Potato and Barley Field Trials Tour

15 January 2016

Pukekawa and Patumahoe

ADDING VALUE TO THE BUSINESS OF CROPPING

Spring barley fungicide programmes

Courtesy Murray Aarts, Pukekawa

These demonstration plots are investigating disease pressure on barley crops in the Northern North Island, and indicating appropriate disease management programmes.

Treatment list (l/ha)

	4 Nov	23 Nov	7 Jan
1.	Untreated		
2.		Aviator 0.35	Tazer 0.25 + Compass 0.25
3.		Aviator 0.7	Tazer 0.5 + Compass 0.5
4.	Aviator 0.7	Aviator 0.7	Tazer 0.5 + Compass 0.5

Key fungicide timings for disease in spring sown barley

Summary

Comparison to autumn sown barley:

Optimum fungicide timings in spring sown barley have generally mirrored those observed in FAR trials on autumn sown barley. However, three key differences have been observed:

- Spring sowing naturally reduces disease pressure allowing lower rates of fungicide to be employed.
- Later sown crops (October) develop much quicker with a short grain fill period reducing the need for fungicide persistence.
- Where dryland crops are sown later, particularly on the east coast of New Zealand (e.g. Hawke's Bay), fungicides produce relatively small gains in profitability and therefore fungicide cost needs to be tailored accordingly.

Therefore consider two spray programmes for spring sown barley starting at the start of stem elongation GS30 or as the rows close over at GS23–30.

Spring barley

GS23-GS30 – Row closure (T1)

Similar products to those used in autumn sown barley have performed well in spring sown barley. At the first timing, tank mixtures of Proline (prothioconazole) with the strobilurins Acanto (picoxystrobin) or with fluoxastrobin in the formulated products Mogul or Fandango have performed well. Seguris Flexi the SDHI (isopyryzam) has also been effective when mixed with Proline as has the pre-formulated SDHI mixture Aviator Xpro (prothioconazole and bixafen). Therefore, for irrigated crops or early sown dryland crops consider:

Proline 0.2 l/ha + Acanto 0.25 l/ha or Proline 0.2 l/ha + Seguris Flexi 0.3–0.45 l/ha or Fandango 0.5 l/ha or Mogul 0.5 l/ha or Aviator Xpro 0.7 l/ha

management strategies

For dryland crops, where disease pressure has been historically low, consider Proline mixed with Protek, Proline 0.2 l/ha + Protek 0.5 or Mogul 0.5 which has the same Proline component as Fandango but half the strobilurin component.

GS39–GS49 – flag leaf fully emerged to awns emerging (T2)

For irrigated crops or early sown disease prone dryland crops consider:

Aviator Xpro 0.7 l/ha or Proline 0.2 l/ha + Seguris Flexi 0.3–0.45 l/ha or Fandango 0.5 l/ha or Mogul 0.5 l/ha

The SDHI option Seguris Flexi would be stronger if the key target diseases were leaf rust and Ramularia leaf spot, whilst the SDHI option based on Aviator Xpro, would be stronger on scald and Ramularia leaf spot. Good leaf rust resistance and/or very dry conditions may reduce the value of adding a strobilurin or SDHI with the Proline.

The later GS49 timing has the advantage of applying fungicide to the flag leaf sheath, which is un-emerged at GS39. However this benefit has to be considered against ensuring that the gap between the two sprays does not exceed four weeks.

Dryland crops with lower disease pressure

Trials in the Manawatu and Hawke's Bay over three years (and drier inland parts of Southland in previous FAR trials) have shown lower cost fungicide programmes to be more cost effective. In the Manawatu and Hawke's Bay trials there has been no increase in yield from adding other fungicides to a two spray Proline programme in dryland situations.

Notes:

Above rates assume optimum timing of application. Late sprays where disease is at high pressure may require higher rates.

In some situations in wetter seasons, dryland sites may be more equivalent to irrigated sites. In dryland situations, monitor rainfall between the key application timings at GS30, 49 and 59 (early stem elongation – ear emergence). If rainfall is more frequent and higher than average, consider implementing irrigated strategy options.

Use of rates lower than the full label rate is done at the grower's own risk.

