Potato Trials Tour

21 January 2016

Lincoln, Southbridge and Chertsey

ADDING VALUE TO THE BUSINESS OF CROPPING

Potato irrigation frequency, sub-soiling and bed type experiment, Lincoln

2015-16 season

Introduction

Results from recent yield-gap surveys of commercial potato crops in Canterbury have highlighted the difficulties growers have supplying enough water consistently during periods of high water demand. This problem can occur from mid-December onwards as the developing potato crop demands more water and competition for water from other crops on the farm increases. The application rates of pivot systems are often too much for the intensively-cultivated soil to absorb, especially under ridge and furrow configuration. Water can fail to penetrate the ridge efficiently (where most of the roots are located), and then collects in the furrows where there are fewer roots and then either drains directly into the soil or runs off to other parts of the field.

As potato roots are often restricted to the top 25 cm of the soil profile due to the presence of cultivation pans (even within the bed), any water that drains below this region also becomes unavailable to the plant. It would be advantageous to be able to use a greater volume of the soil profile as a water reservoir for the crop to access when the irrigator is away elsewhere.

The yield gap research team is conducting a Lincoln-based experiment this season, to test whether different combinations of sub-soiling, sprinkler irrigation frequency and amount, along with a radical change in bed shape, would lead to increased water use efficiency, and even improve yields.

Some plots in the experiment were sub-soiled in late autumn 2015, and in spring, 3m wide flat beds, each with four rows 80cm apart, were established in some plots, and traditional two-row ridge and furrow beds in others. There are two irrigation watering regimes; one to keep half of the crop frequently topped up with water (up to twice weekly; 120 mm in 9 applications so far), and the other attempting to 'mine' water from as deep as possible (50mm in 4 applications so far).

Sub-soiling and bed preparation

The soil at the experimental site is a poorly structured Templeton silt loam (long cropping history) with a very dense subsoil starting at about 25 cm depth. Penetrometer measurements showed that penetration resistance at the interface of the topsoil and dense zone averaged about 4.5 mPa; potato root penetration slows at 1.5 mPa and stops altogether at about 3 mPa.

Several different sub-soiling implements were tested in May 2015 (Figure a and b); the third option (Figure c) proved the most effective at achieving some subsoil disturbance and a degree of shattering to a further 110 mm in depth (from 260 mm to 370 mm from the soil surface). The breaking up of the dense layer may also enable extraction into deeper, less dense material.

Flatbed plots were created using custom-made ‘hoe shoes’ attached to the back of a power harrow (packer/roller removed) to open up furrows (Figure d). Collapsing dry soil on the furrow sides meant they had to be shovelled out by hand to maintain the 200 mm depth. Seed tubers were then planted by hand (280 mm spacing) and furrows covered up by hand with a rake (Figure e).

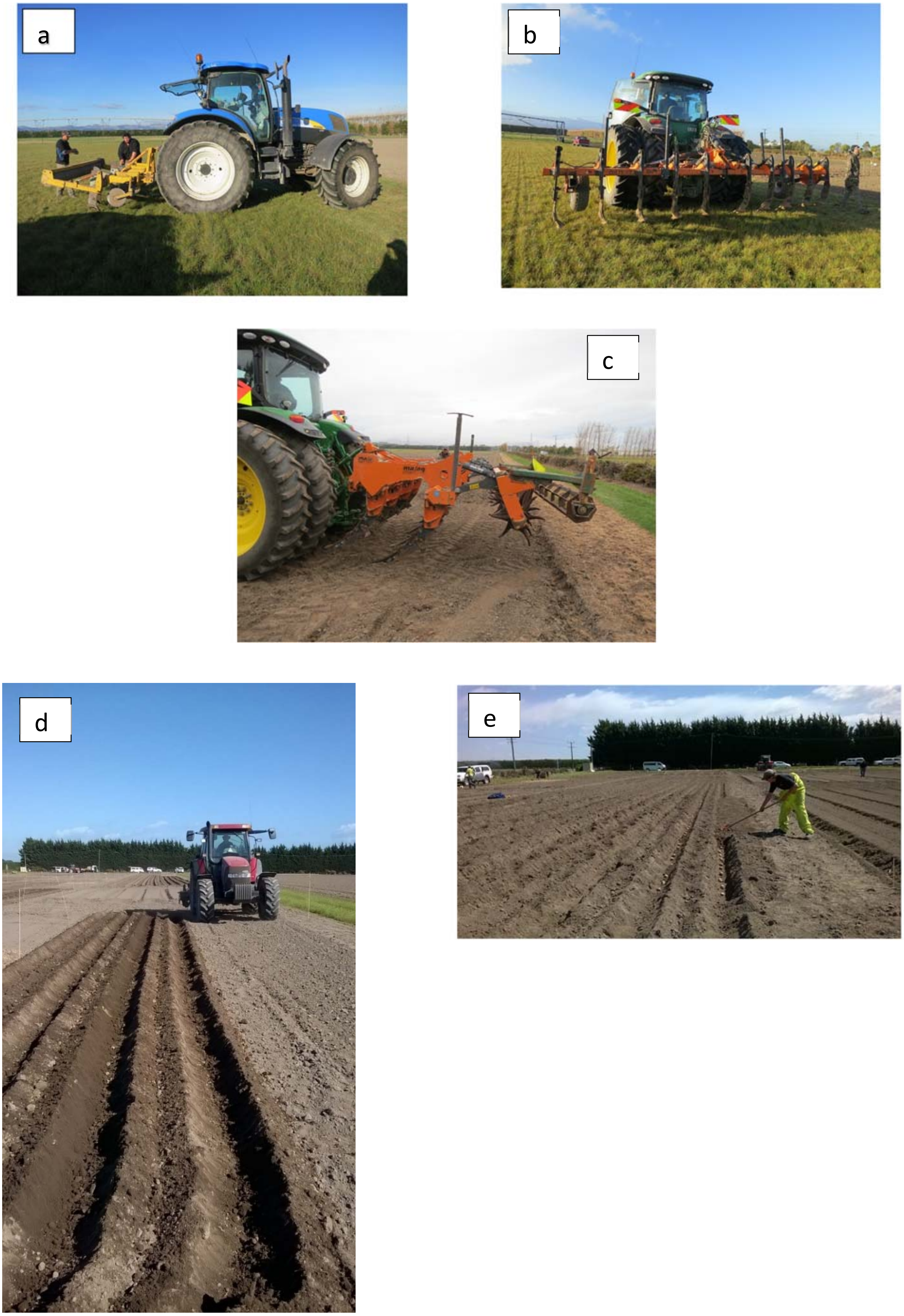
Conventional ridge and furrow plots were bed formed (two row) and then mechanically planted with a two row planter. The rows were moulded once at emergence, giving a final depth of 200 mm.

