemistry, to stop this bacteria in its tracks.

Tomato potato psyllid adult. Whitney Cranshaw, Colorado State University, Bugwood.org (http://www.forestryimages.org/browse/detail.cfm?imgnum=1476083)

MBIE Realising Potato Export Growth PNZ-01

This work is part of the MBIE research programme aimed at growing the New Zealand potato industry by addressing TPP with effective sustainable control measures and resistant potato cultivars. This was a six year programme which finished in September 2019.

Understanding and manipulating insect behaviour (led by Dr Kye Chung Park).

This project developed knowledge of how TPP interact with each other, the environment and the host plant through sensory cues, and is now applying that knowledge to develop prototype tools to improve the current techniques to monitor and control TPP populations in the field and greenhouse.

Using laser vibrometry, acoustic signals from both male and female psyllids have been identified and characterised, synthetic acoustic mimics that alter psyllid behaviour have been produced, and developed a model of the effect of the acoustic signals on male and female behaviour.

With the acoustic, visual and olfactory sensory cues identified, various combinations of these sensory cues are now being tested in glasshouse situations using our new constructed a trap. Our current focus is on the behavioural attractiveness of the combination of visual and olfactory sensory cues to improve monitoring TPP.

Population genetic variation of TPP in relation to NZ growing regions and the distribution of CLso and Zebra Chip disease (led by Dr Rebekah Frampton).

Significant genetic diversity (referred to as genotypes) exists within New Zealand TPP populations but does not appear to contribute to regional population differences.

To the best of our knowledge, the presence or absence of CLso and other endosymbionts (e.g. Wolbachia, Carsonella) is not linked to the TPP genotype. We investigated whether the endosymbiont composition of TPP related to biological properties with regard to uptake and transmission of CLso. A PCR assay to detect Wolbachia and Carsonella endosymbionts has been developed and applied to isofemale colonies and field populations, revealing that the Wolbachia sp. was found only in North Island TPP populations and not in Canterbury. Under the conditions tested the Wolbachia sp. does not seem to affect the ability of TPP to acquire CLso from infected host plants.

No insecticide resistance to organophosphates (acetylcholine esterase) and pyrethroids (para sodium channel) was observed in the tested TPP populations. Understanding the resistance of newer chemistries (e.g. spinosysns and tetronic and tetramic acid derivatives) is more difficult and will require further research using the use of new sequencing technologies.

Understanding host plant response (led by Margaret Carpenter, Steve Lewthwaite and Gail Timmerman-Vaughan).

The tuber transcriptome was affected more by CLso infection than by TPP infestation, whereas aerial parts of the plant (stems and leaves) showed a greater response to TPP feeding. Gene expression shows tuber sugar metabolism is disrupted.

Molecular-level research has broadened the picture of plant metabolic and transcriptional responses during CLso infection, pointing toward the mechanism(s) for tolerance or resistance. Metabolomics has shown that CLso induces changes in key nutrients within the tuber. Measurement of these compounds in breeding lines provides a mechanism for maintaining nutritional quality while breeding for zebra chip tolerance.

This project compared the transcriptomes of tolerant and susceptible lines in response to zebra chip. Many of the changes in gene expression are common to both lines, but there are a group of genes whose behaviour differs between susceptible and tolerant lines. This research was conducted to better understand the potato plant's response to TPP and CLso, to inform breeding of tolerant or resistant cultivars and better management of the crop to achieve product quality.

The PFR Breeding Programme has developed a zebra chip tolerant French fry cultivar which is currently with a licensee and also identified other tolerant lines. Another candidate which is a proprietary breeding line shows heritable increase in zebra chip tolerance and is being used as a parent in the breeding programme. Recently we identified a third breeding line with low zebra chip defect scores from greenhouse and field environments. Commercially available tolerant cultivars will help to reduce zebra chip incidence and severity.

2. Emissions & Nitrate leaching
PNZ-79

The PNZ 79 Emissions project and taskforce will assist in nitrate, carbon and greenhouse gas emission modelling for the potato industry. It is a 6 year project which will provide growers with the tools to easily manage and meet regulatory requirements.

This multi-workstream nationwide project will analyse nitrate uptake, nutrient leaching, calculate carbon emissions, test Teralytic probe data efficacy and validate Overseer predictions for potato crops in multiple regions throughout New Zealand.

The overall aims are:

- To maintain the potato industry's social license to operate
- To protect the ability to grow, process & export potatoes, whilst meeting environmental standards and maintaining international competitiveness
- To ensure industry access to land, water and nutrients through National, Regional and farm programs in order to achieve industry growth targets.

The 5 workstreams are:

Workstream 1 – PNZ-79 Nitrate Leaching

Workstream 2 – Regional Nitrate Leaching & Farm Monitoring & Telemetry Trials

Workstream 3 – Overseer Calibration & Validation / Potato Calculator Version 2

Workstream 4 – Biosecurity & Emissions & Levy Information Systems – BELIS

Potato Calculator V2 - Nutrient Compliance & Optimisation Dashboard

Workstream 5 – Global Consenting Model

In essence our Emissions Project is to protect land, food and people.