Background supporting data 2011–2013

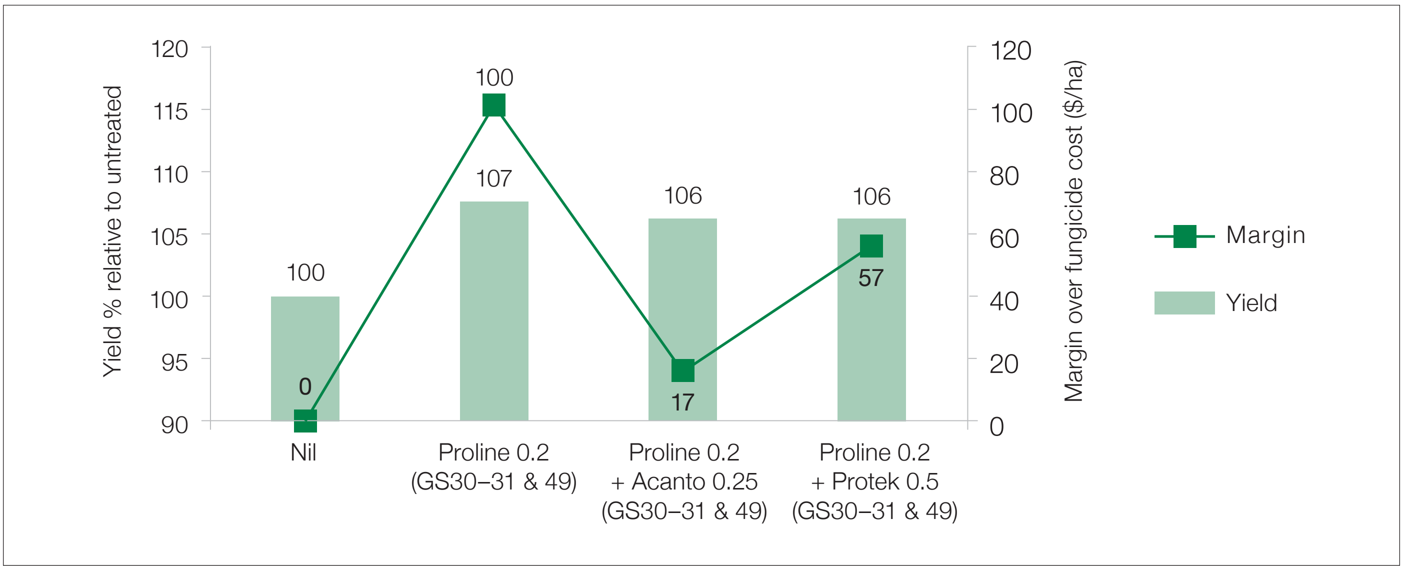
The following table shows the mean yield and $ margin response from 11 fungicide treatments tested at the Chertsey FAR Arable Site from three irrigated trials with cultivars Booma in 2011 and Tavern in 2012 and 2013. Over the three seasons leaf rust was the main disease with Ramularia leaf spot as well in the 2012 season. The highest yielding treatment was Aviator Xpro 0.7 l/ha which yielded significantly higher than Aviator Xpro 0.5 l/ha. Aviator Xpro at 0.7 l/ha is a formulation with the SDHI bixafen and 0.4 l/ha Proline. The second highest yielding treatment had half the quantity of Proline and the SDHI Seguris Flexi at the second application timing.

Influence of fungicide on yield and margin after chemical cost relative to the untreated ($/ha, grain price $400/t) in irrigated spring sown barley – 3 year mean, (Booma 2011 and Tavern 2012-13).

Trt. No.	GS30-31 (l/ha)	GS49 (l/ha)	Yield (t/ha)	% Yield gain over nil fungicide	Margin over fungicide cost ($/ha)
1	Aviator Xpro 0.7	Aviator Xpro 0.7	10.0	38.5	*898
2	Proline 0.2 + Acanto 0.25	Proline 0.2 + S.F. 0.45	9.8	34.7	858
3	Proline 0.2 + Acanto 0.25	Proline 0.2 + S.F. 0.6	9.7	34.0	811
4	Proline 0.4 + Acanto 0.25	Proline 0.4 + Acanto 0.25	9.6	32.7	756
5	Proline 0.2 + Acanto 0.25	Proline 0.2 + S.F. 0.3	9.5	31.7	776
6	Adexar 1.0	Adexar 1.0	9.5	31.9	*639
7	Proline 0.2 + S.F. 0.3	Proline 0.2 + S.F. 0.3	9.5	31.3	762
8	Aviator Xpro 0.5	Aviator Xpro 0.5	9.5	30.6	*732
9	Proline 0.2 + Acanto 0.25	Proline 0.2 + Acanto 0.25	9.4	30.1	725
10	Proline 0.2	Proline 0.2	8.8	21.1	530
11	Nil	Nil	7.2	0.0	0
		LSD	0.3		

S.F. = Seguris Flexi
**Margins for Adexar and Aviator Xpro based on a predicted cost of $120/L and an application cost based on $18/ha per pass.*

The following graph shows the mean yield and $ margin response from four fungicide treatments tested in the Manawatu from 2009 to 2011 for cultivars Fairview, County and Bumpa. The main diseases present were net blotch and Ramularia leaf spot. The yield response was low in this trial series and adding a second fungicide to Proline was not economic.



Influence of fungicide on yield (% relative to untreated) and margin over fungicide cost ($/ha) in dryland spring sown barley for three cultivars 2009–2011, Manawatu. Yield: 100 = 6.64 t/ha.

FAR Potato Research 2015/16

Jen Linton, FAR

FAR's potato research for the 2015/16 season is well underway. This season's programme is similar to last season, but the focus has been further refined.

Psyllid work will continue, with trials established in Matamata, Manawatu and Canterbury. The incidence, importance and timing of pests varies markedly between potato growing regions in New Zealand. The aim of the three field trials is to develop regionally focused pest management strategies, initially focussing on tomato potato psyllid (TPP) and zebra chip disease, putatively caused by *Candidatus* Liberibacter solanacearum (CLso). This project will focus on developing reduced insecticide management strategies by: using thresholds to commence a spray programme (psyllid-count based or Degree Days) and incorporation of agricultural oils into a spray programme to protect the crop from insect pests and consequently from being infected with CLso (TPP) or viruses (aphids).

FAR were successful with an application to MPI SFF for a project that will run for three years in Pukekohe, Manawatu and Canterbury and focus on *Increasing potato yield through understanding the impact of crop rotations and soil compaction*. Year 1 is well underway with eighteen commercial potato field crops being evaluated for this season. The desired outcome of the project is to better understand where potatoes fit in the rotation, how to reduce soil compaction and improve soil structure whilst understanding how all these factors impact of soil borne diseases. Comprehensively testing abiotic and biotic factors along with understanding the rotation and soil borne diseases over three years will give us the full spectrum of how and where potatoes fit best along with understanding where we can increase yield.

