FOUNDATION FOR ARABLE RESEARCH

FAR

# Potato Field Walk

## 21 January 2015

**Courtesy of Mike Moleta**

Potatoes™ NEW ZEALAND

Growing together

ADDING VALUE TO THE BUSINESS OF ARABLE FARMING

# Integrated tomato potato psyllid (TPP) management in potato in Canterbury

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**Key messages for the Canterbury area:**

1. Use clean seed
2. Plant early if possible; shorter exposure to the larger summer populations of TPP
3. Use yellow sticky traps to monitor for TPP adults and aphids from planting
    a. trap height: bottom edge of trap level with the top of the crop canopy
    b. change traps weekly
4. Monitor your crops to assess whether TPP or other pests have arrived in your crop
5. Keep monitoring after starting your spray programme to:
    a. assess insecticide effectiveness
    b. assess presence of life stages of pest insects
    c. assess presence of natural enemies
    d. find 'hot spots' like other pests & diseases or other crop issues
6. Sustainably manage TPP:
    a. use selective insecticides early to maximise natural enemies
    b. maintain spray programme once started
    c. rotate different mode of action insecticides
    d. protect the crop even after desiccation
    e. use reduced spray programmes where possible (degree days, thresholds, agricultural oils, increased spray intervals)
    f. understand what your insecticides do to pest insects and natural enemies

The tomato potato psyllid (TPP) is a small insect, similar in size to an aphid. Psyllids live and feed on solanaceous plants like potato, capsicum, tomato and tamarillo, but also poroporo, boxthorn and nightshade weeds. The adults have two marked white stripes on their abdomen (Figure 1). The presence of psyllids is often given away by psyllid sugars, which are excreted by the adults and nymphs (Figure 1). All psyllid life stages can be found on host plants throughout the year, even in areas with frost. Adults are trapped on yellow sticky traps in all seasons too, which means they are active even when there are no crops around. This has affected research progress on predictive tools for TPP management.

Figure 1: Left - Two adult tomato potato psyllids and eggs on a leaf. Right - Tomato potato psyllid nymphs of different stages and psyllid sugars. 

Psyllid adult and nymphs can transmit the bacterium *Candidatus* Liberibacter solanacearum (CLso) to plants. When a potato plant is infected with this bacterium, the plant will show upward rolling of leaves, yellow to purple discolouration of leaves, axillary bud proliferation, swollen nodes, aerial

tubers and, in later stages, leaf chlorosis (Figure 2). For the tubers, there is a delay in sprouting and emergence and the vascular tissues show browning. Frying of chips from infected tubers results in variable patterns of light and dark stripes, streaks and blotches; the zebra chip (ZC) symptoms (Figure 2). This makes the tubers unsuitable for processing.

**Sustainable management of psyllids**

The arrival of TPP has led to a significant increase in regular applications of insecticides in the potato industry. These spray practices are not only costly but are likely to have a negative impact on the environment and natural enemies, while increasing the potential for insecticide resistance in TPP and other pest insects such as aphids and potato tuber moth. Also, ZC can still be found in potato tubers, thus the insecticide-based strategy is not completely efficacious in terms of disease elimination.

For seed crops aphids are a problem too, because of transmission of viruses. These crops are sprayed frequently as there is a low tolerance for TPP and aphids. Research on sustainable psyllid management has not been conducted in seed crops yet and no best-practice can be recommended. However, a new non-spray management option is now available in the form of mesh covers (see presentation on 'Control of TPP and blight with mesh crop covers').

Figure 2: (L) Foliar symptoms related to tomato potato psyllid feeding and bacterial infection. (R) Zebra chip symptoms (darkening of the vascular tissues and blotching) in chips after frying (stars indicate zebra chip 'positive' chips, the other chips are not showing zebra chip symptoms). Photos: Jessica Dohmen-Vereijssen.

Although ZC is not as important in fresh or table potatoes as these are not processed, a reduction in yield has been observed as well as larger numbers of small tubers. Also, severe ZC affects the taste and texture of the cooked potato.

Research on TPP management has so far mainly focussed on process crops, as ZC affects this end use the most. Most research on sustainable TPP management has been conducted on the North Island. From recent research in Canterbury, it is obvious that each potato growing region needs a tailored suite of management tools. Not only because of the difference in climatic conditions, but also because of the different potato end-uses. Results from a field trial in the 2013-14 season in Canterbury showed that marketable yields comparable to weekly spraying could be achieved with 40% fewer insecticide applications. This will be further tested in the 2014-15 season.

