December 2015

Potato Update

Issue 7

Development of region-specific sustainable management programmes to lower zebra chip disease in process potatoes

Introduction

The incidence, importance and timing of pests varies markedly between potato growing regions in New Zealand. The aim of the three field trials in Pukekohe, Manawatu and Canterbury was to develop regionally focused pest management strategies, initially focussing on tomato potato psyllid (TPP) and zebra chip disease. This project focussed on developing sustainable, 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 affected by zebra chip disease and viruses (aphids).

Method

The research was undertaken on commercial farms in the three main potato growing regions. All crops were planted and maintained by the growers except for the insecticide treatments.

Location	Cultivar	Planted	Harvest
Mauku, Pukekohe	'Moonlight'	5 November 2014	21 April 2015
Cheltenham, Manawatu	'Nadine'	11 September 2014	26 February 2015
Southbridge, Canterbury	'Agria'	23 October 2014	16 April 2015

Five yellow sticky traps per crop were replaced and assessed weekly to keep count of TPP numbers. The trials were set-up with six replicates of six treatments. Insecticides were applied using a knapsack sprayer at 400L/ha and 420 kPa pressure. Each plot was six rows by 7 m.

The treatments were:

No.	Description
1	Standard: Weekly insecticides from emergence
2	Weekly insecticides from 980 degree days (DD) after 1 July
3	Weekly from 3TPP/trap/week
4a	Alternating with an agricultural oil the first 6 weeks from 980 DD after two sprays of Spirotetramat (Pukekohe only)
4b	Alternating with an agricultural oil from emergence after two sprays of Spirotetramat (Manawatu and Canterbury)
5	Mesh crop covers added before emergence, no insecticides
6	Untreated control, no insecticides

Key points

- The incidence, importance and timing of pests varies markedly between potato growing regions in New Zealand.
- Field trials were established in Pukekohe, Manawatu and Canterbury to develop regionally focused pest management strategies, initially focussing on tomato potato psyllid (TPP) and zebra chip disease.
- The accumulated degree days trigger used in treatment 2, has not worked in Canterbury for two years in a row. This is in contrast to trials in the North Island where these treatments work well. This season, a refined trigger will be tested in Canterbury.
- Zebra chip disease incidence can be highly variable in a crop. It is determined by TPP distribution in a field and how many psyllids carry the bacterium that causes the disease.
- Spray timings seem to be quite important to manage zebra chip disease.

Harvest was carried out for the middle two rows by 5 m of each plot and graded on a commercial grader into marketable (>100g), unmarketable (<100g) and reject (diseased/green/insect damage) tubers. Of a subset of marketable tubers, 1 slice (crisp) per tuber was taken and fried for 2 min at 190 °C. Thirty slices per plot were assessed for zebra chip disease on a scale from 0-9.

Results

Because of the very short season and low numbers of TPP, the Manawatu trial was not analysed.

Pukekohe

Psyllid numbers on the traps increased after 1 January. Shortly after that date, the spray for 980 DD (treatment 2 & 4a) was due as well as the spray for the threshold of 3 TPP/trap/week (treatment 3) (Figure 1). Except for mesh crop covers (treatment 5, 45.5 t/ha; 281,000 tubers/ha), marketable weights and numbers for all treatments were higher than for the unsprayed control (68 t/ha; 365.000 tubers/ha, Table 1). As expected, the insecticides used in the different programmes led to a yield increase, up to 16% in this trial.

