

**Ambitious 10SL Efficacy on Psa Disease on Hayward Kiwifruit
2014 - 2015**

Confidential Report Prepared For Gro-Chem Limited

**Prepared By: Lynda Hawes B.Hort.Sci.
Horticultural Consultant
HortEvaluation Ltd**

June 2015

1.0 Executive Summary

Gro-Chem engaged HortEvaluation Ltd to undertake field trial to evaluate efficacy of Ambitious 10SL™ (Ambitious) on Hayward kiwifruit in the Edgecumbe area of Bay of Plenty in 2014/15.

This trial followed two earlier field trials carried out in 2013/14, where Ambitious was applied to Hayward and observations as to growth and disease control effects were made. In those trials, no significant results were obtained, most likely as a consequence of uneven and relatively low natural distribution of Psa inoculum in the two commercial Hayward orchards where trials were located.

The two sites where trials were located had in the previous season, reported relatively high levels of disease symptoms. At the commencement of the trial, site one had inoculum present through spring 2014 as a result of cankers in male vines, producing bacterial ooze; and site two had been managed under a very low input cost programme the previous season, resulting in very high Psa disease levels.

There were six treatments at site one, with treatments two to four each being a single application of Ambitious, early after bud break (treatment two), near the middle of the period between bud break and flowering (treatment three), and towards the end of the period (treatment four). Treatment five comprised two applications of Ambitious, one applied early and one applied mid, at the same timings as treatments two and three. Treatment six comprised two applications of Ambitious, one applied mid and one applied late, at the same timings as treatments three and four.

There were three treatments at site two, at site two, with treatment two being two applications of Ambitious, one applied early and one applied mid between bud break and flowering at this site and treatment three being two applications of Ambitious, one applied mid and one applied late between bud break and flowering at this site.

At both sites, treatment one was the untreated control with no Ambitious application.

All applications were at 50ml Ambitious/100L, sprayed to achieve good coverage.

Treatments were replicated eight times and randomised, at each site. Growers applied their preferred Psa disease control spray programmes at both sites, except that Ambitious was not applied other than as trial treatments, and Actigard was not applied during the period in which trial applications were made.

Plots were single vines. On each vine, four typical canes were marked for assessment.

On each cane, the total number of leaves per cane and the number of leaves per cane with Psa leaf spot were counted. An assessment of the level of Psa leaf spot severity per cane was made using a 0-6 scale. The percentage of leaves per cane with Psa leaf spot was calculated.

On each cane, the total number of flower buds per cane and the number of flower buds per cane with Psa leaf spot were counted. An assessment of the level of Psa flower bud rot severity per cane was made using a 0-4 scale. The percentage of flower buds per cane with flower bud rot was calculated. Weighted average flower bud rot per cane was calculated.

On each cane, number of fruit set was counted. At site one, each cane was hand thinned to remove all evident reject fruit. This represented a higher level of thinning than would typically be achieved by commercial thinners. All thinned fruit was assessed for cause of reject and

counted in the following categories: flat/fan shape, square shape, drop shoulder, small (undersize) and Hayward mark. The cause of reject fruit was calculated as a percentage of the total number of reject fruit.

At site two, a similar approach was taken, except that the whole vine (plot) was thinned and the thinned fruit assessed.

At both sites, the final number of fruit per cane just prior to harvest was counted and the pre-harvest fruit as a percentage of flowers, was calculated.

Prior to harvest, thirty fruit per plot were collected from each plot, and individually tested for fresh weight, Brix, dry matter, firmness and Taste Zespri Grade calculation.

Key leaf assessment findings were

- **At site one**, treatment three had significantly more flower buds (33.4 per cane) than the control (28.7 per cane)
- Treatments three, five and six had a significantly lower spot area score (1.2-1.7 per cane) than the control (3.3 per cane)
- Treatments three, five and six also had significantly less percentage spotted leaves (24.6-39.4%) than the control (60.5%)
- **At site two**, treatments two and three had a significantly lower spot area score (1.9-2.2 per cane) than the control (3.1 per cane)
- Treatments two and three also had significantly less percentage spotted leaves (33.0-37.2%) than the control (49.5%)
- **At both sites**, the factor in common, associated with a significant effect on reducing Psa leaf spot, in both severity score and proportion of leaves affected, was the application of Ambitious mid-season