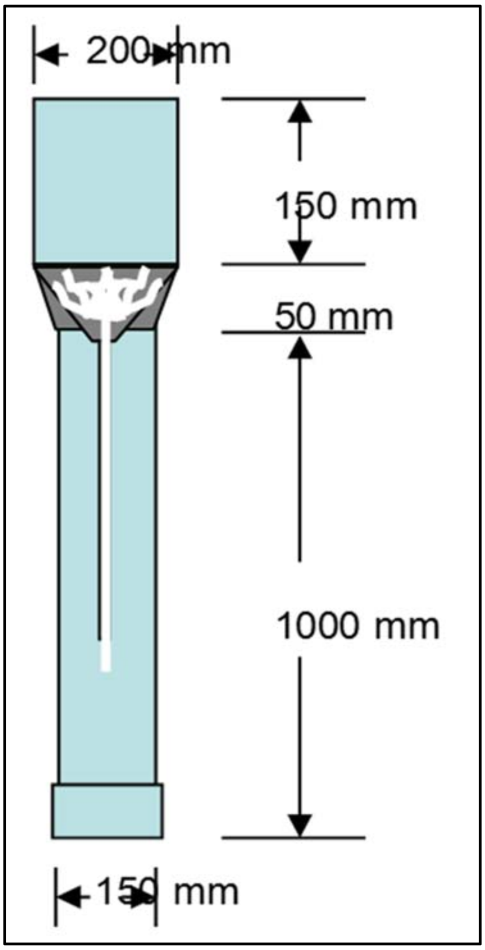
A soil borne disease trial has been established in South Canterbury to evaluate the efficacy of various different fungicides either applied to the seed or in furrow. We are looking at old chemistry and new SDHI chemistry for the control of mostly rhizoctonia and powdery scab. Low disease pressure last season at the two trial sites made it hard to interpret results. A tight potato rotation at the site should result in high disease pressure and some interesting results.

Investigating the water use efficiency of potatoes will be looked at again only in Canterbury. This year a shallow stony soil will allow us to understand the water use on a different soil type. Treatments replacing various soil moisture deficit volumes will identify when we see a yield loss from water stress, also identify where savings can be made through over watering and drainage events. Different stress timings will also be looked at. Often a decision needs to be made between watering one high value crop and another so better understanding when these timings will severely reduce potato yield are important.

Results from the fluxmeter network – Year 1

In July 2014 work began on a project to install a network of tension fluxmeters in commercial cropping farms in Canterbury, Manawatu, Hawke's Bay, Matamata and Pukekohe. The host farms were selected to provide a range of cropping systems, soil types, climatic conditions and management practices.

The fluxmeters are installed in groups of four, at a depth of 1m, below the root zones of most crops. Drainage water is captured in the fluxmeter, pumped to the soil surface through plastic tubing and analysed for nitrogen and phosphorus. In addition to the leachate measurements, a range of soil and plant measurements are collected when crops in the rotation begin and end.



The fluxmeters were installed over the period from September 2014 through to May 2015 as new crops in the rotation were being established. The results outlined here relate to drainage events from the point of installation up to the end of June, a period that does not capture the main winter drainage events. The amount of N and P lost in drainage relates to the drainage volume and the concentration of the nutrients in the drainage water. In general, nutrient losses were lowest at sites where drainage concentrations and volumes were low, and highest where volumes and concentrations were high.

It is important to remember that this is a long-term experiment and individual results must be considered with caution particularly in the first year as these preliminary results were captured when the soil around the fluxmeters was resettling and the soil and water dynamics may be atypical during this period. Although the experimental protocols have been designed to reduce variability, it is likely that some results, both high and low, will be both unexpected and unexplainable.

Fluxmeter sites

Site 10 – Matamata/Pukekohe

Site 10 is located near Matamata on a mixed cropping and livestock grazing enterprise. Soil type is a Waihou silt loam. Fluxmeters were installed in May 2015 and the site subsequently sown with Italian ryegrass. The current crop of potatoes was sown in October 2015. Rainfall for the period 1 October 2014 to 30 September 2015 totalled 1043 mm, 8% below the long-term average for the area (1131 mm). Four drainage samples have been collected in the period following installation of the fluxmeters (13 May 2015 to 30 September 2015) with a total drainage volume of 150 mm. All drainage was collected between July and September 2015. Estimated mineral N and total P losses in drainage have totalled 30 kg N/ha and 0.13 kg P/ha respectively. Residual soil mineral N (0–100 cm depth) and Olsen P concentrations (0–20 cm depth) at the most recent sampling occasion in May 2015 were moderate (105 kg N/ha and 34 mg/L respectively).

Site 11 – Matamata/Pukekohe
Site 11 is located near Pukekohe on an intensive vegetable cropping enterprise. Soil type is a Patumahoe clay loam. Fluxmeters were installed in March 2015 and the site subsequently sown with the current crop of potatoes in June 2015. Rainfall for the period 1 October 2014 to 30 September 2015 totalled 1166 mm, comparable with the long-term average for the area (1183 mm). Four drainage samples have been collected in the period following installation of the fluxmeters (10 March 2015 to 30 September 2015) with a total drainage volume of 229 mm. All drainage was collected between July and September 2015. Estimated mineral N and total P losses in drainage have totalled 59 kg N/ha and 0.16 kg P/ha respectively. Residual soil mineral N (0–100 cm depth) and Olsen P concentrations (0–20 cm depth) at the most recent sampling occasion in June 2015 were high (319 kg N/ha and 193 mg/L respectively).