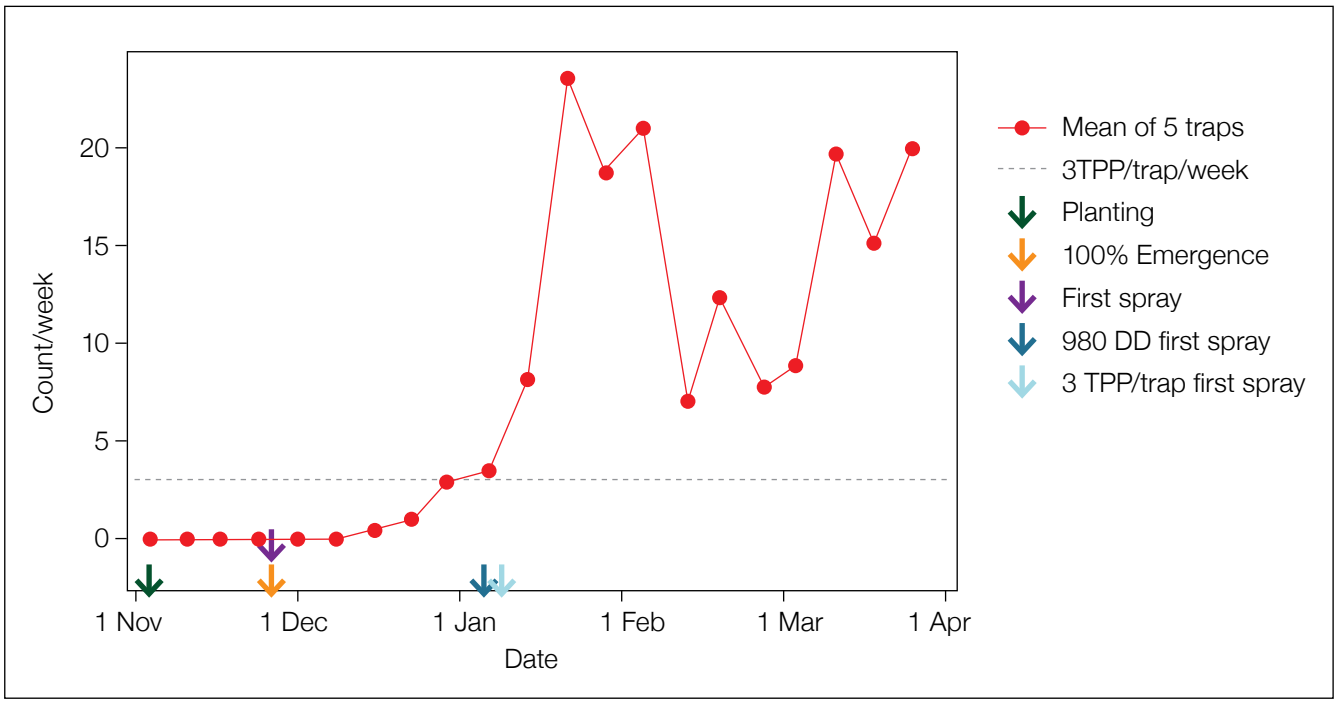

Figure 1. Mean number of TPP caught on yellow sticky traps in Pukekohe. There were 5 sticky traps in the crop.

Zebra chip disease incidence did not vary significantly between the treatments at harvest, although it was highest for the control. The percentage of tubers with zebra chip scores greater than 2 did not vary significantly between treatments. To calculate the profitability of a treatment, the insecticide costs per hectare (including application) were deducted from the marketable yield. In addition, the efficacy of each programme results in more or fewer tubers with zebra chip, which also needs to be accounted for in the profitability. Therefore the treatment with the highest marketable yield may not be the most profitable one. Although the relative profit for all treatments using insecticides was similar, treatment 4a resulted in the highest profit (Table 1).

Table 1. Mean number of TPP caught on yellow sticky traps in Pukekohe. There were 5 sticky traps in the crop.

Trt	Number of insecticide sprays	Number of marketable tubers (per 7.5m²)	Marketable yield (t/ha)	ZC adjusted marketable yield (t/ha)[1]	Relative profit adjusted for ZC[2]
1	16	277.3	76.7	73.9	100
2	11	280.3	79.4	73.7	100.2
3	10	278.3	76.6	74.5	101.4
4a	6 + 5 oils	289.8	77.4	76.2	104.0
5	0	211.8	45.5	45.0	60.8
6	0	274	68.4	67.7	93.7

[1] The weight of marketable tubers with zebra chip discolouration that is generally unacceptable for processors has been deducted from the original marketable weight.
[2] The cost of the insecticides and labour/ha for applying them was deducted from the marketable weight. Treatment 1, the full spray programme, is set at 100. For treatment 5 (mesh covers), a total of $1025/ha was used to cover the cost of the mesh and labour to apply it – this may however not be representing the real costs correctly.

Canterbury

Psyllid numbers on the traps increased after 1 January. Shortly after that date, the 3 TPP/trap/week spray (treatment 3) was due (Figure 2). However, the 980 DD treatment date (treatment 2) was not due until 22 January. Marketable weights and numbers did not vary significantly between the treatments (Table 2). As expected, the insecticides used in the different programmes led to a yield increase, up to 9% in this trial.