Key reject assessment findings were

- **At site one**, for the reject fruit only, treatment three (one application mid) had significantly higher flat/fan reject percentage (40.1%) than the control (24.2%)
- **At both sites**, there were no significant differences between treatments for the final fruit number pre harvest as a percentage of flower buds originally counted

Key fruit maturity findings were

- **At site one**, treatment five (application early and mid between bud break and flowering) had significantly higher average fruit weight (119.8g/fruit) than the control and all other treatments (108.6-112g/fruit).
- **At both sites**, there were no other significant differences between treatments

Use of Ambitious during the period between bud break and flowering represents an important alternative tool to control Psa leaf spot disease.

These results indicate that a single application about mid-way between bud break and flowering provides a further opportunity for growers to enhance control of the leaf symptoms of the disease.

2.0 Introduction

Growers have been able to use Ambitious, (10g/L forchlorfenuron or CPPU active ingredient) on cropping kiwifruit vines for Psa disease control as permitted by the Zespri Crop Protection Standard since 2014/14.

Ambitious has an ACVM limited label claim.

The Kiwifruit Vine Health updated CPPU User Guide 1 October 2014 states that

- CPPU is allowed but not recommended to be used on varieties other than Hayward
- Up to two applications of CPPU are recommended in the permitted use period between bud break and one week before female flowering
- Application is recommended at the label rate, not higher than the label rate

The Zespri 2014/15 Crop Protection Standard (CPS) permits Ambitious use as follows

- Use rate of 50-75ml/100L
- Not to be used on Gold varieties

Ambitious has shown efficacy in potted plant studies, but has shown variable control on Psa-leaf spot and no or low efficacy on bud rot in field trials to date.

Forchlorfenuron is not systemic and is reliant on good coverage of tissue to achieve effects on target canopies. Trial and commercial orchard use of forchlorfenuron in the last two seasons has resulted in a range of observed Psa disease control and other effects.

Forchlorfenuron mode of action is not well understood, but it is clear that application in the period between bud break and flowering results in physical changes to the vegetative canopy.

Such changes have been readily observed and documented. Many growers have reported improved Psa control as a result of inclusion of forchlorfenuron in their spring spray programmes, but these effects have not been readily demonstrated by robust trial work to date.

3.0 Objectives

The objective of the trial was to evaluate field efficacy of Ambitious on Psa disease control on Hayward kiwifruit.

4.0 Materials and Methods

The trial was located at two sites in the Edgecumbe area of the Bay of Plenty region of New Zealand. Edgecumbe generally has less well drained soils and can experience cooler conditions than some other parts of the Bay of Plenty, increasing the risk of Psa infection.

The trial blocks selected had historic high Psa infection levels in 2013/14.

Site one, located on Orchard Road, Edgecumbe, is in an area where growers have struggled to obtain good control of Psa. The block selected had inoculum present through spring 2014 as a result of cankers in male vines, producing bacterial ooze.



Figure 1: Chieftain male bacterial canker at trial site 1, 8 October 2014

Site two, located adjacent to Whakatane River at Te Teko, was an orchard which had been managed under a very low input cost programme the previous season, resulting in very high Psa disease levels.

Refer Appendix 1: Site Locations

Table 1: Property Details

Location	Tanark Orchard KPIN 3086 50 Orchard Road, Edgecumbe Part Block 7	Wai Pounamu Martin Orchard KPIN 4314 1793 State Highway 30, Whakatane, Part Block 5
Manager	Whatu Brown EastPack Kiwifruit Operations	Paul Manson Seeka Kiwifruit Industries Ltd
Trial Manager	Lynda Hawes Email lynda.hawes@xtra.co.nz	Lynda Hawes Email lynda.hawes@xtra.co.nz
Post-Harvest Provider	EastPack Ltd	Seeka Kiwifruit Industries Ltd
Plants	Mature Hayward orchard, full canopy strip male, pergola canopy	10 year Hayward orchard, full canopy strip male, pergola canopy
Spacing	Bays 6.0m, Rows 3.6m, Single Planted	Bays 5.0m, Rows 3.5m Double Planted
Plot Size	2 bays = 43.2m ²	2 half bays = 17.5 m ²
Replication	8	8
Water Rate	Dilute, spray to wet, expanding canopy cover	
Application	Treatments as below	
Sprayer	Solo Pressure Knapsack Sprayer, Model 433, Nozzle setting 3	

At each site, layout was randomised block with eight replications for each treatment. Each plot was marked with tags showing a top and bottom number. The top number was the plot number and the bottom number was the treatment number.

