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MS 4 Psyllid National Monitoring - Year 3 activity and final report

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June 2012

A report prepared for

Market Access Solutionz Limited
Ref: SFF09-143

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PFR SPTS No. 7265

PUBLICATION DATA

Dohmen-Vereijssen J, Taylor N, Jorgensen N. June 2012. MS 4 Psyllid National Monitoring - Year 3 activity and final report. A report prepared for Market Access Solutionz Limited. Plant & Food Research Client Report No. 45845. Plant & Food Research Contract No. 24878. SPTS No. 7265.

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Executive summary

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The seasonal abundance and distribution of the tomato/potato psyllid, *Bactericera cockerelli* (Sulc.) (TPP), was assessed using weekly sticky trap monitoring in commercial potato, tomato and tamarillo crops during the 2009-10, 2010–11 and 2011-12 growing seasons. At an additional two sites, weekly sticky trap and plant assessments were performed.

The most important findings and conclusions are:

- TPP numbers were highly variable between sites and regions. Generally, the North Island had higher TPP numbers than the South Island.
- In general, for both the North and South Islands, the abundance of TPP appeared to peak between early February and late March, with declining numbers towards mid-April. This means that early potatoes in the North Island may escape psyllid/*Candidatus* Liberibacter solanacearum (Lso) damage and could be grown without chemical psyllid control.
- The monitoring (both sticky trap and plant assessment) was influenced by crop management and local climate.
- Greater TPP numbers were generally found on the edge of a crop rather than in the middle. This is a similar observation to that reported from TPP monitoring programmes in the USA.
- The sticky trap monitoring programme is most useful at the beginning of the cropping season, providing an indication of when TPP could be expected to arrive in the crop. Sticky trap monitoring should be accompanied by actual plant assessments throughout the growing season to give a true indication of pest infestation in the crop.
- Sticky traps recorded psyllids 1-4 weeks earlier than plant assessments did.

Further studies should include trapping and plant assessments in unsprayed crops and development of a less labour-intensive weather-based supervised control system for TPP. In addition, this study has shown that in many cases, the first one or two insecticide applications can be omitted, as they were applied too early in the season. Education of growers regarding this would increase profits and decrease TPP insecticide resistance.

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1 Introduction

Since 2006, solanaceous crops grown in New Zealand have been affected by an exotic insect pest, the tomato/potato psyllid (*Bactericera cockerelli* (Sulc), (Hemiptera, Triozidae) (TPP). The arrival of TPP in New Zealand and the identification of its role as a vector of the bacterial pathogen *Candidatus* Liberibacter solanacearum (Lso) have presented a considerable challenge to the New Zealand greenhouse vegetable, tamarillo, tomato and potato industries. Seasonal monitoring in New Zealand's main crop growing areas for these crops was needed to understand the population dynamics of this pest.

Insect monitoring is an important Integrated Pest Management (IPM) tool and is commonly carried out to determine presence or absence, seasonal migration and phenology of insect pests. Additionally, insect monitoring can provide important information to aid pest management decisions, such as estimating damaging population densities and evaluating the efficacy of control measures, and monitoring contributes to the development of action thresholds for insecticide applications and sustainable management.

2 Objective

The aims of this project were (1) to develop simple and effective monitoring tools for the potato psyllid by comparing actual numbers of psyllids in crops (foliage samples) with less intensive sampling methods such as sticky traps and (2) using these data to understand the population dynamics (timing and magnitude of psyllid infestations) of the potato psyllid in different locations and crops (seed, processing, table) under New Zealand conditions, potentially to predict psyllid outbreaks.