Measuring soil water content and crop water use

The bridge irrigator can be programmed to apply different amounts of water to different groups of plots in the same run for the two irrigation treatments. A mix of manual and automated soil moisture sensors are being used to monitor crop water use and determine irrigation strategy each week. A neutron probe is being used to measure soil water twice weekly (immediately pre- and post- irrigation) to 800 mm depth in 200 mm increments. Electronic soil moisture sensors have been placed strategically to 250 - 300 mm depth in ridge and furrow and flatbed to capture hourly crop water use and water refill patterns after irrigation and rainfall events. Trends can be viewed live on-line by the research team.

Soil amendments

Additional small plots have been set up with wheat straw either incorporated into the soil at planting or applied to the surface as a mulch. Measurements from these plots contribute to another research programme investigating ways to use water efficiently and profitably (Steve Thomas; MBIE-funded Maximising Value for Irrigation). Overall this programme aims to better integrate irrigation, crop and soil management. The aim of including these plots is to quantify how different soil management (amendment, mulch and beds) affect water use (including losses from soil evaporation), soil water storage and infiltration.


a
b
c
d
e

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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

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.

Region-specific pest and disease management strategies for potatoes

Natasha Agnew, Plant & Food Research

This project is a partnership between Potatoes NZ, FAR, Plant & Food Research and The Future Farming Centre. It is now into its second year of trials.

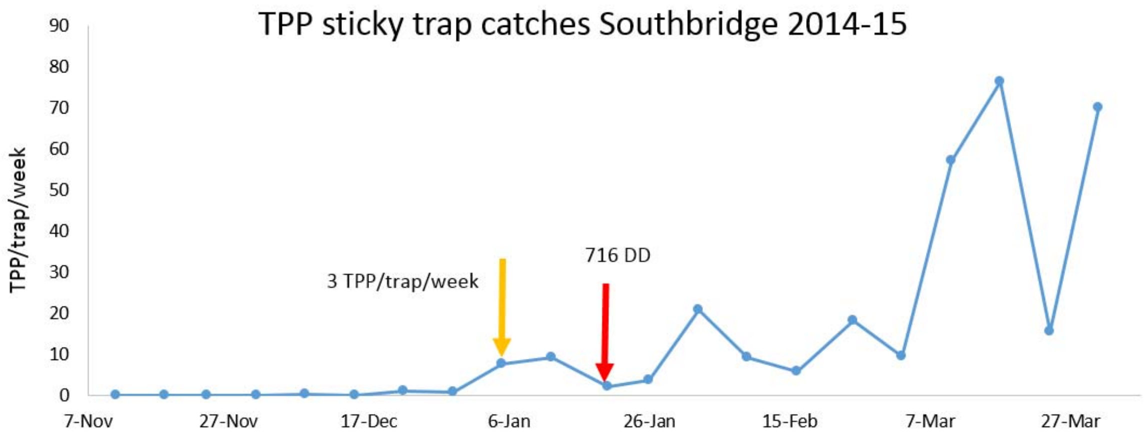
Aim

The aim of this work is to develop region-specific pest and disease management strategies for potatoes in New Zealand.

- Thresholds based on Degree Days or trap counts to initiate sprays
- Incorporating agricultural oils
- Using mesh covers

Results last season

- 980 Degree days reached on 22 January, 17 days after 3 TPP action threshold and far too late in season given TPP numbers.
- Weekly alternating insecticide and Excel from emergence performed well.



Thresholds

Degree days

- A 980 DD developed using mainly North Island information from unsprayed crops. Point at which exponential increase in TPP numbers appears to occur (see Degree Day factsheet for more information about Degree Days).
- This threshold was tested for Canterbury last year and occurred far too late. Testing 716 DD this season.
- 716 DD from the 1st July was reached on 22nd December 2015.

3 TPP/trap/week

- Came from work (again mainly in NI) to develop economic action thresholds to minimise insecticide use based on phenology of TPP in a region.
- 3TPP/trap/week was reached on the 10th December 2015. 12 days before the 716 DD threshold.