Refer Appendix 2: Trial Layout

The grower programme was applied in addition to the treatments, at each orchard. At both sites, neither CPPU products nor Actigard were applied during the trial application period.

Refer Appendix 3: Grower Spray Programmes

At site one, there were six treatments. Treatments two to four comprised a single application of Ambitious, early after bud break (treatment two), near the midpoint between bud break and flowering (treatment three), and towards the end of the period (treatment four). Treatment five comprised two applications of Ambitious, one applied early and one applied mid, at the same

timings as treatments two and three. Treatment six comprised two applications of Ambitious, one applied mid and one applied late, at the same timings as treatments three and four.

At site two, there were three treatments. Treatment two comprised two applications of Ambitious, one applied early and one applied near the midpoint between bud break and flowering at this site. Treatment three comprised two applications of Ambitious, one applied mid and one applied late between bud break and flowering at this site.

At both sites, treatment one was the untreated control (no Ambitious application).

At both sites, application was made at 50ml Ambitious/100L, sprayed to achieve good coverage and at an increasing spray volume as canopy cover developed.

Table 2: Application Dates

	ISO week 2014	36	37	38	39	40	41	42	43	44	45	46
	Date	1-7 Sept	8-14 Sept	15-21 Sept	22 - 28 Sept	29 Sept -5 Oct	6-12 Oct	13-19 Oct	20 - 26 Oct	27 Oct - 2 Nov	3 - 9 Nov	10-16 Nov
Site 1	Treatments				budbreak		T2, T5		T3, T5, T6		T4, T6	flowering start
	Date						8/10/2014		24/10/2014		5/11/2014	
Site 2	Treatments			budbreak			T2		T2, T3		T3	flowering start
	Date						8/10/2014		20/10/2014		1/11/2014	

All applications were made with a Solo 433 motorized knapsack sprayer, resulting in spray coverage similar to that achieved by an orchard airblast sprayer.

Application details were recorded as below.

Table 3: Application Details

Date	8/10/2014, Site 1	8/10/2014, Site 2	20/10/2014 , Site 2	24/10/2014, Site 1	1/11/2014, Site 2	5/11/2014, Site 1
Time	10.00am - 12.10pm	1.30 - 2.30pm	10.10 - 11.10am	9.50am - 12.10pm	9.30am - 10.15am	10.30 - 11.30am
Temperature (°C)	16	19	19	19	19	17
Humidity (%)	64%	65%	64	56	52	71
Rain (mm)	0	0	0	0	0	0
Coverage	Spray to wet					

Weather data source: KVH Weather Station, Edgecumbe

6.0 Assessments

6.1 Site One

Four typical canes were tagged on each vine (plot).

On each cane, Psa leaf spot was assessed once, pre flower.

- Number of leaves per cane were counted
- Number of leaves with Psa leaf spot per cane were counted, to enable calculation percentage of leaves with spot
- Leaf spot severity on each cane was assessed by categorising between 0=no spot and 5= covered in spot/leaf failing.

Refer Appendix 4: Leaf Spot Scoring System

On each cane, flower buds were assessed for Psa symptoms once pre flower

- Number of flower buds per cane were counted
- Number of flower buds showing Psa symptoms were counted

- Flower bud rot severity on each flower bud was assessed by categorising each flower bud between 0=no necrosis and 4= covered in necrosis
- Percentage of flowers affected by bud rot was calculated
- Weighted average flower bud rot per cane was calculated

On each cane, fruit set was determined at early fruit set

- Number of fruit set were counted
- Number of failed flowers that were still attached, were counted
- Failed flower buds as percentage of total flower buds was calculated
- Percentage fruit set was calculated