Site 12 – Matamata/Pukekohe
Site 12 is located near Tuakau on a mixed cropping and livestock grazing enterprise. Soil type is a Patumahoe clay loam. Fluxmeters were installed in April 2015 and the site remained fallowed until the current crop of potatoes was sown in November 2015. Rainfall for the period 1 October 2014 to 30 September 2015 totalled 1166 mm, comparable with the long-term average for the area (1183 mm). Three drainage samples were collected following installation of the fluxmeter units (Figure 62 b). However, due to possible flooding of the units sample volumes could not be calculated with confidence and consequently net losses of N and P were not calculated. Residual soil mineral N (0–100 cm depth) and Olsen P concentrations (0–20 cm depth) at the most recent sampling occasion in April 2015 were high (186 kg N/ha and 101 mg/L respectively).
Good science takes time, and the value in this project is not in single values from one-off drainage events, but in the long-term patterns that will become evident over time. As data is collected we will be able to improve our understanding of cropping systems and the interactions between the physical environment and the management practices associated with the cropping and grazing parts of the rotation. These insights will give us opportunities to discuss and promote good management practices to cropping farmers.

This work is funded by: Ministry for Primary Industries, FAR, HortNZ, Environment Canterbury, Horizons RC, Hawke's Bay RC, Environment Waikato, Auckland Regional Council and Ravensdown.

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Evaluation of seed treatments and in furrow fungicides in potatoes

Nick Pyke, FAR

Key points

- Trials were established in Canterbury and Pukekohe to evaluate various seed and in-furrow fungicide treatments for the control of soil borne diseases.

Pukekohe

- The Pukekohe trial site showed no significant differences within any treatments for any soil borne diseases. Rhizoctonia stem canker and black scurf along with common and powdery scab were not observed in the trial.
- Silver scurf was observed at the Pukekohe site and a number of treatments significantly reduced the severity but the incidence was not reduced by any fungicide treatment.
- There was no difference in yield between treatments. If there is a low disease pressure there was no benefit in applying seed treatments or in furrow fungicides.
- Soils in the Pukekohe region may have disease suppressive properties. It is proposed to try to better understand these properties of soil in other research.

Aims and Method

The aim of the trials were to evaluate various fungicides either applied to the seed or in-furrow to evaluate the control of soil borne diseases. Fungicide treatments were applied directly to the seed tubers as either a seed treatment or an in-furrow spray prior to closing over the furrows. Standard crop management was undertaken by the grower for the remainder of the season.

Results

The Pukekohe trial site showed no significant differences within any treatments for any soil borne diseases. Emergence was similar in all treatments with the exception of Maxim (only reached 72% emergence). Rhizoctonia stem canker and black scurf were not observed in the trial. Common scab and powdery scab were also scarce. Silver scurf was observed but the incidence was not reduced by any fungicide treatment. There was no significant difference in yield between treatments.

Acknowledgements

Thanks to Peracto who carried out this trial work.

Table 1 Treatment effect on potato tuber total yield and marketable yield (t/ha) at Pukekohe in the 20104/15 season (selected treatments).

		Pukekohe			
Treatment applied		**Application type**	**Total Yield (t/ha)**	**Marketable Yield (t/ha)**	**Silver scurf rating (0-4) *Helminthosporium solani***
1.	Untreated control	-	79.6	65.8	2.91a
2.	Monceren	Seed	60.6	46.7	2.70abc
3.	Monceren Amistar @ label	Seed In-furrow	62.5	48.5	1.79cde
4.	Monceren Amistar 2x label	Seed In-furrow	59.2	42.9	1.35e
9.	Monceren Nebijin	Seed In-furrow	65.3	48.4	2.25a-e
10.	Monceren Nebijin + Amistar	Seed In-furrow In-furrow	61.1	45.3	1.39d-e
11.	Amistar @ label	In-furrow	51.0	38.0	1.88b-e
12.	Amistar 2x label	In-furrow	59.8	45.0	1.68cde
13.	Rizolex	Seed	58.2	46.8	2.35a-e
20.	Nebijin	In-furrow	57.4	47.0	2.56a-d
21.	Nebijin + Amistar	In-furrow	50.9	37.0	1.89a-e

Improving potato yields through better understanding of the soil

Craig Tregurtha, Plant and Food Research

Key points

- Potato crops in Canterbury (and throughout NZ) typically yield well below potential.
- Soil compaction and soilborne disease appear to be the main factors leading to these lower yields.
- A three year Sustainable Farming Fund project (2015-18) is measuring the impact of soilborne disease and pre-plant cultivation practices on potato production in Pukekohe, Manawatu and Canterbury.
- A trial set up this season at Plant & Food Research in Lincoln will investigate whether different irrigation frequency and bed formation (flat bed, conventional ridge and furrow, subsoiling) will affect crop water use efficiency.

Previous research

Potato yields in Canterbury have remained static at 50–60 t/ha (paid yield), and crop production at this level is becoming uneconomic. Field research carried out in eleven crops during 2012-13 season showed that the main factors limiting potato yields were:

1. The presence of soilborne diseases reducing underground root and stem health, and
2. Compacted soils restricting root growth and reducing the crop's ability to take up water and nutrients.