Assessments

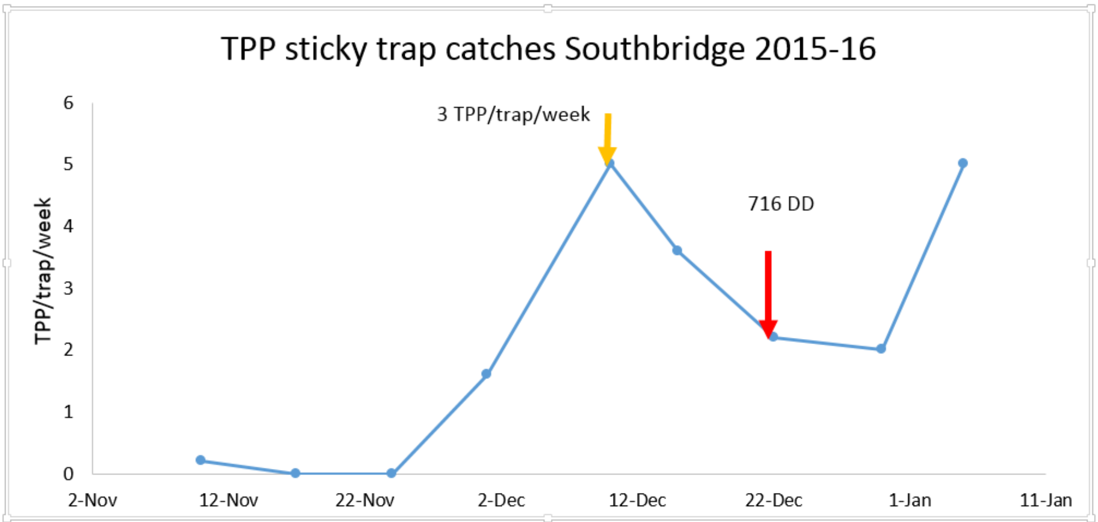
During growing season

- Yellow sticky traps (10 x 25 cm) in crop prior to emergence, following protocol from FAR/PNZ crop monitoring factsheet. Changed and assessed weekly.
- Leaf assessments for TPP life stages, hoverfly & lacewing life stages, potato tuber moth, blight.

At harvest

- Marketable # and yield
- Unmarketable # and yield
- Diseased # and yield (green, PTM damage, rot, cut tubers etc)
- ZC fry test, 0-9 scoring

Results so far…



December

- 1 TPP egg and 9 TPP nymphs
- Lacewing egg, larva and adults
- No hoverfly
- No blight

January

- 162 TPP eggs, 239 TPP nymphs, 28 adults
- 489 lacewing eggs, 7 larva, 10 adults
- No hoverfly
- No blight

Treatments

Standard: Weekly from emergence	Weekly from 716 DD	Weekly from 3TPP	Alternating with oil from emergence	Alternating from DD OR 3 TPP	Standard with only PP1 as adjuvant	Mesh covers	Control
Movento			Movento		Movento		
Movento			Movento		Movento		
Avid			Avid		Avid + PP1		
Avid			Excel oil		Avid+ PP1		
Avid			Avid		Avid+ PP1		
Sparta			Excel oil		Sparta+ PP1		
Sparta	Movento	Movento	Avid	Movento	Sparta+ PP1		
Sparta	Movento	Movento	Excel oil	Movento	Sparta+ PP1		
Sparta	Avid	Avid	Sparta	Avid	Sparta+ PP1		
Proteus	Avid	Avid	Excel oil	Excel oil	Proteus+ PP1		
Proteus	Avid	Avid	Sparta	Avid	Proteus+ PP1		
Proteus	Sparta	Sparta	Excel oil	Excel oil	Proteus+ PP1		
Metafort	Sparta	Sparta	Sparta	Avid	Metafort+ PP1		
Metafort	Sparta	Sparta	Excel oil	Excel oil	Metafort+ PP1		
Metafort	Sparta	Sparta	Sparta	Sparta	Metafort+ PP1		
Metafort	Proteus	Proteus	Excel oil	Excel oil	Metafort+ PP1		
Metafort	Proteus	Proteus	Metafort	Sparta	Metafort+ PP1		
Metafort	Proteus	Proteus	Metafort	Excel oil	Metafort+ PP1		

Investigating irrigation rates and timings, and their subsequent effect on yield on Innovator potatoes at Chertsey

Jen Linton, FAR

Introduction
In Canterbury, summer rainfall is often inadequate so irrigation is essential for maximising potato yields. Since all crop types need irrigation during this period and water is a limited resource in most farming systems, it is helpful to know where water savings can be made for potato crops, without compromising yield. Additionally, excessive watering can risk drainage and leaching. This project investigated a range of irrigation amounts and timings to test their impact on tuber yield and quality.

Site
The site was planted on the 24 October at the Chertsey FAR research site using a commercial planter with the cultivar Innovator. The trial is set up on a Chertsey silt loam soil type with four replicates of seven irrigation treatments. Each plot is four rows by 10m. Soil water content is being monitored using neutron probes, one in each plot. Water is being applied through drip irrigation set up along the ridge.

Treatment List
1. Nil (rain fed only)
2. Replace 50% crop water use
3. Replace 75% crop water use
4. Replace 100% crop water use
5. Replace 100% crop water use fortnightly
6. Replace 100% of crop water use once then 0% for 3 weeks then again replace 100% of crop water use
7. Replace 75% of crop water use until canopy closure then 0% for 3 week then again replace 75% of crop water use

Irrigation treatments to date
- Rain fall from planting until 18.01.16 = 105mls
- Applied irrigation from planting (100% replacement) = 185mls

Evaluation of seed treatments and in furrow fungicides in potatoes

Jen Linton & 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.