3 Outline of the methodology

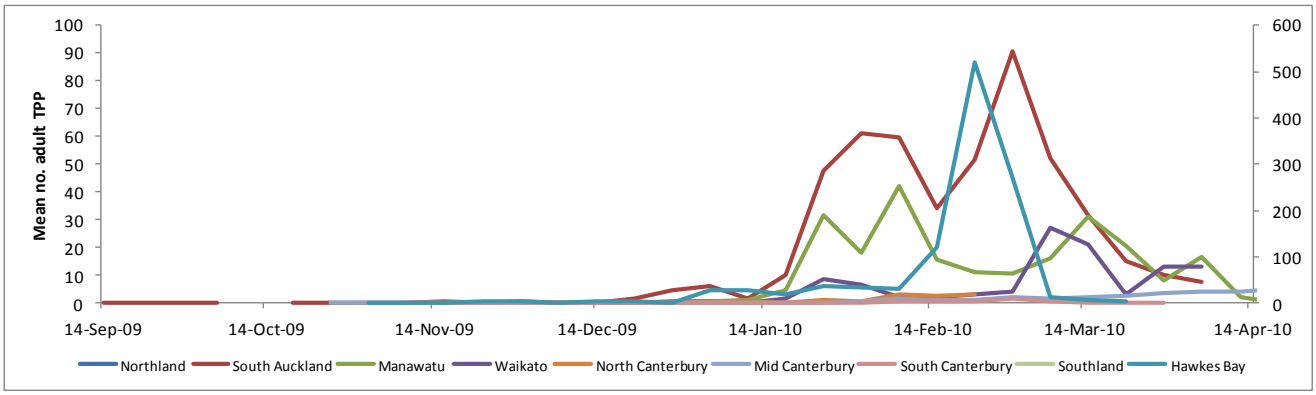
- Yellow sticky trap monitoring was conducted in commercial potato, tomato and tamarillo crops in the North and/or South Islands over three growing seasons (2009-10, 2010-11 and 2011-12).
- In the third year, sampling sites throughout the country from Northland to Southland comprised a total of 41 monitoring sites (1 tomato, 6 tamarillo and 34 potato crops). Not all sites were funded through SFF; the majority were funded through commercial, Horticulture Australia Limited or Plant & Food Research internal funding.
- All sampling was influenced by normal commercial practices (e.g., spraying) and localised environmental effects (e.g., rainfall).
- As for the previous year, two additional sites in Canterbury and in Hawke's Bay were selected for weekly trap and plant assessment (see also Berry et al. 2011). These assessments were made in the same field to correlate the two trapping techniques, which could simplify monitoring in the future.
- Yellow sticky traps: Double sided yellow sticky traps (BugScan®, 25 cm x 10 cm) were mounted on wire frames or stakes just above plant height. Traps were placed 5 m from the field edge and where possible at the north, south, east and west corners of a site. Traps were collected and replaced weekly.
- Plant assessment: Fifty plants per crop were assessed weekly. At first emergence, whole plants were sampled until this became too labour-intensive; then it was switched to sampling whole stems. Numbers of all TPP life stages on two whole stems (all leaves attached) per plant (each stem facing other rows) were recorded.
- Weekly monitoring data were collated by researchers at Plant & Food Research Lincoln & Hawke's Bay and submitted to Stephen Ogden/Sally Anderson for the weekly national psyllid monitoring update.

4 Year 3 results

The following observations were made:

- The first TPP flights were recorded early November 2011 in the North Island and late November 2011 in the South Island (Figure 1C). For both regions, TPP numbers on sticky traps were most abundant from mid-January to mid-April.
- Higher TPP numbers were recorded in the North Island than in the South Island (Figure 1C).
- Although TPP numbers were high on average, the TPP numbers in Hawke's Bay and South Auckland regions were considerably lower for the 2011-2012 season than they had been for the two previous seasons (Figure 1).
- The Northland sticky traps in tamarillo orchards recorded lower numbers of TPP than in the previous season.
- The 2011-2012 TPP numbers in Canterbury were lower than in the 2010-2011 season, but higher than in the 2009-2010 season (Figure 1).
- Given previous years' indication of TPP in the Southland region, a regular monitoring site was set up for the third year of this SFF. TPP were recorded in low numbers from early January to mid-March 2012 when the last set of sticky traps was removed (Figure 1C).
- There was no correlation between number of adults on sticky traps and any of the life stages of the whole-plant assessment. However, sticky traps recorded psyllids 1-4 weeks earlier than plant assessments did.