On each cane, reject rate was assessed in the third week of December 2014

- Reject fruit was removed, counted and assessed for reject cause
- Percentage reject by cause was calculated

Pre harvest final fruit number was assessed, shortly before harvest after final crop grooming had been completed

- Number of fruit per cane was counted
- Number of fruit at harvest as a percentage of flowers was calculated

Harvest fruit quality was assessed

- 30 fruit were collected per plot, for all plots
- Each fruit in each plot was assessed for Brix, Dry Matter, Taste Zespri Grade calculation, Fresh Weight and firmness

Site Two

The same assessments and calculations were carried out at site two except

- The number of failed flowers that were still attached were not counted
- Reject rate assessment was done by removing all reject fruit from each vine, counting and analysing for cause of reject

7.0 Data Analysis and Results

Analysis of variance was carried out on raw data. No data transformation was required for the analyses.

7.1 Psa Assessment

Site 1	Flower Buds	Score area spot	No. of leaves	Spotted leaves%	Flower severity weighted average	Affected flowers%
residual df	35	35	35	35	35	35
Control (Trt 1)	28.7 bc	3.3 a	51.5 a	60.5 a	0.61 a	36.1 a
Early (Trt 2)	28.6 bc	2.8 a	55.6 a	56.4 a	0.44 a	26.6 a
Mid (Trt 3)	33.4 a	1.7 b	48.7 a	36.2 b	0.51 a	31.1 a
Late (Trt 4)	30.8 ab	3.2 a	56.3 a	59.7 a	0.57 a	34.6 a
Early + Mid (Trt 5)	25.8 c	1.2 b	54.5 a	24.6 c	0.40 a	24.5 a
Mid + Late (Trt 6)	31.5 ab	1.6 b	48.2 a	39.4 b	0.42 a	28.7 a
Trt s.e.d	2.22	0.34	4.05	5.36	0.092	4.50
LSD 5%	4.50	0.68	8.22	10.88	0.186	9.14

Trt P-value	0.027	<.001	0.216	<.001	0.140	0.100
Trt Significance	*	***	NS	***	NS	NS
Trt 1 sem	1.73	0.23	3.24	5.38	0.086	4.01
Trt 2 sem	1.92	0.33	2.67	5.00	0.077	4.33
Trt 3 sem	2.11	0.31	2.29	5.47	0.102	5.25
Trt 4 sem	2.16	0.17	3.91	3.65	0.064	3.38
Trt 5 sem	1.85	0.14	3.68	3.06	0.103	4.04
Trt 6 sem	1.28	0.20	1.33	3.99	0.074	4.37

For site one, treatment three had significantly more flower buds (33.4 per cane) than the control (28.7 per cane).

Treatments three, five and six had a significantly lower spot area score (1.2-1.7 per cane) than the control (3.3 per cane).

Treatments three, five and six also had significantly less percentage spotted leaves (24.6-39.4%) than the control (60.5%).

There were no significant differences between treatments for the other variables.

Site 2	Flower Buds	Score area spot	No. of leaves	Spotted leaves%	Flower severity weighted average	Affected flowers%
residual df	14	14	14	14	14	14
Control (Trt 1)	35.7 a	3.1 a	65.3 a	49.5 a	0.40 a	27.8 a
Early + Mid (Trt 2)	31.4 a	1.9 b	54.2 a	33.0 b	0.36 a	25.3 a
Mid + Late (Trt 3)	37.5 a	2.2 b	57.5 a	37.2 b	0.32 a	22.6 a
Trt s.e.d	4.41	0.27	6.24	4.55	0.066	4.41
LSD 5%	9.46	0.57	13.38	9.76	0.14	9.46
Trt P-value	0.387	0.001	0.223	0.007	0.502	0.387
Trt Significance	NS	***	NS	**	NS	NS
Trt 1 sem	4.92	0.25	6.69	2.15	0.038	2.24
Trt 2 sem	2.60	0.23	2.60	4.35	0.057	3.71
Trt 3 sem	2.37	0.23	3.58	3.78	0.060	2.61

For site two, treatments two and three had a significantly lower spot area score (1.9-2.2 per cane) than the control (3.1 per cane).

Treatments two and three also had significantly less percentage spotted leaves (33.0-37.2%) than the control (49.5%).