Canterbury

- The Canterbury trial site resulted in a wide range of soil borne diseases.
- Rhizoctonia stem canker was found to be infecting 40% of the untreated plots by March. Although not significant, there was a trend towards Monceren plus Proline, and Merivon on its own reducing both the percentage of infected plants and the percentage of infected stems per plant.
- Black scurf, common scab, powdery scab and nemotodes were all present when tubers were inspected at harvest. There were differences between treatments, however again they were not significant.
- There was no significant difference in yield between treatments in Canterbury.

Aims and Method

The aim of the trials was 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 Canterbury trial site resulted in a wide range of soil borne diseases. Rhizoctonia stem canker was found to be infecting 40% of the plants in untreated plots by March. Although not significant there was a trend towards Monceren plus Proline, and Merivon on its own to reduce the incidence of rhizoctonia stem canker infected plants (32.5% and 27.5% respectively). Black scurf, common scab, powdery scab and nemotodas were all present when tubers were inspected at harvest. There were differences between treatments however again they were not significant. 10% of untreated tubers had black scurf with Emesto followed by Proline having the best control with no infection. Nematode damage was found in 17% of untreated tubers. The incidence of nematodes in Monceren treated plots was higher (not significantly) than any treatments without Monceren. Amistar treatments appeared to reduce the percent infection but this was not significant. Other treatments had similar levels to the untreated.

Acknowledgements

Thanks to Peracto who carried out this trial work.

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

		Canterbury				
Treatment applied		**Application type**	**Total Yield (t/ha)**	**Marketable Yield (t/ha)**	***% plants Rhizoctonia***	***% Nematodes***
1.	Untreated control	-	100.8	82.8	40.0 (26.1)	16.9
2.	Monceren	Seed	106.6	80.2	37.5 (19.3)	44.2
3.	Monceren Amistar @ label	Seed In-furrow	105.2	76.5	40.0 (22.0)	43.8
4.	Monceren Amistar 2x label	Seed In-furrow	112.8	86.2	45.0 (24.7)	39.6
6.	Monceren Proline	Seed In-furrow	99.4	72.3	32.5 (15.3)	35.9
9.	Monceren Nebijin	Seed In-furrow	103.9	80.3	45.0 (23.5)	36.7
10.	Monceren Nebijin + Amistar	Seed In-furrow In-furrow	120.2	97.6	47.5 (24.8)	50.2
11.	Amistar @ label	In-furrow	112.3	82.6	47.5 (26.9)	13.2
12.	Amistar 2x label	In-furrow	117.2	90.0	37.5 (26.4)	6.6
13.	Rizolex	Seed	109.9	90.8	42.5 (22.2)	23.5
14.	Merivon	In-furrow	120.7	97.6	27.5 (14.3)	29.3
20.	Nebijin	In-furrow	113.9	96.0	40.0 (18.5)	25.3

( ) % stems infected with Rhizoctonia.

July 2014

Potato Update

Issue 1

Potatoes NEW ZEALAND Growing together

Monitoring for tomato potato psyllid with sticky traps: a guide for growers

Why monitoring?

Crop monitoring techniques allow for the collection of information about pest insect populations throughout the growing season. This information is beneficial to both growers and researchers.

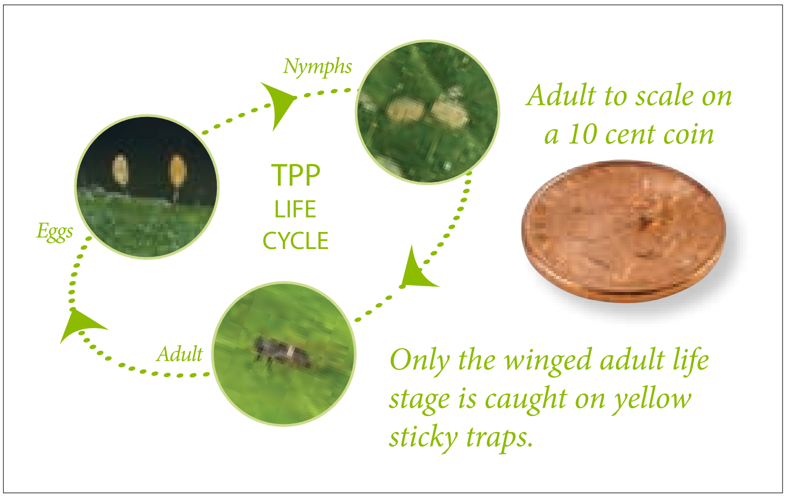


Figure 1. Life cycle of Tomato Potato Psyllid (TPP).

Trapping protocol

- Traps at the end of each pack may have 'clean' sides, so to ensure both sides are coated in adhesive, press back-to-back with a sticky side to transfer the adhesive.
- Attach sticky traps to 1.5 m bamboo poles or similar using the twist ties provided with the traps and metal fold-back clips for extra security.
- Each trap should be positioned on a pole with the bottom edge of the trap level with the top of the crop canopy. Move the trap position upwards as the canopy height increases over the growing season.