A



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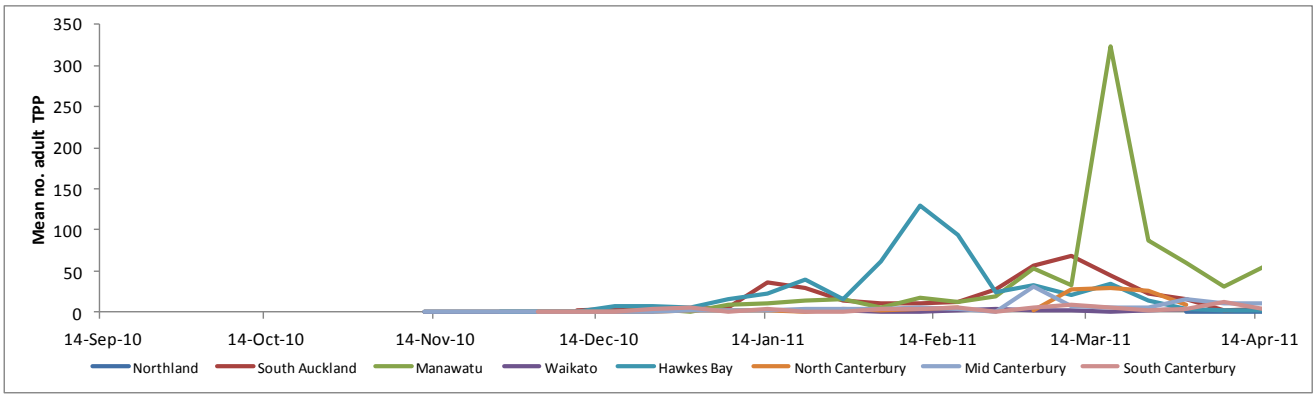

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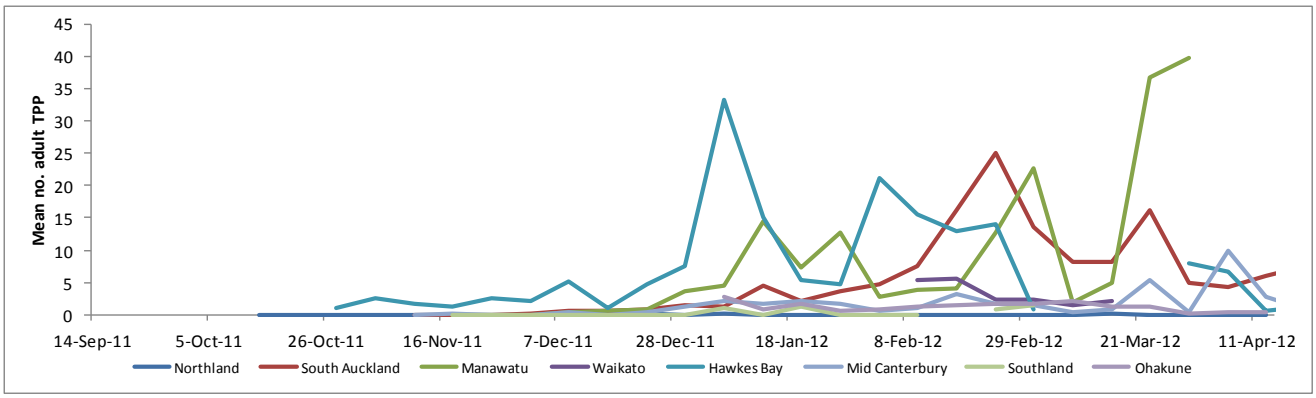

Figure 1. Adult potato/tomato psyllid yellow sticky trap catches for different sites for the (A) 2009-10, (B) 2010-11 and (C) 2011-12 growing seasons. Please note that in (A) the secondary right-hand y-axis is for Hawke's Bay only; for other regions, the primary left-hand y-axis applies.