KAITIAKITANGA
LAND • FOOD • PEOPLE

Potatoes
NEW ZEALAND

PNZ-79 Workstream 1: Nitrate leaching below the root zone

Current and potential regulatory changes require that potato production is environmentally sustainable while being economically sustainable for growers. The leaching of nitrate (NO3) into ground water is one of the current environmental focus for the whole farming sector.

Workstream 1 of the PNZ-79 project, led by Plant & Food Research (PFR) includes a literature review of nitrate leaching methodologies and previous research and controlled field experiments.

The literature review undertaken in late 2019 highlighted that:

- **There currently is limited data on nitrate leaching from New Zealand potato crops**
- **There are several strategies currently available to growers to reduce the risk of nitrate leaching**
- **Most available strategies revolved around making informed management decisions about nitrogen and water inputs.**

Controlled field experiments within PNZ-79 Workstream 1, collect data on nitrate leaching from different combinations of irrigation and nitrogen inputs:

- **Irrigation**
  - Good Management Practice: using a deficit strategy which refills soil water content to 90% of field capacity (replacing soil water content in the rooting zone, 0-600 mm, to a target that allows for potential rainfall in order to minimise the risk of leaching through drainage).
  - Poor Management Practice: refilling soil water content to field capacity and using an uncalibrated irrigator (irrigation likely to cause drainage).
- **Nitrogen (preliminary soil test estimated mineralisation to provide approximately 100 kg N/ha, and every treatment also received 20 kg N/ha at planting)**
  - Nil: no N applied as side-dressing
  - Low: 100 kg N/ha (½ GMP) applied as 4 equal side-dressings fortnightly from crop emergence
  - GMP: informed decision based on recommendation from the Potato Calculator (setup for cultivar and soil type at the site) and Nutrient Management Guidelines (Reid and Morton, 2019) = 200 kg N/ha applied as four equal side-dressings fortnightly from crop emergence
  - High: 400 kg N/ha (2x GMP) applied as four equal side-dressings fortnightly from crop emergence.

'Russet Burbank' potatoes were planted on 21 October 2019 (31 cm seed spacing, 20 cm seed depth, 0.82 m row width). Experimental plots are 14 rows by 10 m. Irrigation is applied using a single span lateral irrigator. All side-dressings of nitrogen were applied as urea, immediately followed by 10 mm irrigation (minimal amount).

Following the harvest of the potato crop, the plots will be planted in wheat and grown until grain maturity. Nitrate leaching will be measured during the wheat phase to determine winter leaching from residual N remaining following potato harvest.

Data collected from the experiment include:

- **Soil water content down to 1.5 m depth is measured at regular intervals and following likely drainage events (e.g. 20+ mm rainfall) to inform irrigation and monitor potential drainage**
- **Ceramic solution samplers (4 per plots) have been installed at 90 cm depth and are measured for nitrate concentration after each drainage event**
- **Soil mineral N down to 90 cm depth is measured monthly. Soil mineral N was also measured down to 1.5 m following the potato crop emergence, at final tuber harvest and following the wheat crop. Mineralisable N from 0 to 30 cm depth was measured before planting the potato crop and before planting the wheat crop.**

All the data collected within that experiment will be used to:

- **Provide support for the refinement of the Overseer Nutrient Budget tool for potatoes**
- **Provide a calibration dataset for the development of a grower decision-support tool**
- **Promote Good Management Practices through better understanding the potential risk of leaching from different scenarios.**

The wider PNZ-79 project, is currently in further development to expand to include other vegetable crops (e.g. onions, brassicas etc…) and regions.

Figure: Aerial view of the PNZ-79 trial in late December 2019 (Lincoln, Canterbury).

Workstreams 2-5 are currently underway, under the management of Iain Kirkwood, but no update material at time of printing.

3. Potato Breeding
PNZ-28

Plant & Food Research have run an active potato breeding programme for over 60 years, with the North and South Islands serviced out of Pukekohe and Lincoln, respectively. The programme focusses on delivering improved potato cultivars adapted to the New Zealand environment, with an eye on genotypes that might also meet international niches. Targets include improving yield, quality, and production under reduced inputs, whilst also exploring opportunities for higher value innovative products. There is heavy selection for increased tolerance to diseases significant to New Zealand, such as Zebra Chip. This breeding effort is underpinned by an integrated science research programme developing genetics for a future where sustainable growing systems are compulsory, access to healthy food is a priority and niche products are a premium.

The mechanics of the breeding process involve:

1. Maintaining sufficient parental material to provide the characteristics of interest, with Plant & Food Research's current collection containing approximately 800 genotypes.
2. Generating new combinations and expressions of characteristics through the crossing of parental genotypes, producing thousands of seedlings each season – photos 1 & 2.
3. Fixing the new characteristics by clonal selection, then screening their expression and general commercial performance – photo 3, and (4) refining the process through client feedback.

After about 10 years of selection, the best performing cultivars are further trialled by clients to determine which ones will be commercialised. Successful lines are protected by PVR, maintained in a finger-printed pathogen-tested state, and disseminated to domestic and international markets for commercial production.