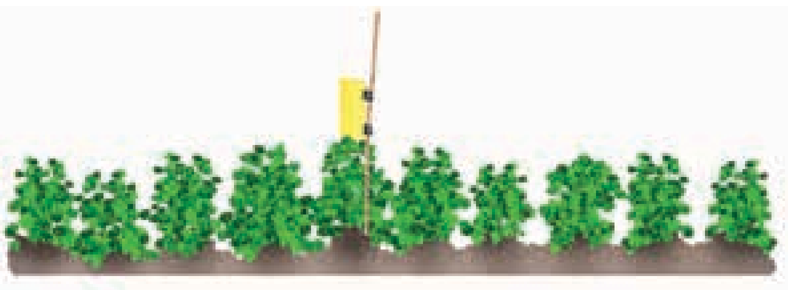


Figure 2. Trap positioning.

Tips for trapping

- Traps should be placed in your crops from planting until harvest. We recommend that you continue your trapping until four weeks after harvest.
- We recommend the use of 10 x 25 cm yellow sticky trap, see end of document for suppliers.
- Traps should be replaced weekly.
- Traps should be wrapped individually with cling film (e.g. GLAD® Wrap) in the field and taken to a more comfortable location for counting. If you send your traps away for assessment and there is a delay in posting them, store them in the refrigerator to help preserve the insects.
- As insecticides have specific modes of action, we recommend that sticky trap monitoring is carried out alongside visual plant assessment, to gauge the numbers of eggs and nymphs, and the presence and impacts of important insect predators. Examine middle leaves of plants, paying particular attention to the underside of each leaf selected.

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Trap placement

- Use a minimum of five traps per field.
- Place four traps five metres into the crop from the field margin, one per side, and one in the centre of the crop.

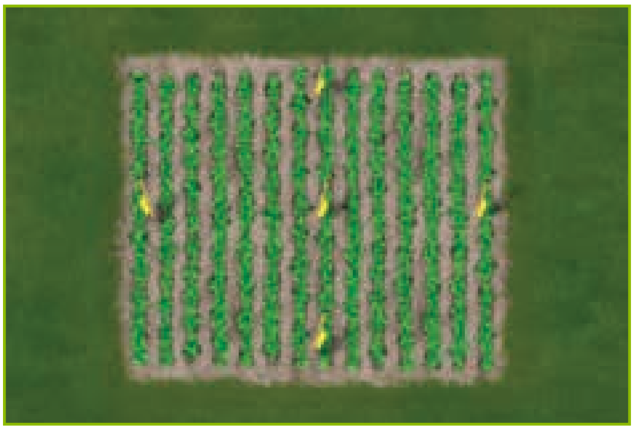

Figure 3. Trap placement.

Trap assessment

- If you send traps away for assessment, they must be clearly labelled with your name, site details, date put in the crop, date removed from the crop and position of the trap in the field.
- If you are assessing your own traps, you will require a magnifying glass (or access to a microscope), a permanent marker for circling TPP and a recording sheet. (http://bit.ly/GGHO8F).

Figure 4. Trap assessment label sample.

How you can help

Allow access to your spray diary information – this can help explain fluctuations in the numbers of TPP caught on your traps.

Provide information about the types of vegetation (weeds, shelter plants) surrounding your crops.

Inform us of anything out of the ordinary in relation to pest or disease incidence and yield you observe in your crops from year to year.

Resources

Plant & Food Research
Auckland 09 925 7000 or Lincoln 03 977 7340
www.plantandfood.co.nz

Suppliers of both sticky traps and crop monitoring services

Fruitfed Supplies:
www.fruitfed.co.nz or 06 873 0956
Horticentre:
www.horticentre.co.nz or 0800 855 255

Suppliers of sticky traps only

CRT Farmlands:
www.crt.co.nz or 0800 278 583

Crop monitoring service providers only

SGS: www.sgs.co.nz or 0800 747 2474

Psyllid resources

Potatoes New Zealand:
www.potatoesnz.co.nz

Acknowledgements

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For further information

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July 2014

Potato Update

Issue 2

Potatoes NEW ZEALAND Growing together

Degree Days and how to use them in tomato potato psyllid management decisions

How do insects grow and develop?

- Heat is required for insects to develop from one stage in their life to another, i.e. eggs – nymphs – adults.
- The warmer the weather the faster they develop and the cooler the temperature the slower they develop.
- All insects have a cut off temperature below which development is negligible (lower development threshold) and a maximum temperature at which the rate of development stops (upper development threshold). These thresholds can be used in predicting insect development.

What are Degree Days and how are they calculated?

- Degree days measure insect growth and development in response to daily temperatures.
- In a 24 hour period degree days can be calculated as follows:

[(Temp Min + Temp Max)/2] - Lower development threshold = DD

- One degree day accumulates for each degree the average temperature remains between the lower and upper development threshold over 24 hours.
- Several degree-days can accumulate during a 24-hour period.
- For example with TPP (7.1–33.6°C development range), on a day when the average temperature is 18.1°C, 11 degree days would accumulate.
- It takes 358 degree days for TPP to develop from an egg to an adult, i.e. to complete 1 generation (Tran et al. 2012. Environmental Entomology 41: 1190-1198).

Tips for trapping

- Tomato potato psyllid (TPP) development occurs between 7.1 and 33.6°C.
- The warmer the weather the faster TPP develop, therefore it is possible to use degree days to predict their development.
- It takes TPP 358 degree days to develop from an egg to an adult. Thus, if the average temperature was 17.1°C it would take 35.8 days to go from an egg to adult.
- Degree days can be useful early in the season to time first insecticide application.
- Degree days are best used in conjunction with monitoring to decide on spray timings.