5 Combined results over the 3 years of the study

- TPP numbers were highly variable between sites and regions. Generally, the North Island had higher TPP numbers than the South Island (Figure 2).
- In general, for both the North and South Islands, the abundance of TPP appeared to peak between early February and late March, with declining numbers towards mid-April (Figure 2). This means that early potatoes in the North Island may escape psyllid/Lso damage and could be grown without chemical psyllid control.
- The monitoring (both sticky trap and plant assessment) was influenced by crop management and local climate.
- Greater TPP numbers were generally found on the edge of a crop rather than in the middle. This is a similar observation to that reported from TPP monitoring programmes in the USA.
- The sticky trap monitoring programme was most useful at the beginning of the cropping season, providing an indication of when TPP could be expected to arrive in the crop. Sticky trap monitoring should be accompanied by actual plant assessments throughout the growing season to give a true indication of pest infestation in the crop.
- Sticky traps recorded psyllids 1-4 weeks earlier than plant assessments did.

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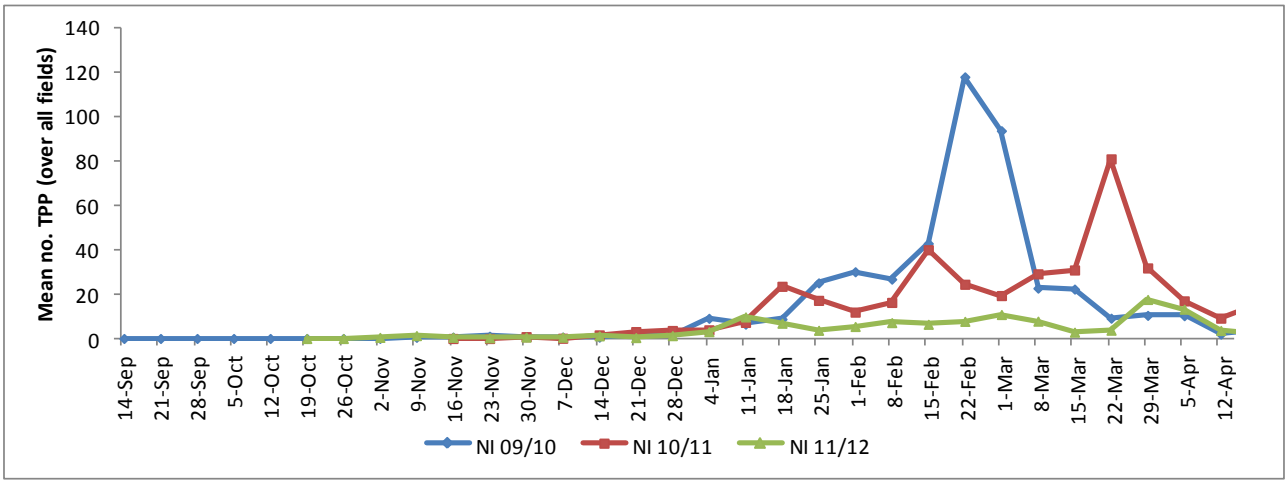

