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Overwintering of tomato potato psyllid in Hawke's Bay 2010

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Contents

Executive summary

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In 2010 a study was carried out to improve our understanding of Tomato Potato Psyllid (TPP) overwintering, by weekly monitoring adult TPP on sticky traps at two sites in the Hawke's Bay region. Non-crop plant species found with TPP during preliminary surveys have been included in this report to provide further information on the population dynamics of TPP in the Hawke's Bay region. All TPP life stages were found on box thorn and poroporo plant samples, suggesting TPP use alternative host plants as overwintering reservoirs. No TPP were caught on sticky traps during the overwintering period. However, it is likely that the abundance of local overwintering sources enables short distance dispersal of TPP in the Hawke's Bay region. Therefore, the correct number, location and placement of sticky traps is essential for the optimal use of sticky traps to detect early season crop invasion.

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1 Background

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 impact of the TPP and associated pathogen *Candidatus* Liberibacter solanacearum has presented a considerable challenge to process tomato production in Hawke's Bay, New Zealand.

In New Zealand, numbers of TPP caught on sticky traps in 2008–09 and 2009–10 were highly variable between regions and monitoring sites (Berry & Jorgensen, unpubl. data). In the Hawke's Bay region in particular, TPP numbers were especially high at some tomato monitoring sites.

An understanding of the population dynamics and movement of TPP will help control strategies to reduce infestations of TPP and incidence of Liberibacter in tomato and potato crops. In New Zealand, sources of TPP invading newly sown tomato and potato crops are largely unknown. A study by Cameron et al. (2009) concluded that yellow sticky traps were more effective than plant samples as early indicators of TPP activity in cropping areas. Cameron et al. (2009) also showed that in October 2008 adult TPP in south Auckland were first captured on yellow sticky traps close to volunteer potatoes rather than other weed hosts in October. In the US, TPP populations are thought to migrate annually to northerly locations with wind and high temperatures (Wallis 1955). Also, TPP are reported to overwinter on *Lycium andersonii* (Anderson boxthorn/Anderson wolfberry) and *Lycium macrodon* (desert wolfberry) (Romney 1939), perennial shrubs of the family Solanaceae. In New Zealand, we have a related species of box thorn, *Lycium ferrocissium*.

The objective of the current study was to improve our understanding of TPP overwintering population dynamics by monitoring the incidence of adult TPP on sticky traps at two sites in the Hawke's Bay region from July to October 2010.

2 Method

TPP numbers were monitored weekly using yellow sticky traps in two sites ('Fraser' (Puketapu area) and 'Cox North' (Pakowhai area)) in the Hawke's Bay from early July 2010 until mid October 2010. 'Fraser' and 'Cox North' sites (previous season commercial tomato sites) were selected because each had had significant TPP population pressure in the 2009/10 growing season.

One double-sided yellow sticky trap (100 x 250 mm, Bug-Scan®, Biobest, Biological Systems) was placed in each quarter of the site (N, S, W and E location), 3–5 m in from the middle of each site edge. Each trap was secured to a metal stake at canopy height. Traps were replaced every 6–8 days and the collected traps stored in clear plastic A4 sleeves for ease of transport and subsequent psyllid identification. TPP adults were identified and counted using a 40x binocular microscope.

2.1 Additional study: Detection of TPP/ *Ca.* Liberibacter solanacearum on non-crop plants in New Zealand

(Funded within a Plant & Food Research Internal Capability Research Programme)

A component of the Plant & Food Research Internal Capability Programme 'TPP/Liberibacter/Phytoplasma Biology' included the detection of TPP/*Ca.* Liberibacter solanacearum on non-crop plants during the 2009–10 overwintering and growing seasons.

During 2009–10, plant specimens (weeds, bush and tree species) were collected from within crops and their adjacent boundaries in 12 field surveys in the North (7) and South (5) Islands of New Zealand. Plant specimens were identified and assessed for invertebrates.

Table 1 below presents the non-crop plant species found with TPP during preliminary surveys in the Hawke's Bay. These have been included in this report to provide further information on the population dynamics of TPP in the Hawke's Bay region.

3 Results and discussion

3.1 Sticky trap monitoring

During the monitoring period of 2 July – 21 October 2010 no TPP were caught on yellow sticky traps at the 'Cox North' and 'Fraser' sites.