The 11 crops were all grown in moderately deep silt loam soils, which should have good potential for water storage and supply during the dry summer months, compared to many of the shallower, stony soils in Canterbury. However, long term cropping has resulted in hard layers forming just under the seed tuber planting zone, preventing roots from accessing deeper stored water when the irrigator is away watering other crops. Additionally, current practice is to 'de-stone' beds before planting, which now also includes the removal of coarse crop residues and clods, thus creating a very fine seed bed. These cultivation management trends, coupled with the recent advent of high intensity overhead sprinkler systems, could be reducing water infiltration and water storage capacity in the ridges, and at the same time increasing the risk of erosion, run-off, nutrient leaching and waterlogging.

In the 2012-13 crop survey, bed shape, root vigour (based on root density and spread) and some soil quality indicators were measured at the full canopy growth stage. Six of the crops had dense zones at about 25 cm depth below the ridge top, and no roots were seen below this. Additionally, many of the crops had good root growth only within the ridges; with moderate growth under the bed furrow and weak or non-existent growth under the wheel tracks.

Two extreme examples are illustrated in Figures 1 and 2. Crop 8 (Figure 1, top) had a long cropping history (including potatoes), resulting in high levels of soilborne pathogens and subsequent severe crop infections, as well as a hard cultivation pan at 23 cm depth which prevented the roots exploring deeper. By full canopy, no roots were observed growing under the furrows (wheel or bed). This crop had a final yield of 56 t/ha (measured in observation plots) from an estimated potential (based on climatic conditions) of 80 t/ha. In contrast, Crop 7 (Figure 1, bottom) was mostly in pasture for the previous ten years and was never planted in potatoes. Soilborne disease symptoms were mild compared to Crop 8. The grower used machinery that attempts to minimise the effects of soil compaction. There was no compaction layer evident at the typical cultivation zone depth and the potato roots were seen under both the bed and the wheel track furrows, as well as observed tracking beyond 30 cm depth below the ridge. Final yield in the observations plots were 87 t/ha, similar to the estimated potential yield for that crop.

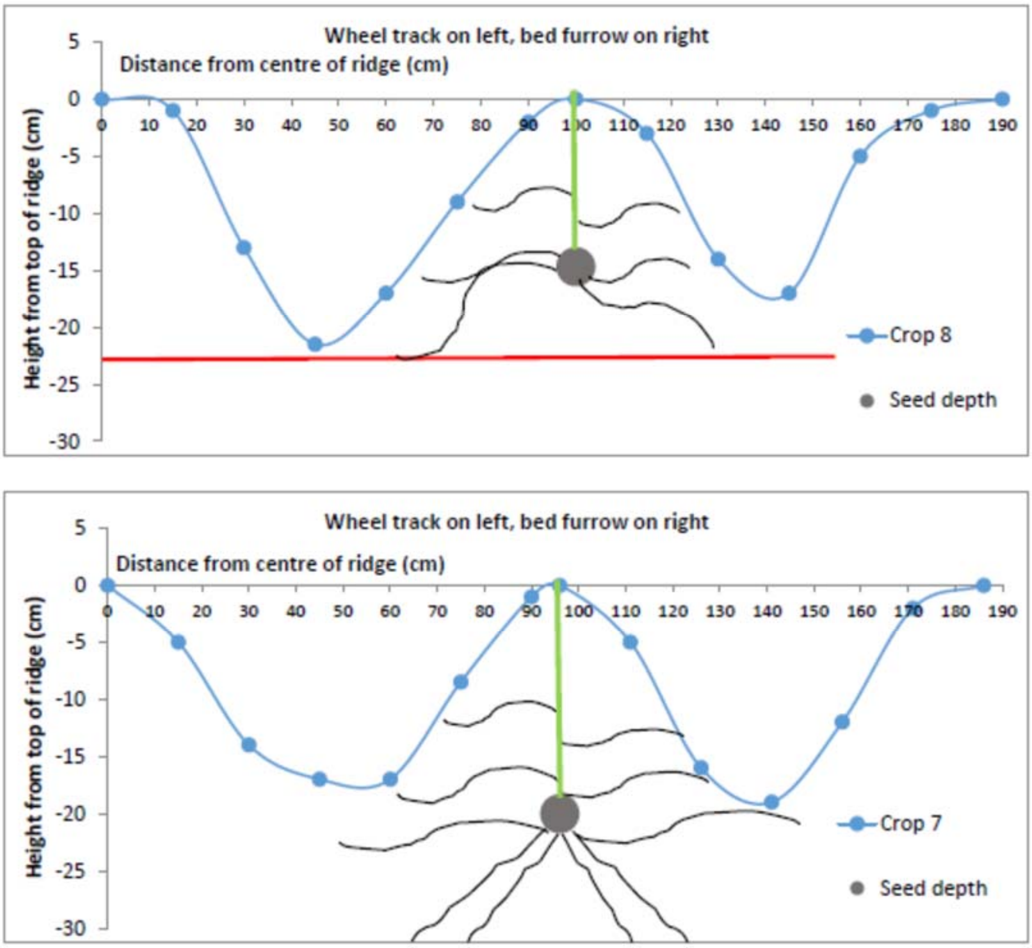

Figure 1. Potato bed profiles for Crop 8 (top) and Crop 7 (bottom), wheel track furrow on left, bed furrow on right. On the vertical axis, zero is the top centre of one ridge. Seed tuber position is denoted by the brown circle, the green vertical line represents the underground stems. The black wavy lines represent root vigour, direction and extent. A total of two root lines denotes very poor root growth and 10+ root lines excellent root growth. The solid red line denotes a compaction zone. No red line indicates that little or no root restriction was measured.