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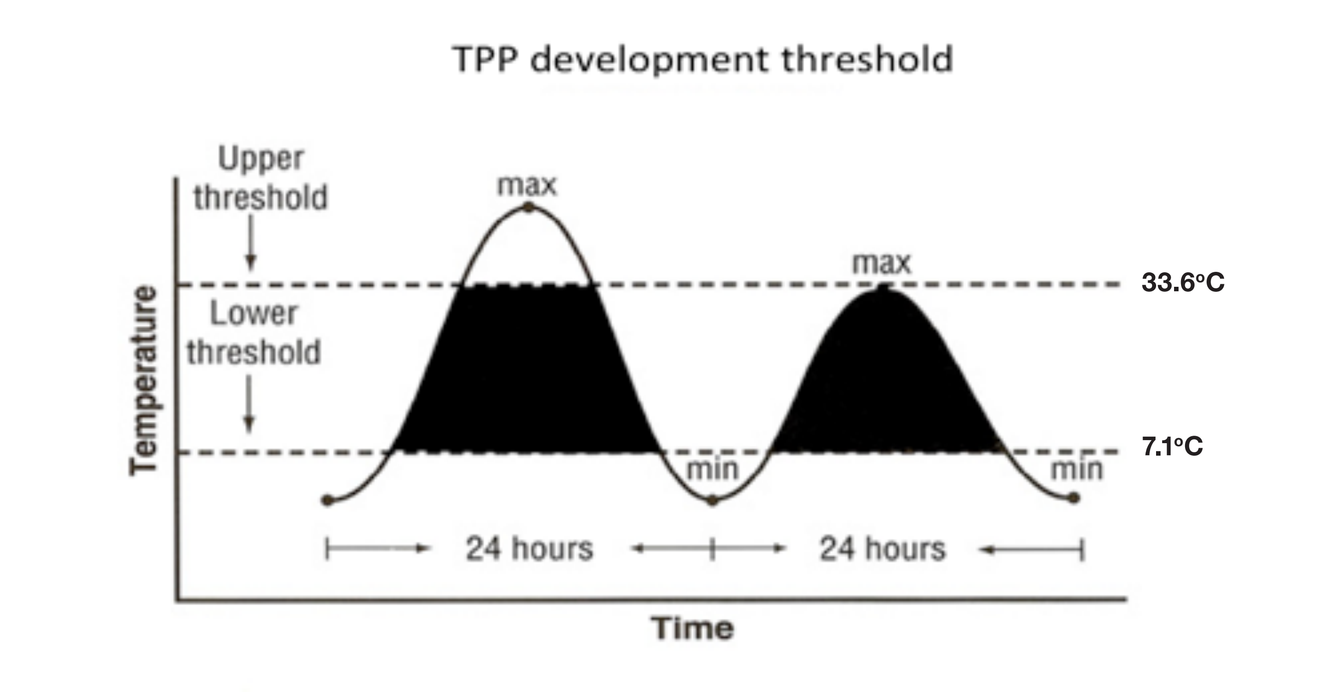

Figure 1. TPP development threshold.

Using degree days for tomato potato psyllid management

- Accumulated degree days can be an important decision support tool in Integrated Pest Management (IPM) programmes.
- Depending on weather conditions insect development varies between years and locations. For TPP, by January insect development can be one to two weeks faster in a year with warm spring weather than in a year with cold spring weather. Similarly, insect development may be several weeks faster in Pukekohe than Chertsey (Canterbury).
- Degree days can be used to optimise the timing of insecticide applications rather than relying on calendar dates.
- Degree days are most useful early in the season, as insecticide applications, rain and irrigation may alter TPP populations. Once eggs are found in your crop, 358 degree days later those eggs will potentially be adults.
- As the season progresses you will have all TPP life stages in your crop.

Things to consider

- Psyllids are active throughout the year, even in frosty areas.
- Degree days are best used in conjunction with crop monitoring using sticky traps and plant sampling. Crop monitoring provides valuable information on TPP arrival, population build up and the life stages present in your crop and you can choose your insecticide accordingly (see the PNZ TPP management poster and the other factsheets).
- It is important to be aware of other plants near your crop that can sustain TPP and act as a source of infestation. These include African boxthorn, thornapple and Poroporo but also volunteer potatoes (please see Potato Update 3 ‘Non-crop host plants of tomato potato psyllid in New Zealand’ for more information).

Acknowledgements

This work was funded by the Ministry for Primary Industries, Sustainable Farming Fund SFF 11/058: IPM Tools for psyllid management.

For further information

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July 2014

Potato Update

Issue 3

Potatoes NEW ZEALAND Growing together

Non-crop host plants of tomato potato psyllid in New Zealand

What is a host plant?

A host plant is a plant on which TPP completes its full lifecycle from egg through to adult.

What crops are host plants of TPP?

Crops belonging to the Solanaceae and Convolvulaceae family, which includes potatoes, tomatoes, capsicums, chilli peppers, goji berries, tamarillos, eggplant, tobacco, kumara/sweet potato and taewa/Māori potatoes.

Why do you need to be aware of non-crop host plants of TPP?

Some of the species described below such as African boxthorn, Jerusalem cherry and Poroporo have all life stages of TPP on them all year round. This is the case for all of New Zealand, even frosty areas. This means that whether you have a crop in the ground or have harvested your crop and it is the middle of winter, TPP are potentially surviving and breeding on non-crop plants in or near your crop.

Key points

- Tomato potato psyllid (TPP) can complete its lifecycle on a number of crop and non-crop plants.
- Some non-crop host plants can provide a host for TPP all year round even in frost prone areas.