# Control of TPP and blight with mesh crop covers

*Charles Merfield, BHU Future Farming Centre*

### Can we use zero foliar insecticides and fungicides in potatoes?

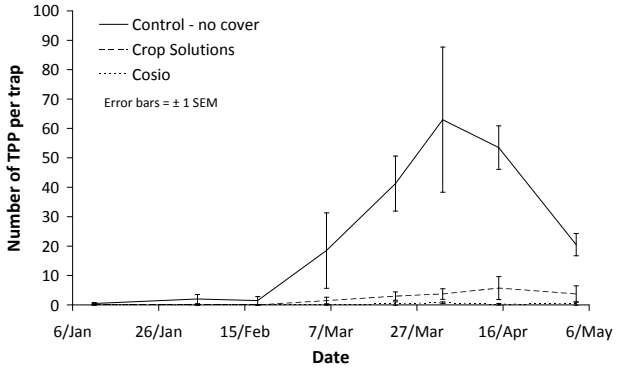
Agrichemical management of tomato potato psyllid (TPP) continues to improve with better timing of sprays based on predicted and measured TPP populations, plus the use of biorational insecticides that are less toxic to beneficial insects that help control TPP. However, even though fewer sprays are being used, ideally TPP could be controlled non-chemically, e.g. through biological control by parasitoids such as *Tamarixia triozae* or entomopathogenic fungi sprays. Another non-chemical approach is physical control, and mesh crop covers are the leading physical control of crop pests in European field crops.

### What are mesh crop covers?

Mesh crop covers are akin to fly screens on windows, but for field crops. They are a woven mesh of fine plastic threads, like fishing line, that when laid over the crop creates a physical barrier, to stop pest reaching the crop, just like fly screens keep insects out of the house. Some 100,000 ha of mesh is in use in Europe with 100s ha on individual farms. It is now the only means of controlling root fly on turnips and swedes as there are no legal and effective chemicals left. They are also the opposite of frost cloth, which aims to increase temperature under the nets, mesh crop covers are designed to have the minimum effect on the under sheet microclimate - with a 1°C average increase typical.


### Control of TPP and blight with mesh crop covers

Field experiments over two seasons at the Future Farming Centre, have shown that mesh is highly effective at keeping TPP off crops and significantly increasing yield against a null control, especially when taking into account that TPP also causes tuber size to decrease as well as yield.



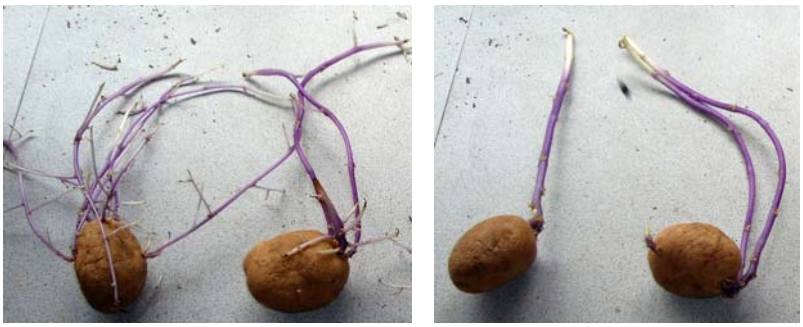

| | Control | Mesh |
|---|---|---|
| **Total yield, tonne / ha** | 35 | 43 |
| **Percent increase over control** | 0% | 23% |
| | | |
| **Percent of tubers > 125 g** | 38% | 70% |
| **Marketable yield of tubers >125g tonne / ha** | 13 | 30 |
| **Percent increase over control** | 0% | 125% |

Organic growers using mesh in Canterbury and Hawke's Bay, have also been achieving excellent TPP control using mesh. In addition, a surprise finding was that mesh gives a high level of potato blight control (see below). The causal effect for this has not yet been determined, but it is clear that it is not due to temperature and/or humidity effects as there was zero difference in Smiths Periods under mesh and in the uncovered controls in the BHU trial.

It is speculated that the blight control is due to a 'spectral filter' effect where the mesh changes the types of light (blue, green, UV etc.,) that hit the crop. This effect has been used in Europe and Israel since the 1990s to control both fungi and insect pests in polytunnels. As mesh is a physical barrier, it is akin to a broad-spectrum insecticide, in that it will stop any pest that is too big to get through the mesh holes. As mesh hole size goes down to 0.3 mm mesh can keep out pests as small as thrips. Mesh is therefore also able to control the other main potato pests: aphids and tuber moth. The photo above shows covered potatoes on left (green) and uncovered on right (brown) 2013 season in Hawke's Bay