Photo 1: Potato seedlings, initially sown in families with common parents, then pricked out into individual plugs

Photo 2: Thousands of seedlings are trans-planted into the field each season, to allow single-plant hand-dug selection following full exposure to a growing season

Photo 3: Selected seedlings are clonally propagated, to allow replicated evaluation across seasons and environments

4. Maximising the Value of Irrigation PNZ-24

The 2013–2019 MBIE programme 'Maximising the Value of Irrigation' (MVI) has developed management strategies and new technologies to improve productivity, minimise wasted water, and reduce negative environmental impacts from irrigated land. The programme has shown that by measuring soil water holding capacity and crop water use under an irrigator and understanding the associated degree of variability we can make better irrigation decisions that improve on-farm economic and environmental outcomes.

Improved economic returns

Field trials conducted at Massey University, Palmerston North, show that the use of variable rate irrigation (VRI) can increase profit (less water costs and potentially more yield) when soil variability under the irrigator is significant, with every millimetre of water saved equating to about $2/ha. If 50 mm of irrigation was saved under a 550 meter long pivot then this would be a saving of about $9500.

At sites with large variability in soil water storage (e.g. Fig 1 A), modelling studies suggest that VRI results in less irrigation applied; up to 31% in potatoes. While at sites with low variability (e.g. Fig 1 B), there was little difference.

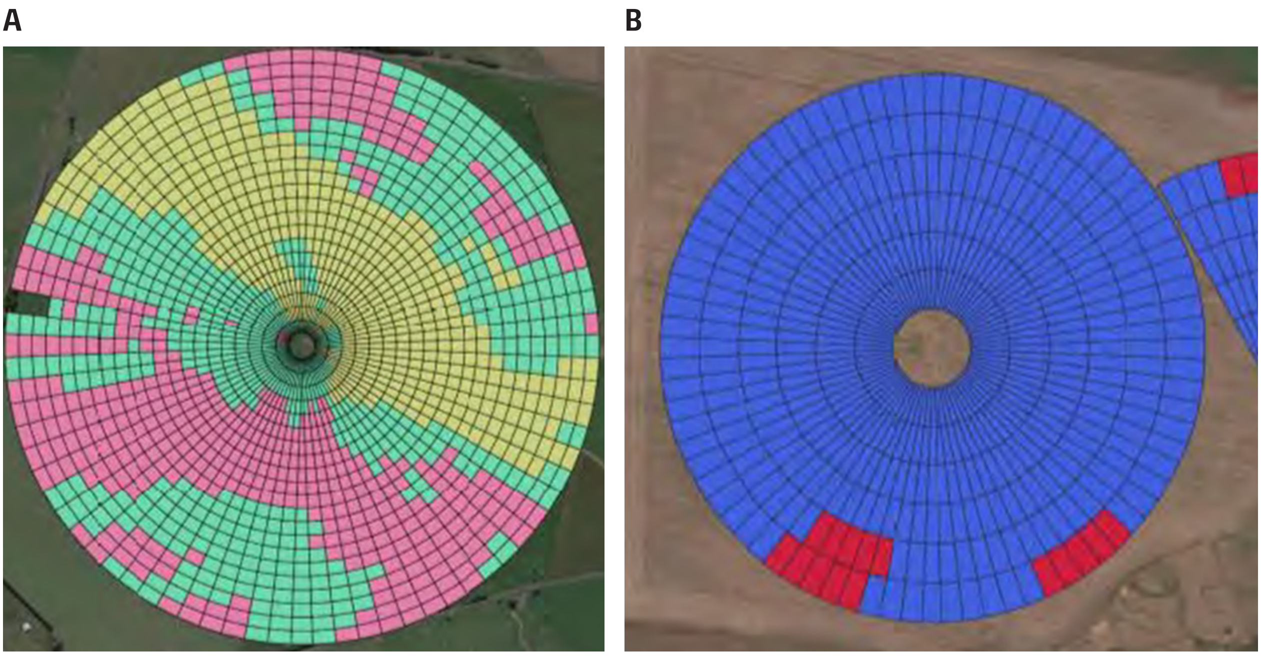


Figure 1 - Variability in soil type at two MVI study sites

Determining crop water use allows us to understand how much water the crop needs and when to avoid stress. Field trials at Massey University have shown that yields are reduced when crops are stressed due to an over or under supply of water. To avoid this the programme has made improvements in crop water use estimation using sensing – enabling us to ask both the plant and the soil when and how much water to apply. By understanding more about how much water is available in the soil directly under the irrigator it is much easier to make better decisions about how much to apply.

Managing to a deficit, means the soil isn't refilled the whole way, enabling rainfall to be captured for plant growth rather than draining away. Capturing 100 mm of rainfall is the equivalent of 1000 m3/ha of irrigation saved or a production saving of $200/ha. Modelling studies across five sites demonstrate that managing irrigation to a soil moisture deficit using VRI, compared with uniform irrigation, can result in no difference in yield.

Better environmental outcomes

Although getting water in to soil sounds simple, it really is anything but. Figure 2 shows a snapshot of what saturated flow through soil looks like. The pattern of this flow is a result of the initial wetness of the soil, how much water is being applied and how fast it is going on. Too wet, too fast and the water cannot be absorbed in to the soil pores. Typically, rain falls at rate of less than 2 mm/h, whereas long centre pivot can apply water at a rate up to (and in excess of) 100 mm/h.