Non-crop host plants in New Zealand

Following is a list of the most important host plants that may be present around your potato crop.

Common name: African boxthorn
Botanical name: *Lycium ferocissimum*
Description: Evergreen perennial. Chinese boxthorn is similar but is deciduous.
Distribution: Throughout New Zealand, predominantly in coastal areas.

Photo: John Barkla.

Photo: Anna-Marie Barnes.

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Common name: Poroporo
Botanical name: *Solanum laciniatum or S. aviculare*
Description: Perennial shrub.
Distribution: *S. laciniatum*: throughout New Zealand; *S. aviculare*: throughout NI and SI as far south as Banks Peninsula and south Westland.


Photo: Anna-Marie Barnes.


Photo: Phil Bendle.

Common name: Thornapple
Botanical name: *Datura stramonium*
Description: Summer annual.
Distribution: Common in the North Island. Scattered in northern/central South Island.


Photo: H. Zell.


Photo: H. Zell.

Common name: Apple of Peru
Botanical name: *Nicandra physalodes*
Description: Frost tender annual. Often found in association with thornapple.
Distribution: Occasional to common in frost-free North Island localities. Occasional in warmer South Island places as far south as Canterbury.


Photo: Peter de Lange.


Photo: John Smith-Dodsworth.

Common name: Jerusalem cherry
Botanical name: *Solanum pseudocapsicum*
Description: Evergreen perennial shrub.
Distribution: Occasional in warmer, frost-free areas of both North and South Islands.

Photo: H. Zell.

Common name: Field bindweed
Botanical name: *Convolvulus arvensis*
Description: Perennial.
Distribution: Occasional throughout New Zealand. Common in Hawke's Bay, Nelson, Marlborough and Canterbury.

Photo: Mike Lusk.

Common name: Chinese boxthorn
Botanical name: *Lycium barbarum*
Description: Deciduous perennial shrub.
Distribution: Occasional throughout New Zealand.

Photo: Pancrat.

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For further information

For more detailed information and additional photographs on the above plants please refer to the New Zealand Plant Conservation Network webpage (http://www.nzpcn.org.nz) or Nature Watch NZ (http://naturewatch.org.nz). We would like to thank the New Zealand Plant Conservation Network for providing most of the pictures.

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Potato Update

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Potatoes NEW ZEALAND
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Oils and selective insecticides for tomato potato psyllid management in potato

Introduction

This factsheet aims to introduce oils and selective insecticides suitable for inclusion in developing integrated pest management (IPM) programmes to combat TPP in potatoes. When developing effective and sustainable pest management strategies, and especially when it involves insect vectors, it is important to not rely on chemical control alone – other control mechanisms (cultural, physical and biological) should always be included to minimise the build-up of insecticide resistance, minimise insecticide use and optimise pest control.

Oils are active against pest insect species but are less harmful than broad-spectrum insecticides to non-target species, reducing disruption of biological control agents.

Selective, narrow-spectrum insecticides also cause less harm to some types of insects than they do to others (please see Potato Update 5 'Protecting beneficial insects in potato crops' for more information).

Reduced spray programmes

These are part of sustainable pest management strategies and decrease the chances of pest insects developing resistance to insecticides. Options to reduce the number of insecticide sprays are:

- Incorporating oils into the spray programme.
- Increasing spray intervals, e.g. from 7 to 10 days.
- Using monitoring (plant and/or sticky traps) to determine the start of a spray programme.
- Using developed action thresholds to determine the start of a spray programme (Auckland only).
- Using Degree Days to determine the start of a spray programme.

Key points

- Both oils and a number of selective insecticides can be used in IPM programmes to control tomato potato psyllid (TPP).
- IPM programmes reduce the number of insecticide sprays and reduce the risk of resistance.
- Monitoring, using sticky traps or plant sampling, along with action thresholds and an understanding of insect development in degree days can be used to guide the start of spray programmes.
- Insecticide spray programmes should use a range of different insecticide mode of action groups to reduce the risk of resistance.

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Considerations for best practice for Insecticide Resistance Management (IRM) in potatoes

	Auckland and possibly rest of North Island	Canterbury
Emergence until December	Thiamethoxam should not be needed. Beneficial insects should control early season aphids and TPP.	Thiamethoxam is widely used. Effect of beneficial insects on pest insects present not determined early season.
December onwards	Think about which reduced spray programme would work for you. A best practice programme includes: • spirotetramat (2 applications) • abamectin (4 applications) • spinetoram (4 applications) • cyantraniliprole (3 applications) is also available for early use, but is mainly untested. • Then, other mode of action (MoA) insecticides should be used to protect the crop from late season TPP and potato tuber moth (PTM). Note that resistance to synthetic pyrethroids (SPs) is reported for PTM in the north of the North Island. • Protect the crop from TPP and PTM right through until harvest, including after desiccation.	Think about which reduced spray programme would work for you. A best practice programme includes: • spirotetramat (2 applications) • abamectin (4 applications) • spinetoram (4 applications) • cyantraniliprole (3 applications) is also available for early use, but is mainly untested. • Then, other mode of action (MoA) insecticides should be used to protect the crop from late season TPP. • Protect the crop from TPP right through until harvest, including after desiccation.