In early October 2010, tomatoes were planted 2km North of the previous season's 'Cox North' (the 'Harris' site). One sticky trap was placed in that crop to monitor early season TPP activity. TPP adults were detected on the trap at that site in mid December 2010. Direct monitoring of field plants detected TPP eggs and nymphs 4 weeks earlier, in mid November 2010.

In mid October 2010, tomatoes were planted at a site 12 km west of the previous season's 'Fraser' (the 'Ohiti' site). Traps were placed in this crop to monitor early season TPP activity. TPP adults were detected at this site in early December 2010. Monitoring of field plants detected TPP eggs and nymphs 3 weeks earlier, in early November 2010.

A recent study by Cameron et al. (2009) suggested that yellow sticky traps were more sensitive than plant samples in the South Auckland area. They also postulated that the delayed infestations of later planted, widely separated crops were indicative of populations building up from a small number of dispersers rather than by mass migration. The failure to capture TPP adults on sticky traps in the current study may have been the result of a number of factors. There may have been insufficient sticky traps in key locations between previous season crops and newly planted crops, and/or the TPP adults may have dispersed to overwintering hosts prior to the trap monitoring period.

3.2 Detection of TPP/ *Ca.* Liberibacter solanacearum on non-crop plants in New Zealand

TPP was found on four Solanaceae species (box thorn, volunteer potato, black nightshade and poroporo) and one Phytolaccaceae species (inkweed) (Table 1). All TPP life stages were found on all box thorn (four samples/location/sampling date) and all poroporo (one sample/location/sampling date) samples.

Table 1: Life stages and location of TPP found on non-crop plants in the Hawke's Bay.

Plant	Date Collected	Location	Life Stage		
			Egg	Nymph	Adult
Box thorn (Lycium ferocissimum)	03/09/2010	Paki Paki road	Yes	Yes	Yes
Box thorn (Lycium ferocissimum)	03/09/2010	Stock road	Yes	Yes	Yes
Box thorn (Lycium ferocissimum)	24/09/2010	Cnr Omarunui and Korokipo roads	Yes	Yes	Yes
Volunteer Potato (Solanum tuberosum)	11/09/2010	Brookfields road	Yes	No	Yes
Black nightshade (Solanum nigrum)	02/09/2010	Margaret road	No	No	Yes
Poroporo (Solanum aviculare)	18/09/2010	Margaret road	Yes	Yes	Yes
Poroporo (Solanum aviculare)	10/09/2010	Matangi road	Yes	Yes	Yes
Inkweed (Phytolacca octandra)	28/09/2010	Brookfields road	Yes	No	Yes

TPP is capable of living year-round in certain locations in southern Texas and Mexico where temperatures are mild and alternative host plants are continuously available (Abdullah 2008).

In New Zealand, the Hawke's Bay region is ideally suited for year-round survival of all stages of TPP because of its mild winters and warm summers. The temperate climate of the Hawke's Bay region is also ideal for horticulture with large areas of orchards and vineyards on the plains. A number of solanaceous host plants are present in abundance for long periods during the year in the Hawke's Bay. The above table indicates that box thorn (a densely branched evergreen shrub often used as hedging) is an overwintering host for TPP, with all life stages commonly found. Box thorn hedging is found throughout the Hawke's Bay region. Poroporo (Solanaceae), a soft-wooded shrub native to New Zealand, was also found to support all life stages of TPP. Poroporo is common in lowland areas throughout the North Island of New Zealand and in coastal and inland areas of northern South Island (Roy et al. 1998). Martin (2008) suggested there were few weed hosts of TPP, and as annual plants they were unlikely to provide overwintering reservoirs. However, as mentioned our surveys during the winter months of 2010 found all life stages of TPP on perennial box thorn and poroporo indicating these species are likely overwintering hosts.

In summary the presence of all TPP life stages on box thorn and poroporo plant samples suggests TPP use alternative host plants as overwintering reservoirs. The abundance of local overwintering sources likely facilitates short distance dispersal of the TPP in the Hawke's Bay. However, there were no TPP caught on sticky traps in the current study. The correct number, location and timing of sticky trap placement is likely to be important for the optimal use of sticky traps to detect early season invasion into crops. Molecular screening of box thorn and poroporo DNA is currently underway to determine whether these plant species also have the potential to act as reservoirs for *Ca.* L. solanacearum. Such information will provide an insight into the role of immigrant TPP in the spread of *Ca.* L. solanacearum in potatoes and may have important implications for their management.

4 References

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