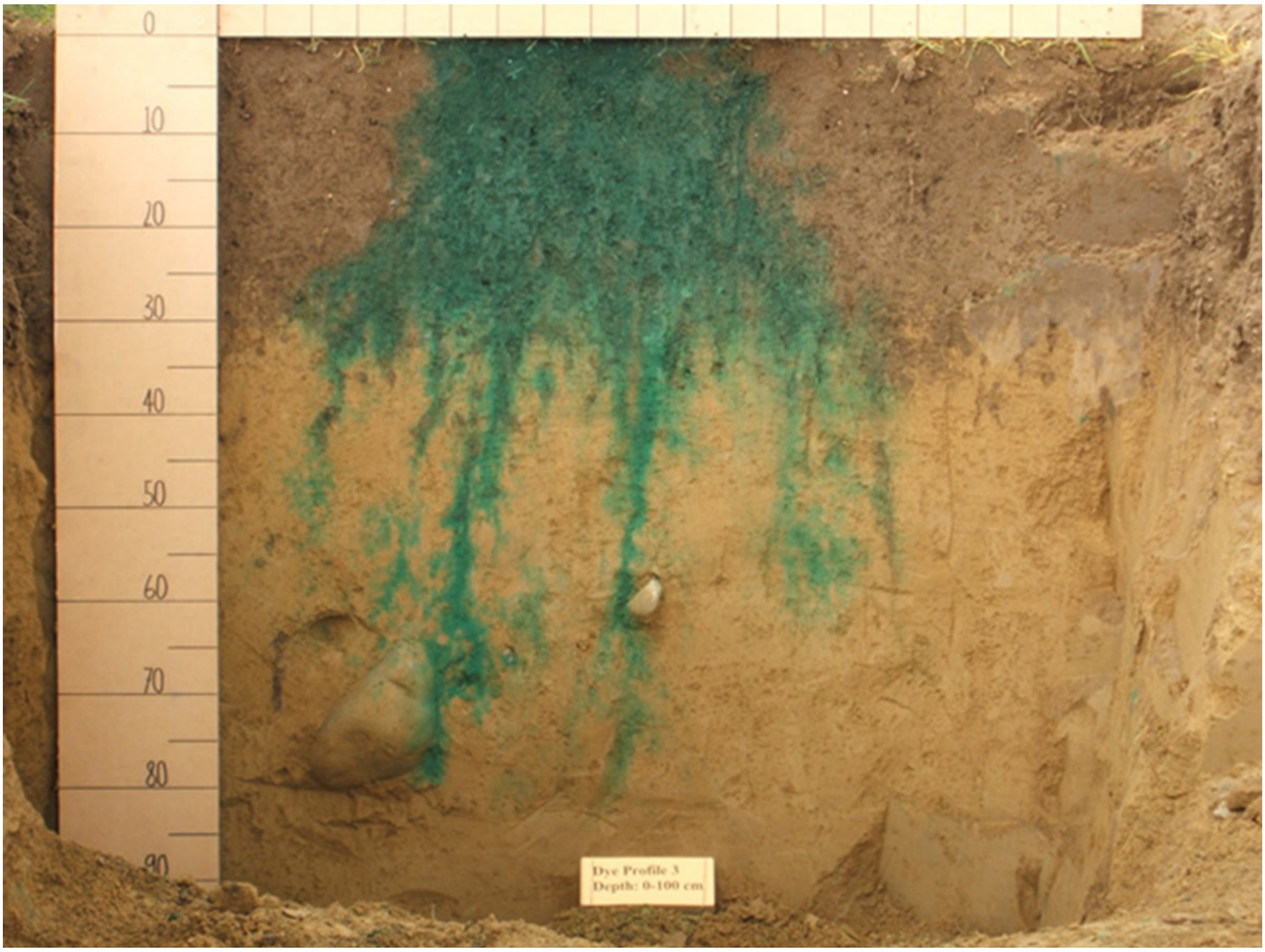


Figure 2 - Dye tracer showing water flow through soil
Photo supplied by Sam Carrick, Manaaki Whenua – Landcare Research

In this example if dissolved nutrients were in the fingered, saturated flow they would have leached deeper in to the profile, bypassing much of potato root zone. In this situation leaching losses can be large. Our field trials show that this leaching can be greatly reduced by managing irrigation to maintain soil water deficits. When considering installing or replacing irrigation systems avoid systems that apply water at high application rates. Installers should aim at matching their system to the soil infiltration capacity – the rate that soil absorbs water when it is saturated. Often this is less than 20 mm/h.

At sites with large variability in soil water storage, modelling studies suggest that VRI results in up to a 43% decrease in drainage in potato crops. While at sites with low variability, there was little benefit to applying VRI. Understanding your soil water storage and managing this to a deficit will reduce your risk of unwanted leaching.

Other research has shown the benefits of increasing the amount of available soil water through modifying soil beds, and or applying soil amendments. Applying mulches led to increased yields by reducing evaporation losses.

To maximise profit and reduce unwanted environmental losses the key steps are:

- Know how much water your soil stores and how variable this is

- Use sensors or water balance methods to work out how much water to apply

- Leave some storage in the soil after irrigation to capture rainfall and avoid leaching.