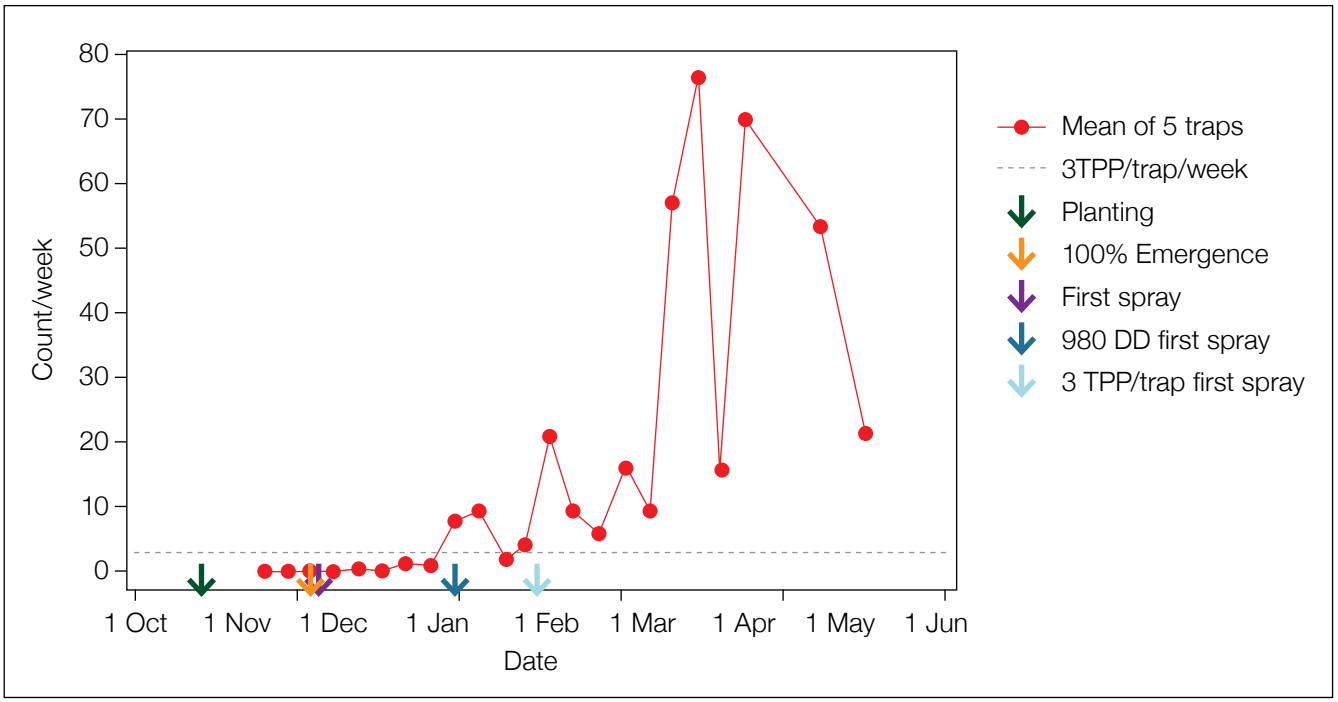

Figure 2. Average number of TPP caught on yellow sticky traps in Canterbury. There were 5 sticky traps in the crop.

Zebra chip disease incidence at harvest varied somewhat between the treatments, with incidence lower for all treatments than for the unsprayed control, and significantly so for treatment 3. The percentage of tubers with zebra chip scores greater than 2 did not vary significantly between treatments at harvest.

Table 2. Marketable yield (number of tubers and t/ha), the zebra chip (ZC) adjusted marketable yield and ZC adjusted relative profit for each of the treatments in the Canterbury trial.

Trt	Number of insecticide sprays	Number of marketable tubers (per 7.5m^2)	Marketable yield (t/ha)	ZC adjusted marketable yield (t/ha)[1]	Relative profit adjusted for ZC[2]
1	18	216.7	64.0	61.2	100
2	9	171.2	54.4	51.4	84.5
3	12	178.7	52.5	51.1	83.5
4b	11 + 7 oils	186.8	55.1	53.3	87.1
5	0	177.7	56.7	56.1	92.6
6	0	193.8	58.6	54.7	91.9

[1,2] For footnote explanations see Table 1.

Discussion

In Pukekohe, similar to the Sustainable Farming Fund field trial in 2013/14, treatment 4a was the most promising and profitable treatment of the reduced spray programmes.

In Canterbury, similar to the Sustainable Farming Fund field trial in 2013/14, treatment 4b was the most promising of the reduced spray programmes. For profitability, it was just slightly lower than mesh or no insecticide use. The accumulated DD trigger used in treatment 2 has not worked in Canterbury for two years in a row. This is in contrast to trials in the North Island where the DD treatments work well. This season, a refined trigger will be tested in Canterbury.

In general, zebra chip disease incidence can be highly variable in a crop; it is determined by TPP distribution in a field and how many of them carry the bacterium that causes the disease. The potato plant itself also adds variability: how it responds to the disease, when it was infected, and yield in general. Spray timings seem to be quite important to manage zebra chip disease. So keep an eye on the sticky traps and on TPP in your crop.

Acknowledgements

We thank Andy Bailey, Ian Corbett and Bruce and Wayne Carter for hosting the trial, Peracto for applying the insecticides and agricultural oil, Charles Merfield (Future Farming Centre) for supplying the mesh cover, Plant & Food Research for their project management and effort throughout the season and the FAR team for their collaboration.

PO Box 23133, Templeton, Christchurch 8445, New Zealand
Phone: +64 3 345 5783 • Fax: +64 3 341 7061 • Email: far@far.org.nz • www.far.org.nz