Figure 2. Poor root distribution of a low yielding crop in a poorly structured compacted soil (Crop 8, left), and excellent root vigour and distribution in a high yielding crop with no soil compaction (Crop 7, right).

Higher yields from the observation plots in the crops were associated with increased root vigour (density and spread) (Figure 3). Crops with root systems that are largely restricted to the ridge zone are at greater risk of progressive yield loss when the crop's daily water requirement is higher than the soil can supply. This signals that the ability to provide an environment that will maximise root growth is a key consideration when selecting fields and planning cultivation techniques for potato crops.

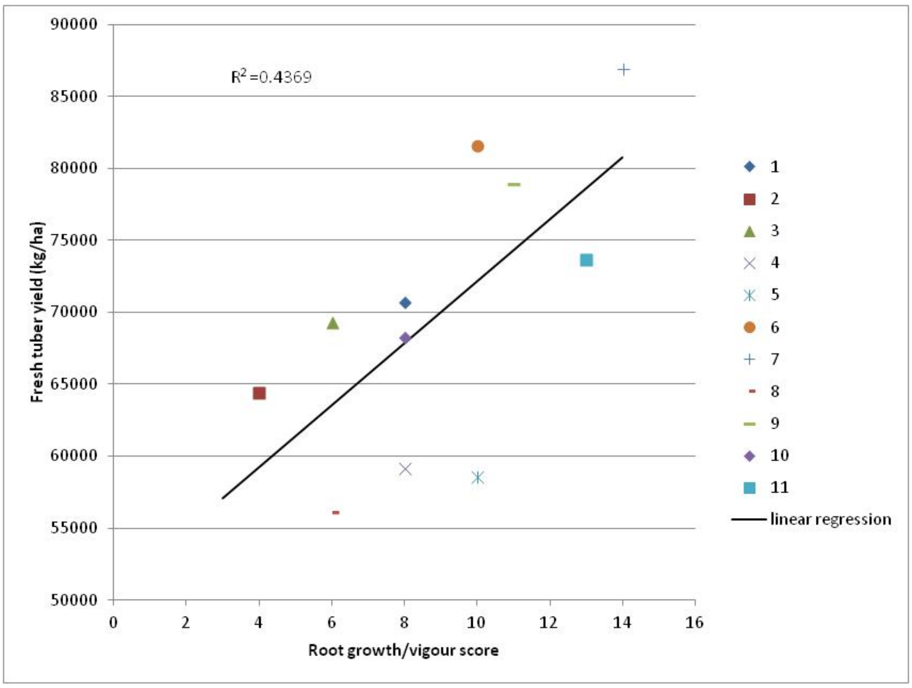

Figure 3. Relationship between root growth (2 = very poor growth, 14 = excellent growth) at crop maturity and fresh tuber yield from observation plots of the monitored potato crops (numbered 1 - 11) in 2012-13.

Current research

Over the next 2-3 years a detailed investigation will be conducted in 18 crops nationwide as to how current cultivation techniques and previous cropping history affect the growing environments of potato crops. Additional to standard soil quality tests, soil 'disturbance' from pre-plant cultivation will be quantified using a modified US-based system where individual tillage passes are scored on a 5-point scale for the degree of soil disturbance from inversion, mixing, lifting, shattering, aeration and compaction. These individual scores are then summed to get a soil disturbance rating (SDR) for each cultivation pass. The total SDR can then be calculated for each potato crop.

Table 1. Some examples of scores used in quantifying soil disturbance from individual tillage passes. A higher value indicates greater soil disturbance, which can decrease soil quality.

Tillage type	Inversion	Mixing	Lifting	Shattering	Aeration	Compaction	SDR
Bed former	4	4	3	5	5	2	23
Destoner	5	5	5	5	5	5	30
Subsoil rip	1	2	2	5	5	1	16
Maxi-till	3	3	3	4	3	2	18

CROP 39

Cross:
CROP 17 x Coliban = 4353-3

Market niche:
Maincrop fresh, suitable for washing

Maturity
- mid season maturity, similar to Desiree

Tubers
- slightly flattened oval-round
- shallow eyes
- white flesh
- bright attractive skin that can wash up well even from later dug crops
- physiological disorders rare
- slightly susceptible to bruising so may need extra handling care
- medium-long dormancy, slightly earlier than Moonlight

Disease and pest resistance
- susceptible to both cyst nematode species
- slightly susceptible to powdery scab (score 5.5 where 9 is very resistant)
- susceptible to late blight slightly better than Ilam Hardy
- in one years soft rot testing scored about the midpoint of the lines tested. Better than Nadine in early trial soft rot scores.

Cooking quality
- suitable mainly as a fresh market potato
- holds together (some sloughing) on boiling with little after-cooking darkening
- dry matter content from mid-season on digging around 18–20%
- sugar levels are low unless the crop is exposed to low temperatures before harvest

Yield and agronomy
- consistent high yields from mid-season onwards from a range of sites
- tuber size tends to be medium-large from 30 cm spacing, mostly uniform (≈ 84%)
- released in New Zealand as a washing potato

CROP 78

Cross:
Bondi x CROP 20 = 1417/13

Market niche:
A main crop french fry potato with potential for long term storage, either in the ground or in cool storage at 7°C for over 6 months. A potato with exciting potential.