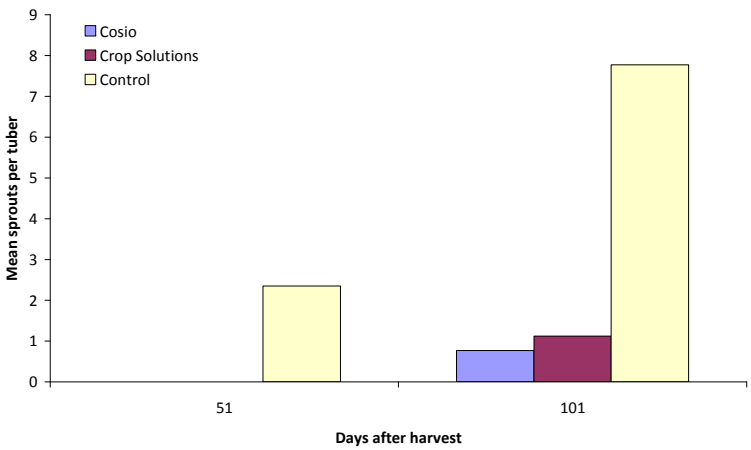
**Mesh for seed potato production**

While tuber moth is only a problem in the North Island and aphids are well managed in food crop potatoes, the latter are a major problem in seed potato production as they spread viruses. 100% control of aphids in seed potato crops would be ideal to eliminate virus spread, however, due to the nature of aphids and chemical control, this is impossible. In comparison, mesh crop covers, can offer 100% control of aphids (and all other potato insect pests) so it is considered that there is major potential to use the mesh in seed potato production to achieve a significant reduction in virus levels and also the damage caused to tubers from TPP feeding on the foliage (see below) as well as from zebra chip caused by *Candidatus* Liberibacter solanacearum.



(L) Normal sprouts on mesh grown tubers (R) 'whip-tail' sprouts from TPP infested tubers.

(R) Sprouting rates.



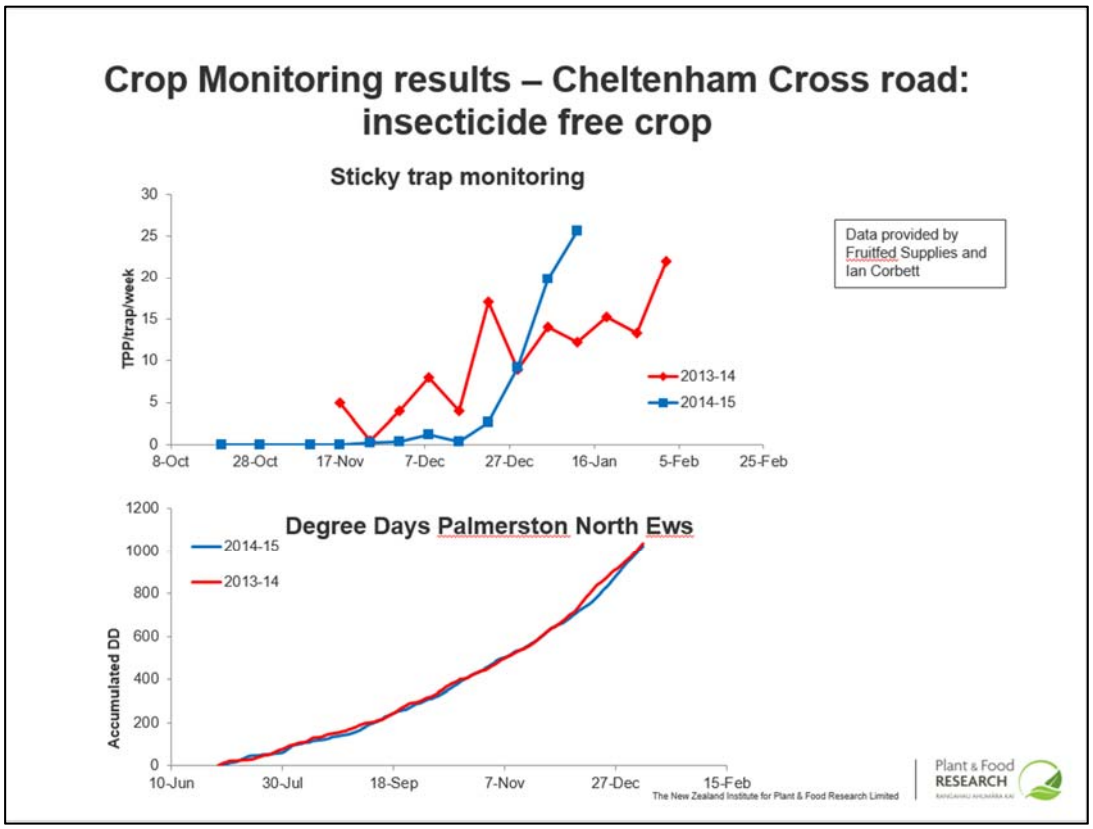

In addition, to ensure complete of aphid and TPP control in the first and second generations biological control agents such as the Cleobora and Dusky ladybirds can be introduced under the mesh to mop up any pests that manage to infiltrate the mesh.