There were no other significant differences between treatments.



Figure 2: Site One and Site Two Leaf Spot Scores and Spotted Leaves Percentages

7.2 Fruit Thinning

Site 1	Reject Assessment Data at Thinning (percentage)					No. Fruit Pre Harvest as % of Flowers
	Flat/Fan	Drop Shoulder	Square	Small	Hayward Mark	
residual df	35	35	35	35	35	35
Control (Trt 1)	24.2 bc	5.8 a	5.9 a	44.0 a	18.2 a	46.2 a
Early (Trt 2)	23.3 c	8.1 a	18.0 a	37.2 a	13.4 a	55.9 a
Mid (Trt 3)	40.1 a	3.1 a	7.6 a	42.0 a	6.0 a	44.8 a
Late (Trt 4)	24.3 bc	5.6 a	4.7 a	43.7 a	17.8 a	48.4 a
Early + Mid (Trt 5)	27.0 abc	1.1 a	5.7 a	49.2 a	14.4 a	60.1 a
Mid + Late (Trt 6)	37.3ab	4.1 a	8.7 a	36.6 a	9.9 a	49.8 a
Trt s.e.d	6.60	2.96	8.05	8.87	5.38	5.58
LSD 5%	13.40	6.00	16.34	18.01	10.92	11.33
Trt P-value	0.048	0.269	0.599	0.726	0.205	0.070
Trt Significance	*	NS	NS	NS	NS	NS
Trt 1 sem	5.27	1.80	2.08	6.84	3.34	5.13
Trt 2 sem	8.40	3.53	12.00	8.91	6.21	5.61
Trt 3 sem	2.67	1.66	4.06	6.43	2.58	4.81
Trt 4 sem	4.64	1.86	2.47	5.43	5.76	3.58
Trt 5 sem	4.72	1.14	3.97	8.64	4.87	4.93
Trt 6 sem	2.86	1.70	3.53	3.75	3.47	3.16

For site one, treatment three had significantly higher flat/fan reject percentage (40.1%) than the control (24.2%).

There were no significant differences between treatments for the other variables including the final fruit number pre harvest as a percentage of flower buds originally counted.

Site 2	Reject Assessment Data at Thinning (percentage)					No. Fruit Pre Harvest as % of Flowers
	Flat/Fan	Drop Shoulder	Square	Small	Hayward Mark	
residual df	14	14	14	14	14	14
Control (Trt 1)	24.0 a	9.0 a	19.8 a	42.1 a	4.3 ab	52.4 a
Early + Mid (Trt 2)	21.3 a	9.4 a	19.2 a	41.0 a	5.5 a	52.2 a
Mid + Late (Trt 3)	18.1 a	9.2 a	21.6 a	47.1 a	2.0 b	55.0 a
Trt s.e.d	4.99	2.43	5.31	3.17	1.28	4.28
LSD 5%	10.70	5.22	11.39	6.80	2.75	9.18
Trt P-value	0.506	0.990	0.891	0.165	0.047	0.771
Trt Significance	NS	NS	NS	NS	*	NS
Trt 1 sem	4.43	2.41	4.59	1.88	0.89	2.60
Trt 2 sem	2.37	1.83	2.37	3.58	0.79	4.20
Trt 3 sem	2.17	1.88	3.93	3.95	0.74	4.07

For site two, treatment three had significantly lower Hayward mark reject percentage (2.0%) than the treatment two (5.5%).

There were no significant differences between treatments for the other variables.