Maturity
- medium maturity similar to Moonlight (score 3.5 where Moonlight Is 3.8)
- moderate dormancy similar to Moonlight (score 7.0 where 9 is long)

Tubers
- oval-long shape, sometimes slightly flat - uniformity of tubers 4 (5 average on a 1–9 scale) and consistent shape
- light red skin
- shallow eyes, better eye distribution for cutting seed than Bondi
- white flesh
- physiological disorders rarely occur except for occasional surface cracking and rare hollow heart
- Bruising 2.0 (Innovator 1.6) (0=nil; 5=severe)

Disease and pest resistance
- moderate resistance to late blight, similar to or slightly better than Bondi. Significantly better than Russet Burbank or Ranger
- has resistance to *pallida* PCN but susceptible to *rostochiensis*. Susceptible to RO1
- has reduced susceptibility to Zebra Chip compared to widely used cultivars French fry varieties
- moderately susceptible to powdery scab - average 6.2 (0=VS; 9=VR – Bondi 5.8). If powdery scab levels are high it can affect roots
- Moderately susceptible to potato viurus Y

Cooking quality
- excellent consistently high french fry processing quality
- dry matter moderately high 0.5–1.0% above Bondi
- will process from long term ground storage or from cool storage to below 7°C
- excellent overall flavour

Yield and agronomy
- has a reasonably high yield potential across a wide range of growing conditions, higher on average and more consistent than Bondi. Medium tuber number, consistently higher than Bondi
- should perform well with lower than average fertiliser applications for Russet Burbank but needs more fertilizer than Bondi or Moonlight for high yield

CROP 80

Cross:
Summer Delight (CROP 17) x CROP 20 = 1413/3

Market niche:
An attractive yellow fleshed potato suitable for fresh market in both washed and brush markets across a wide range of seasonal slots.

Maturity
- medium maturity similar to Moonlight
- moderate dormancy slightly longer than Summer Delight (CROP 17)

Tubers
- oval shape
- medium/large but smaller than Summer Delight
- shallow eyes
- yellow flesh - more yellow than Summer Delight but less than Agria
- physiological disorders rarely occur
- yellow skin often moderately bright which holds its lustre
- attractive with possible washing potential

Disease and pest resistance
- moderately high resistance to late blight
- has resistance to both species of PCN
- appears to have good resistance to soft rot
- moderately susceptible to powdery scab, better than Agria (but mixed from S→R, 5.17–7.22, average 5.78)

Cooking quality
- suitable as a fresh market potato with some possible French fry potential
- holds together well on boiling with no after-cooking greying
- excellent flavour
- sugars are normally low at harvest but not suitable for long term storage. No CIS
- dry matter content similar to Moonlight, usually around 18–19%

Yield and agronomy
- a very high yield potential across a wide range of growing conditions in plantings from early July through to early December in New Zealand
- medium tuber number

CROP 100

Cross:
Kaimai x Crop 20 = 1550/6

Market niche:
An early-main to main crop processing potato, with potential for medium term storage, either in the ground or in cool storage down to 7°C for four months.

Maturity
- medium-late maturity slightly later than Moonlight
- medium dormancy, slightly shorter than Moonlight

Tubers
- generally round-oval in shape
- shallow eyes
- flesh colour yellow
- physiological problems rare
- resistant to bruising damage

Disease and pest resistance
- highly resistant to Pa PCN
- moderately susceptible to powdery scab (5.4 where 9 is very resistant)
- high resistance to late blight

Cooking quality
- dry matter consistently high
- consistently good fry colour both from field and medium-long term storage to below 7°C
- some sloughing but no greying in boiling tests

Yield and agronomy
- a line with high yield potential as a main crop potato

Effects of JMS Stylet Oil foliar applications in combination with insecticides on the tomato-potato psyllid (TPP), crop yields, tuber dry matter content and zebra chip (ZC) in potato

Peter Wright, Plant and Food Research

- Growers rely on regular applications of mainly broad-spectrum insecticides to control TPP.
- BUT insecticides may not kill feeding TPP on foliage fast enough to prevent *Candidatus* Liberibacter solanacearum (Lso) transmission.
- Hence the search for a TPP repellent- to reduce insecticide applications - and use in IPM programmes.

Mineral oils have a repellent effect to insects pests that discourages egg-laying and feeding, and can kill insect eggs through contact toxicity and suffocation.

Field trial at Pukekohe carried out over 3 seasons (2012-16) tested JMS Stylet Oil foliar applications on its own and in combination with insecticides for:

- Efficacy against TPP
- Effect on zebra chip incidence and severity
- Effect on crop yields
- Phytotoxicity to potato plants

Trial details

- Trials planted early November
- Randomised Latin square design
- 5 treatments of 5 replications each
- Plots 10 m long and 3 m wide (6 rows)

Treatments

1. 7-day insecticides + 'regular' wetting adjuvants (Treatment 'W').
2. 7-day insecticides + JMS Stylet Oil ('W+JMS').
3. 14-day insecticides + JMS Stylet Oil alternating with JMS Stylet Oil only ('ALT/Hi').
4. 14-day insecticides + JMS Stylet Oil + Du-Wett alternating with JMS Stylet Oil + Du-Wett – Reduced water volume ('ALT/Lo').
5. 7-day JMS Stylet Oil ('JMS')