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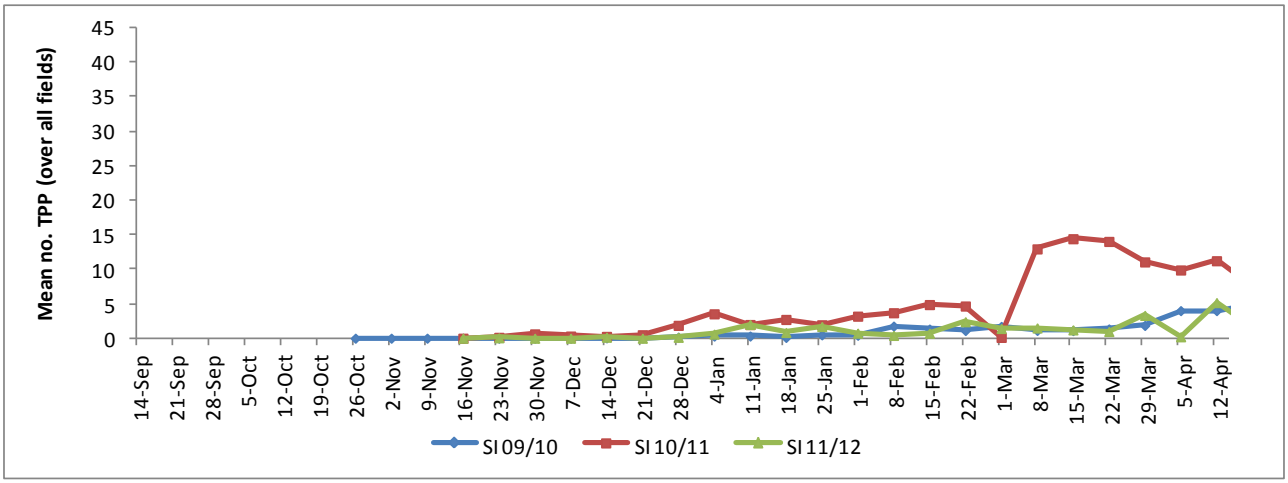

Figure 2. Mean number of adult tomato/potato psyllids trapped on yellow sticky traps averaged over all sites for each of the three monitoring seasons in the (A) North Island and (B) South Island.

6 Discussion and extension information

This work has provided insight into the population dynamics of TPP in New Zealand. It is now generally known when TPP may arrive in the crop in a specific area. This will aid growers in controlling TPP more sustainably; for example, by being able to omit the first insecticide sprays. Besides increasing profits, this will also decrease insecticide resistance development in TPP.

There were differences in psyllid numbers between the North and the South Islands, which can be explained by climate differences. However, zebra chip disease, caused by Lso, has been observed in South Island potatoes; thus control of the psyllid population is also necessary there. An important question that arises from this is how prevalent Lso is within the psyllid population that arrives in a crop. Plant & Food Research this year may obtain funding to research this.

Yellow sticky traps indicated the presence of psyllids 1-4 weeks earlier in the season than plant assessments did; this has also been shown by Cameron et al. (2009). This makes these traps a good monitoring option early in the season.

There was no correlation between the numbers of adults on the sticky traps and any of the psyllids' life stages on the plants. This can, however, be explained by the insecticide applications, which firstly disturb adult psyllids and subsequently lead to increased number of adults in sticky traps, and secondly cause mortality of part of the population. For future research, we suggest repeating these two monitoring techniques on unsprayed potato crops. However, the early-season monitoring data can also be used to look for correlations between weather parameters and first psyllid flight. If a correlation can be found, a region-specific weather-based supervised control system could be developed, which would omit the sometimes unreliable and always labour-intensive psyllid monitoring.

7 List of outputs:

- Presentation given at SFF meeting 28 February 2012
- Presentation will be given by Natasha Taylor at the Psyllid Conference 26 & 27 July 2012, Ellerslie Events Centre, Auckland

8 References

Berry NA, Jorgensen N, Taylor N 2011. Tomato Potato Psyllid trap and plant monitoring – SFF Support. A Plant & Food Research report prepared for Potatoes NZ. SPTS No. 6189. 20p.

Cameron PJ, Surrey MR, Wigley PJ, Anderson JAD, Hartnett DE, Wallace AR 2009. Seasonality of *Bactericera cockerelli* in potatoes (*Solanum tuberosum*) in South Auckland, New Zealand. New Zealand Journal of Crop and Horticultural Science 37: 295-301.