MAXIMISING THE VALUE OF IRRIGATION

Landcare Research & Plant & Food Research led Programme

Work was completed as part of the Maximising the Value of Irrigation programme with principal funding from the Ministry of Business, Innovation and Employment (MBIE) and co-funding from the Foundation for Arable Research, Horticulture New Zealand Vegetable Research and Innovation Board, Environment Canterbury, Hawke's Bay Regional Council and Irrigation New Zealand. The programme was led by Manaaki Whenua - Landcare Research, Plant & Food Research and the Foundation for Arable Research.

5. PMTV Update
PNZ-74

Introduction

Potato mop-top virus is a plant virus that largely affects potatoes. Their primary hosts are plants in the **Solanaceae** and **Chenopodiaceae** families.

Potato mop-top virus is both seed- and soil-borne, vectored by Spongospora subterranea f. sp. subterranean, the causal agent of powdery scab on potato. Once established in fields, the virus can survive in the fungus for up to 20 years in the soil, even in the absence of a potato crop.

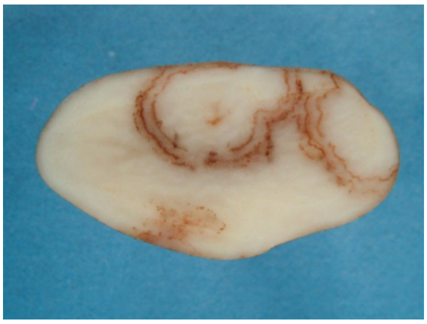
The infection of the potato plant can be either directly from the infected mother tuber or through a current season transmission via a powdery scab infection of the roots or tubers.

It can be spread through seed tubers (including in soil adhering to tubers), soil associated with people movements/ machinery, and via waste from potatoes handling facilities (processors wash packers, grading sheds, etc).

Symptoms

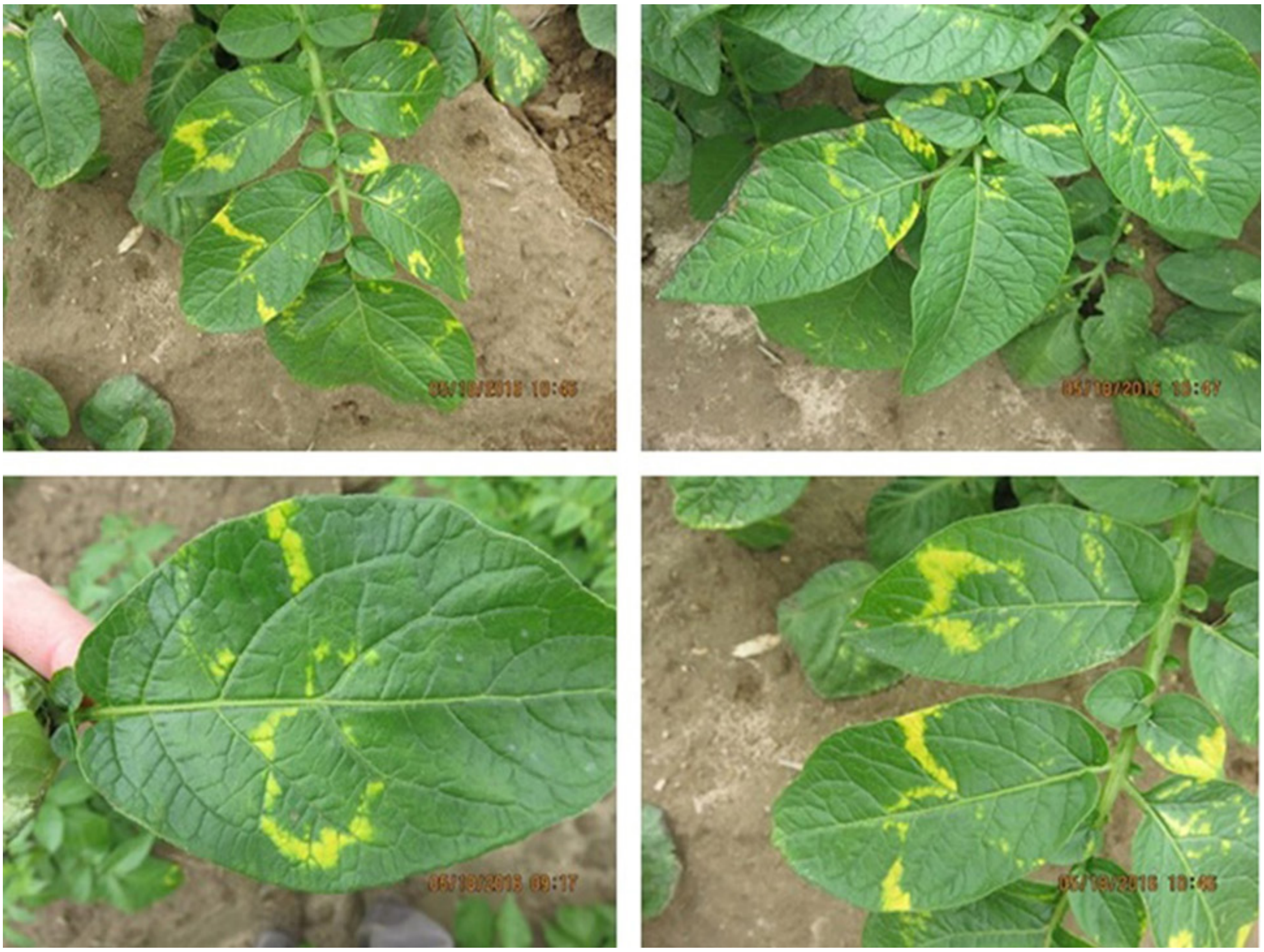
Affected potatoes can display both foliar and tuber symptoms of varying severity depending on the sensitivity of the variety and the source of infection, including:

- distortions to the skin;
- deep cracking and rust-coloured arcs, streaks or flecks in the tuber flesh;
- yellow colouration on the foliage (mother tuber infections only).



Deep cracking and rust-coloured arcs

Deep cracking and rust-coloured arcs



Yellow colouration on the foliar

Identifying the disease through visual observation of foliar and tuber symptoms in potato has not proven to be a reliable detection method, as the virus can also cause symptomless infections. PMTV can however be reliably identified using molecular and serological tests in potato roots and tubers, and can also be identified by soil sampling using the bait plant test.

PMTV Management plan 2019/20

Following a meeting with seed growers it was agreed that the best means of limiting the spread of the virus would be to monitor and manage it in seed crops. To this end it was agreed that we will test 50% of all seed crop in 2019/20 season. The tests will all be anonymous and will cover all seed growing regions and each seed grower will have at least one of their paddocks tested. The results will be compiled nationally and compared to the result from the previous year 2018/19 to determine if the percentage of crops infected with PMTV was increasing or decreasing. If an increasing trend was observed the seed industry would implement a more rigorous testing program which could include a pre-planting soil test if the methodology could be demonstrated to be reliable.

6. Inspector Training & trial plots

The Biosecurity and Seed Potato Inspector Training day was held on Friday 13th December at Plant and Food Lincoln (Ashley Room) from 10am to 3pm.

The invitation was primarily for New Zealand Seed Potato Certification Scheme registered inspectors (SGS, AsureQuality and Eurogrow) and was extended to include key regional agronomists.

The course covered firstly the Potato Sector Risk organisms and how to identify them in the field and what to do if there is a suspected find and secondly field and tuber inspection methodologies, and pest, disease and defect identification which included practical sessions in field plots at the Lincoln site.

Training inspectors in the field and in the classroom.

7. Farm Environment Plans

The National Policy Statement for Freshwater Management (NPS-FM), and Regional Council - Land and Water Plans are requiring growers to develop and implement a Farm Environment Plan (FEP). The environmental issues of concern to the council include management of nutrients, soils, irrigation, waterways, and biodiversity.

Nutrient allocation, water allocation and resource consenting are matters still being debated across the country, but the one consistent message is that FEPs are going to be an essential tool to help growers manage their environmental impact. Another fundamental regulatory requirement is the ongoing monitoring/audit of FEP implementation and continuous improvement, which can be achieved and demonstrated via independently audited self-management assurance systems like NZGAP.

NZGAP has developed an Environment Management System (EMS) add-on as a pathway for growers to demonstrate to regulators, consumers and their community that they are growing in an environmentally sustainable manner.

The NZGAP EMS add-on:

- Is now available for all NZGAP and GLOBALG.A.P. certified growers
- Can be audited as a stand-alone or alongside your usual GAP audit
- Has been formally recognised by Environment Canterbury (ECan) as a pathway for growers to meet Plan Change 7 (PC7) requirements for an audited FEP
- Is in the process of recognition in Waikato, Gisborne, Hawkes Bay, and Horizons
- Is seeking national recognition via the NPS-FM
- Is fundamentally based on industry developed guidelines and codes of practice

FEP workshops are currently being rolled out across the country by HortNZ in collaboration with product groups, district associations, growers, industry stakeholders, advisers and councils. The workshops aim to assist growers with the development of FEPs and implementation of Good/Best Management Practices in the industry guidelines. Four workshops have already taken place in Levin, two in Pukekohe, while Canterbury are being planned for March 2020. Plans for other regions are still being developed, so more information will be available soon. www.nzgap.co.nz

Example of a grower who has implemented good practices in industry guidelines and the EMS add-on

8. Inspiring farm excellence through farmer – led discussions

- **Factual, evidence-based advice, information and activity is core to what we do at AHDB.**
- **The SPot Farm programme up-scales the research and demonstrates the on-farm implementation of the science from our £1.5m annual R&D investment in a commercial, field-scale environment.**
- *"Inspiration for farmers to adopt new technologies and make beneficial changes on farm must come from voices they are familiar with and trust. This is why AHDB is investing over £1m in our Farm Excellence network every year, to build on and create new groups to allow more farmers to see action on farm and channel innovation at those that can use it the most."* Susannah Bolton, AHDB Director of Knowledge Exchange

Aims and objectives

- **Increasing productivity vs risk of failure**
  - It's an unfortunate fact that for many potato businesses the risk of failure is simply too high to risk changing a system that works.
- **Giving confidence to deliver change**
  - The SPot Farm steps in to offer growers an insight into how new systems and practice can be implemented at their own potato enterprise, ultimately to give levy- payers and their agronomists more confidence to deliver change.
- **Locally relevant**
  - Using a steering Group made up of the host, their agronomist and other local growers, projects are decided based on local conditions and concerns.