Spray date	'W'	'W+JMS'	'ALTHi'	'ALTLo'	'JMS'
26 Nov	Movento (no adjuvant)	Movento (no adjuvant)	JMS Stylet Oil	JMS Stylet Oil + Du-Wett	JMS Stylet Oil
3 Dec	Movento (no adjuvant)	Movento (no adjuvant)	Movento (no adjuvant)	Movento + Du-Wett	JMS Stylet Oil
10 Dec	Avid + Eco-oil	Avid + JMS Stylet Oil	JMS Stylet Oil	JMS Stylet Oil + Du-Wett	JMS Stylet Oil
17 Dec	Avid + Eco-oil	Avid + JMS Stylet Oil	Avid + JMS Stylet Oil	Avid + JMS Stylet Oil + Du-Wett	JMS Stylet Oil
24 Dec	Avid + Eco-oil	Avid + JMS Stylet Oil	JMS Stylet Oil	JMS Stylet Oil + Du-Wett	JMS Stylet Oil
1 Jan	Sparta + Actiwett	Sparta + JMS Stylet Oil	Sparta + JMS Stylet Oil	Sparta + JMS Stylet Oil + Du-Wett	JMS Stylet Oil
7 Jan	Sparta + Actiwett	Sparta + JMS Stylet Oil	JMS Stylet Oil	JMS Stylet Oil + Du-Wett	JMS Stylet Oil
15 Jan	Sparta + Actiwett	Sparta + JMS Stylet Oil	Sparta + JMS Stylet Oil	Sparta + JMS Stylet Oil + Du-Wett	JMS Stylet Oil
23 Jan	Sparta + Actiwett	Sparta + JMS Stylet Oil	JMS Stylet Oil	JMS Stylet Oil + Du-Wett	JMS Stylet Oil
29 Jan	Proteus + Actiwett	Proteus + JMS Stylet Oil	Proteus + JMS Stylet Oil	Proteus + JMS Stylet Oil + Du-Wett	JMS Stylet Oil
5 Feb	Proteus + Actiwett	Proteus + JMS Stylet Oil	JMS Stylet Oil	JMS Stylet Oil + Du-Wett	JMS Stylet Oil
12 Feb	Proteus + Actiwett	Proteus + JMS Stylet Oil	Proteus + JMS Stylet Oil	Proteus + JMS Stylet Oil + Du-Wett	JMS Stylet Oil
19 Feb	Tamaron + Actiwett	Tamaron + JMS Stylet Oil	JMS Stylet Oil	JMS Stylet Oil + Du-Wett	JMS Stylet Oil
26 Feb	Tamaron + Actiwett	Tamaron + JMS Stylet Oil	Tamaron + JMS Stylet Oil	Tamaron + JMS Stylet Oil + Du-Wett	JMS Stylet Oil
5 Mar	Tamaron + Actiwett	Tamaron + JMS Stylet Oil	JMS Stylet Oil	JMS Stylet Oil + Du-Wett	JMS Stylet Oil
13 Mar	Tamaron + Actiwett	Tamaron + JMS Stylet Oil	Tamaron + JMS Stylet Oil	Tamaron + JMS Stylet Oil + Du-Wett	Tamaron + JMS Stylet Oil

Results (Season 1)

Table 1. Effect of spray treatments on tomato-potato psyllid (TPP) adult, nymph and egg numbers, and aphid, potato tuber moth, and 'other pests'

24 February 2014 Treatment	TPP Adults	TPP Large Nymphs	TPP Small Nymphs	TPP Eggs	Aphids	Potato Tuber Moth
'W'	0	0	0	0.28	0.34	0
'W+JMS'	0	0	0	0	0.10	0
'ALT/Hi'	0	0.01	0.01	0.010	1.13	0
'ATL/Lo'	0	0	0	0.07	0.30	0
'JMS'	0.11	0.05	0	1.00	18.58	0

Table 2. Effect of treatments on TPP predators, brown lacewing adults, larvae and eggs, hoverfly adults, larvae and eggs, and 'other predators'

24 February 2014	Brown Lacewing			Hoverfly		
Treatment	Adults	Larvae	Eggs	Adults	Larvae	Eggs
'W'	0	0	0.09	0	0	0.01
'W+JMS'	0	0	0	0	0	0
'ALT/Hi'	0	0	0.04	0	0	0
'ATL/Lo'	0.02	0.01	0.22	0	0	0
'JMS'	0	0.02	0.42	0	0	0.05

Table 3 Summary of the number of insecticide applications, average marketable and reject tuber yields (kg/plot), and dry matter content of harvested potatoes

Treatment	Number of insecticide applications	Marketable tuber yield (kg/plot)	Marketable percentage	Dry matter content of marketable tubers
'W'	16	61.0	96.1	19.4
'W+JMS'	16	59.8	96.1	19.5
'ALT/Hi'	8	57.8	95.0	19.4
'ATL/Lo'	8	55.6	95.6	19.3
'JMS'	1	56.7	94.1	18.9

Table 4 Summary of number of foliar-applied insecticide applications, and zebra chip (ZC) score (scale 0-9), and 'severe' ZC (score >4) of harvested potatoes

Treatment	Number of insecticide applications	Mean ZC Score	ZC score >4 (%)
'W'	16	0.49	6.0
'W+JMS'	16	0.19	2.0
'ALT/Hi'	8	0.31	4.7
'ATL/Lo'	8	0.13	0.7
'JMS'	1	1.45	18.0


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