Points to remember

- Rotate your different mode of action insecticides to decrease the risk of insecticide resistance in insects. Some active ingredients have the same modes of action; please check the Potatoes NZ poster, the product label and the Novachem manual for more information or visit the Insecticide Resistance Action Committee (IRAC) website (www.irac-online.org) for comprehensive data and default recommendations on IRM strategies.
- Visit www.sripmc.org/IRACMOA/IRMFactSheet.pdf for more information on IRM.
- Check the product label, the Potatoes NZ poster or the Novachem manual for more details on maximum number of applications for a product and recommended spray intervals.

Summary of effects of oils and selective insecticides on transmission of *Candidatus* Liberibacter solanacearum (CLso) and individual tomato potato psyllid life stages from SFF 11/058 laboratory studies. Symbols: ✔ = significant effect observed; (-) = slight or limited/short-lived effect observed; (✔) = potential residual effect on egg hatching rate; 0 = no significant effect was observed; NA = product/insect combination was not tested.

Product	Active ingredient	Classification	Mode of action	CLso transmission reduction[1]	Reduced oviposition or egg hatching[2]	Increased nymph mortality[2]	Adult repellence[1]	Increased adult mortality[1]
Organic JMS Stylet-Oil®	Mineral oil + adjuvant	Contact	Suffocation	0	(✔)	✔	✔	0
Excel® Oil	Mineral oil	Contact	Suffocation	✔	(✔)	✔	✔	0
Sap Sucker Plus/ Thunderbolt	Oxygenated monoterpenes, neem oil, dispersants and adjuvants	Contact	Inhibits feeding behaviour and development	0	(✔)	✔	✔	0
Benevia®	cyantraniliprole	Translaminar, systemic (xylem), contact (minor)	Disrupts muscle function, inhibits feeding behaviour	0	✔	✔	0	✔
Movento®	spirotetramat	Translaminar, systemic (phloem + xylem)	Reduces adult fertility and survival of offspring	0	✔	✔	NA	(-)
Sparta™	spinetoram	Contact, translaminar	Nerve poison, inhibits feeding behaviour	0	(-)	✔	(-)	✔
Avid®	abamectin	Translaminar	Nerve poison, inhibits feeding behaviour	✔	✔	✔	NA	✔

[1] Based on residual activity only.
[2] Based on residual and/or direct spray effects.

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For further information

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Potato Update

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Potatoes NEW ZEALAND
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Protecting beneficial insects in potato crops

Introduction

Tasmanian lacewings, hoverflies and eleven-spotted ladybirds are all predators of the tomato potato psyllid (TPP) and they will eat all life stages of this pest, being adults, nymphs and eggs, although this latter life stage is less preferred. If given a chance, these beneficial insects will get into potato crops and attack pests 24/7. Research in the SFF 11/058 programme has shown that there are selective products that will help control the psyllid but cause little or no short-term mortality to the key beneficial insects in New Zealand potato crops.

To keep beneficial insects working in your crops for longer:

- Minimise insecticide use if possible
- Use selective products, especially early season when beneficial insects are most likely to make an impact on TPP populations
- Save other products for use later in the season

Key points

- Lacewings, hoverflies and ladybirds are all predators of tomato potato psyllid.
- Selective insecticides can help control tomato potato psyllid but cause little damage to beneficial insects.

The following is a summary of non-target impacts of selected insecticides and oil-based products on key New Zealand beneficial insects, based on short-term laboratory assays conducted for SFF 11/058 (2012–14). Note that field impacts on beneficial insects may be less severe because the amount of exposure will differ. Assay results are indicated by two triangles, the first summarising direct spray assays, the second summarising residue assays. Symbols follow the IOBC (International Organisation for Biological Control) non-target impacts classification for laboratory trials: ▲ = <30% mortality (harmless or slightly harmful), ▶ = 30–79% mortality (moderately harmful), ▼ = >79% mortality (harmful). NA indicates that a species/product combination was not tested.

Active ingredient (product and adjuvant actually tested)	IRAC[1] group (sub-group or exemplifying active ingredient)	HSNO environmental hazard classifications:	New Zealand beneficial insect species		
			Tasmanian lacewing larvae (*Micromus tasmaniae*)	Small hoverfly larvae (*Melanstoma fasciatum*)	11-spotted ladybird adults (*Coccinella undecimpunctata*)
methamidophos (Tamaron®)[2]	1 (organo-phosphates)	Tamaron: 9.1A,9.2B,9.3A,9.4A	▼▼	▼▼	▼▼
spinetoram (SpartaTM plus Bond®Xtra)	5 (spinosyns)	Sparta: 9.1A,9.4A	▲▼	▶▶	NA
abamectin (Avid® plus Eco-Oil®)	6 (avermectins)	Avid: 9.1A,9.2C,9.3B,9.4A	▲▲	▲▶	NA
spirotetramat (Movento®)	23 (tetronic and tetramic acid derivatives)	Movento: 9.1B	▲▲	▲▲	NA
cyantraniliprole (Benevia® plus Actiwett®)	28 (diamides)	Benevia: 9.1A,9.4B	▲▲	▲▶[3]	NA
paraffinic mineral oil (JMS Organic Stylet Oil®)	-	OrganicJMS Stylet Oil: 9.1B	▶▲	▲▲	▲▶
paraffinic mineral oil (Excel® Oil)	-	Excel Oil: 9.1D	▶▲	▲▲	▲▶

[1] IRAC stands for Insecticide Resistance Action Committee, see http://www.irac-online.org/ for more information.
[2] Please note that Tamaron is no longer commercially available.
[3] Mean mortality < 30% but some surviving larvae unable to move normally and unlikely to complete development.

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