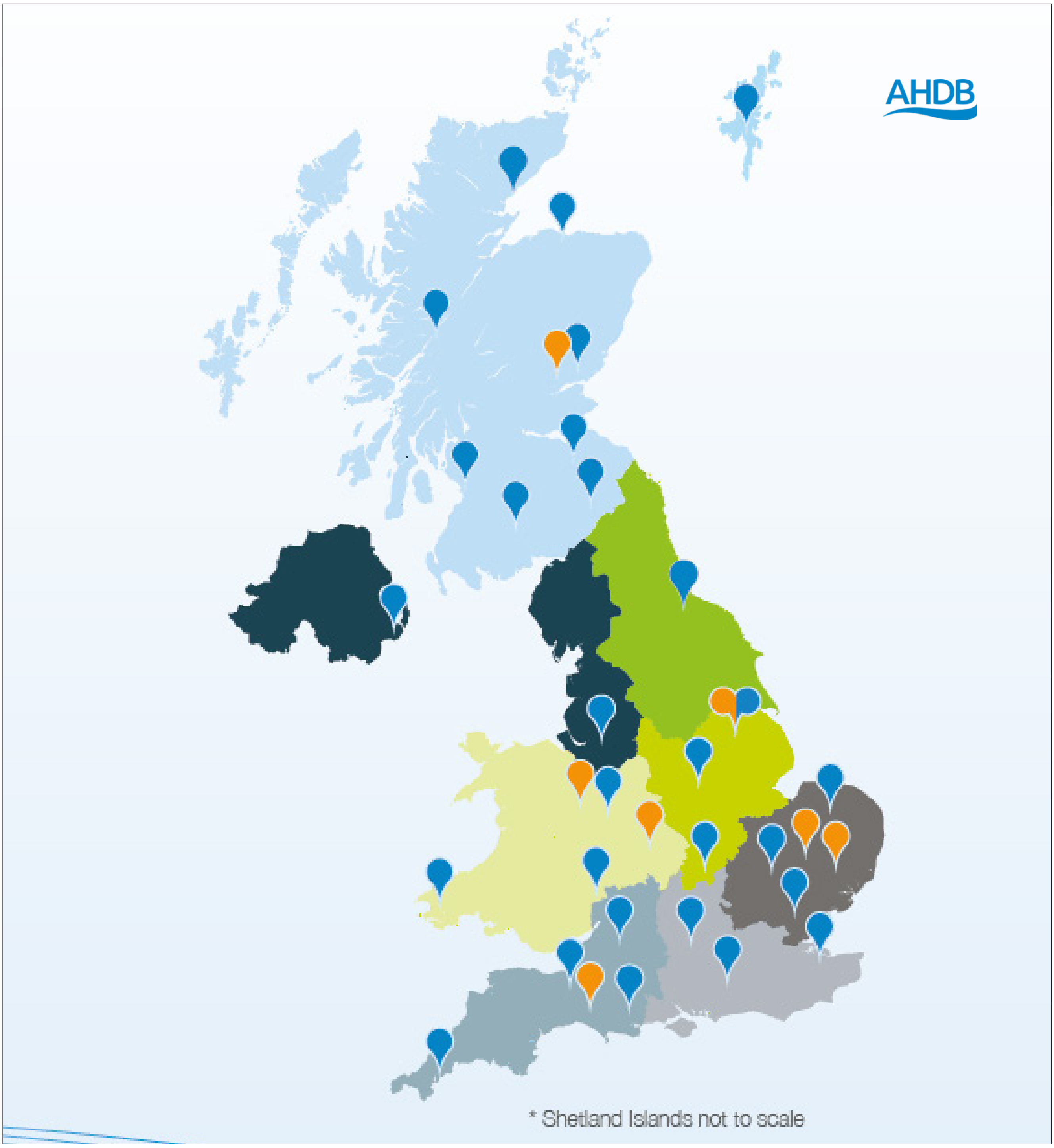
FARM EXCELLENCE

AHDB Monitor Farms and Strategic Arable Farms

Strategic Farm

Monitor Farm

* *The Scottish Monitor Farms are run as a joint initiative between Quality Meat Scotland (QMS) and AHDB Cereals & Oilseeds with funding from the Scottish Government.*



9. Powdery scab - suppressive soils

Research project funded by Hort Innovation (Australia) and Potatoes NZ

Peter Wright & Richard Falloon

Tuber powdery scab

Spongospora root galls

Greenhouse experiment, 2018 (288 pots)

The aims of our study were to

1. Determine if powdery scab suppressive soils are present in New Zealand and, if so,
2. To gain further knowledge and understanding of how disease suppressiveness impacts key taxonomic bacterial and fungal groups in the soil, and
3. To examine the interactions and effects of soil physical, chemical factors and biological factors on disease suppression.

Suppressive soils are a promising sustainable and eco-friendly approach for pathogen control, and an additional aim of this research was that the findings will assist in development of agronomic management options that enhance soil health and promote soil microorganism populations that suppress the intractable quality- and yield-limiting potato diseases caused by Spongospora subterranea.