# PNZ/FAR demonstration field trials - pest management

• Aim: To develop **region-specific pest and disease management strategies** for potatoes in NZ
• PNZ, FAR, PFR & Future Farming Centre

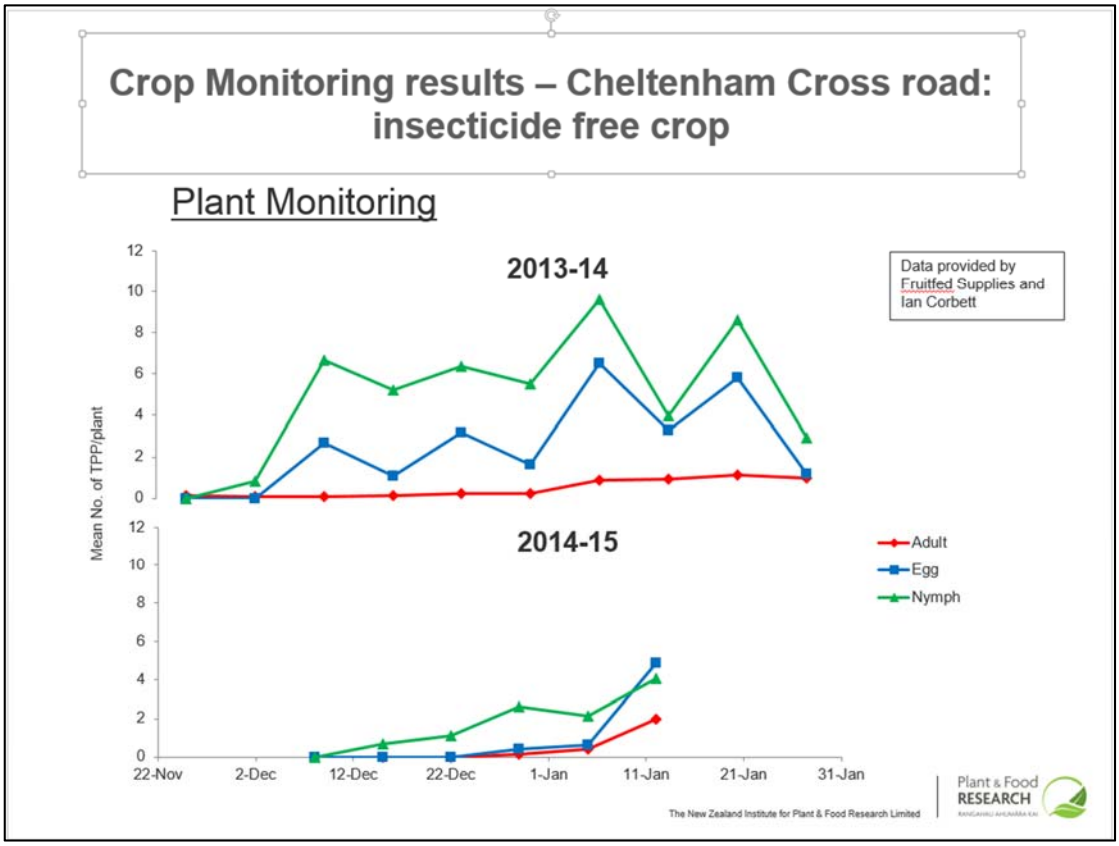
**TREATMENTS**

1. Standard spray programme from emergence (2 Movento, 3 Avid, 4 Sparta, 3 Proteus, 4 Metafort). **10 applications**
2. Threshold – 980 DD from 1 July to initiate standard spray programme. Threshold reached 4th Jan - **1 Movento**
3. Threshold – 3 TPP/trap/week to initiate standard spray programme. Threshold reached 29th Dec - **1 Movento**
4. 2x Movento then weekly alternating insecticide and Excel. **7 applications, 3 oils**
5. Mesh crop covers
6. Untreated control




Interesting that nymph numbers are higher than egg numbers

Saw 1st psyllid nymph on 2nd Dec last season, whereas this season we didn't see the 1st nymph until the 15th Dec.




Last season 1st TPP trapped on 18th Nov as soon as traps were put in the crop

This season we trapped our 1st TPP a week later on the 24th of Nov

Looking at DD accumulations for this season and last season there is very little difference

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