Greenhouse experiments

Two experiments have been completed (2017 and 2018). Field soils from the Pukekohe/Waikato region were inoculated with Spongospora and planted with a Spongospora-susceptible potato cultivar. The soils were characterised for their chemical and physical characteristics, and microbial populations. Resulting plants were assessed for root galling and powdery scab.

Key results

- Some of the soils suppressed Spongospora diseases
- Soil heat treatment increased powdery scab, indicating disease suppression was associated with the soil microbial populations
- Powdery scab suppressive soils had different populations of specific bacteria than non-suppressive soils
- Some suppressive soils had very high natural amounts of manganese

A third greenhouse experiment (2019) measured effects of different natural manganese levels in field soils on Spongospora diseases, and determined if soil and foliar applications of manganese affect these diseases.

Hort Innovation POTATO – PROCESSING FUND
This project has been funded by Hort Innovation using the processing potato research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au

Potatoes NEW ZEALAND Growing together

Plant & Food RESEARCH RANGAHAU AHUMĀRA KAI

Horticulture™ New Zealand

TAKING PART IN A HORTICULTURE FIELD DAY?

THINK ABOUT BIOSECURITY! HERE ARE SOME EASY STEPS.

Field days are a great way to share information and knowledge in a hands-on way. However, movement of people, goods and vehicles between farms/orchards during a field day can present a biosecurity risk. Pests or pathogens can inadvertently be carried:

- onto the host's property
- back to the attendees' property.

Implementing simple everyday biosecurity practices can help to minimise the biosecurity risk for both hosts and attendees, which is a great outcome for all.

If you are an ORGANISER:

- Include biosecurity messaging on promotional material and in communications with host properties.
- Minimise the number of vehicles and use transport that is not usually used on the farm/orchard if possible.
- Keep a register of all attendees to ensure tracing is possible if required.
- Avoid visiting properties that are known to have high risk pest, pathogen or weed infestations.

If you are a HOST PROPERTY:

- Make sure good biosecurity practices are visible on your property.
- Provide a biosecurity briefing about the actions you'd like visitors to take so that attendees know what you expect of them.
- Ensure that you have a designated and clearly signposted parking area.
- Provide a footwear wash and disinfection station at the point of entry e.g. boot scrubbers and water for cleaning, sanitising spray or a footbath containing an appropriate sanitising product for disinfection.
- Provide hand sanitiser if people will be touching plants or soil.
- Avoid use of other people's tools and equipment for demonstrations, unless they have been thoroughly cleaned and disinfected first.
- Monitor the part of your property where the visit took place over time for unfamiliar pests, pathogens or weeds.

If you are an ATTENDEE:

- Make sure your clothing and footwear is clean. Avoid wearing clothes and shoes that you wear on your own farm/orchard.
- Clean and disinfect your footwear between each site during the field day and before returning to your own farm/orchard.
- Follow all biosecurity signage and requests at host properties.

BE A BIOSECURITY CHAMPION:

HELP TO PROTECT YOUR PROPERTY AND YOUR SECTOR FROM PESTS AND PATHOGENS.

Potatoes NEW ZEALAND

Event Day Advice

Health and safety
These events are being held on working farms. Please take appropriate care and be aware of potential hazards. For your safety, please:

- **Follow instructions from PNZ staff/event manager, at all times**
- **Stay within the areas specified by PNZ staff/event staff**
- **Stay out of trial plots unless invited by PNZ staff/event staff**
- **Report any hazards you see, directly to a member of PNZ staff/event staff**

Biosecurity: All visitors to farms will clean boots/footwear upon entry and departure, or boot covers will be provided by event manager. Biosecurity Advice is covered in Topic 8 & will soon be available in A3 poster form.

Specific hazards to be aware of:

- **Vehicles: Take care when moving across or through the car parking, entry and exit areas**
- **Trips and falls: Watch out for uneven ground**
- **Weather: Sun block is available on site**
- **Electric fences**

First aid and emergencies Should you require any assistance, please ask a member of PNZ staff. In case of emergency call 111 and notify a PNZ staff member. Iain Kirkwood has current First Aid certificate and first aid kit.

Event Sites

- **Canterbury** - Plant and Food Research, Lincoln
- **Pukekohe** - Plant and Food Research, Pukekohe
- **Manawatu** - Chris Pescini's Farm, 52 Kimberley Rd, Levin (old hort research station)

Vehicles - Vehicles will not be permitted outside of the designated car parking areas.

Smoking - No smoking permitted on these property.

2020 Upcoming Industry Events

- **NZGAP FEP workshop -** 25th February @ 5:30 pm - 8:00 pm - Pukekohe Indian Association Events Centre, 57 Ward Street, Pukekohe, 2120 New Zealand
- **LANDWISE Conference** - 27th & 28th May, Hawkes Bay http://www.landwise.org.nz/events-2/landwise-2019/
- **PNZ Agronomist Forum & AGM** - 12th & 13th August, Pukekohe Indian Association Events Centre, 57 Ward Street, Pukekohe, 2120 New Zealand
- **November Means New Potatoes 2020** - 12th November, Auckland venue TBC

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