7.3 Fruit Maturity

Site 1	Average Weight (g)	Average °Brix	Average Dry Matter %	Average DM %Variability	TZG	Average Pressure (kgf)
residual df	35	35	34	34	35	35
Control (Trt 1)	109.7 b	6.61	15.7	0.81	0.28	8.3
Early (Trt 2)	109.7 b	6.59	15.4	0.95	0.24	8.3
Mid (Trt 3)	111.2 b	6.55	15.6	0.74	0.28	8.3
Late (Trt 4)	108.6 b	6.45	15.5	1.00	0.26	8.4
Early + Mid (Trt 5)	119.8 a	6.53	16.1	0.81	0.29	8.4
Mid + Late (Trt 6)	112.0 b	6.45	15.6	0.93	0.28	8.4
Trt s.e.d	2.87	0.114	0.42	0.167	0.071	0.11
LSD 5%	5.83	0.232	0.86	0.338	0.144	0.23
Trt P-value	0.005	0.618	0.688	0.591	0.989	0.834
Trt Significance	**	NS	NS	NS	NS	NS
Trt 1 sem	2.50	2.60	3.10	2.80	2.30	2.60
Trt 2 sem	0.091	0.121	0.120	0.114	0.119	0.102
Trt 3 sem	0.27	0.42	0.32	0.45	0.32	0.20
Trt 4 sem	0.069	0.189	0.059	0.196	0.099	0.127
Trt 5 sem	0.053	0.070	0.047	0.062	0.063	0.030

Trt 6 sem	0.11	0.12	0.16	0.12	0.12	0.11
-----------	------	------	------	------	------	------

For site one, treatment five had significantly higher average fruit weight (119.8g/fruit) than the control and all other treatments (108.6-112g/fruit).

There were no significant differences between treatments for the other variables.

Site 2	Average Weight (g)	Average °Brix	Average Dry Matter %	Average DM %Variability	TZG	Average Pressure (kgf)
residual df	14	14	14		14	14
Control (Trt 1)	97.7	4.44	14.5	n/a	0.13	8.9
Early + Mid (Trt 2)	102.2	4.44	14.0	n/a	0.07	8.7
Mid + Late (Trt 3)	95.5	4.40	14.7	n/a	0.14	8.8
Trt s.e.d	3.17	0.054	0.61		0.052	0.18
LSD 5%	6.80	0.117	1.30		0.111	0.39
Trt P-value	0.136	0.734	0.501		0.390	0.562
Trt Significance	NS	NS	NS		NS	NS
Trt 1 sem	1.91	0.038	0.54		0.040	0.11
Trt 2 sem	2.47	0.042	0.47		0.037	0.14
Trt 3 sem	1.90	0.033	0.31		0.045	0.14

There were no significant differences between treatments for any of these variables.

8.0 Discussion

At both sites, the factor in common, associated with a significant effect on reducing Psa leaf spot, in both severity score and proportion of leaves affected, was the application of Ambitious mid-season.

While this effect on Psa leaf spot was difficult to document by photography, observed canopy condition at leaf spot assessment time in November 2014, was very different between untreated control plots which received the grower standard programme and plots which had received early/mid, mid or mid/late application of Ambitious, between bud break and flowering.

At both sites, plots for treatments three, five and six at site one and treatments two and three at site two, had large areas of green, healthy canopy. Psa leaf spot was observed at lesser levels on these treatments than on other treatments.

At both sites, the grower programme only standard treated plots had much less green, healthy canopy, with Psa leaf spot being much more evident.

The presence of significantly more flower buds per cane on treatment three, Ambitious applied once mid-season, may or may not be a real treatment effect. Flower buds only were counted. No note was taken of vacant flower bud stalks at that time.

The significantly higher percentage of reject fruit caused by flat or fan fruit shape at site one, is set in context, by the fact that there was no significant difference in the overall number of fruit as a percentage of flower buds originally counted. i.e. in considering causes of reject, flat or fan shape was a higher contributor to reject cause, but the level of reject fruit as a percentage of the original number of flowers, was not significantly different across all treatments.

For site two, the significantly lower percentage of reject fruit caused by Hayward mark for treatment two (Ambitious early and mid) compared with treatment three (Ambitious mid and late), may or may not be a real treatment effect. Again, the level of reject fruit as a percentage of the original number of flowers, was not significantly different across all treatments.

Fruit maturity characteristics were not altered by any of the Ambitious treatments, compared with the grower programme, except at site one. At site one, fruit treated with Ambitious early and mid between bud break and flowering was 10.1g heavier (119.8g/fruit) than untreated fruit (109.7g/fruit). At the same site, fruit treated with Ambitious mid (111.2g/fruit) or mid and late (112.0g/fruit) was slightly heavier, but these results were not statistically significant.

The above effects were obtained using Ambitious at 50ml/100L.

Use of Ambitious during the period between bud break and flowering represents an important alternative tool to control Psa leaf spot disease.

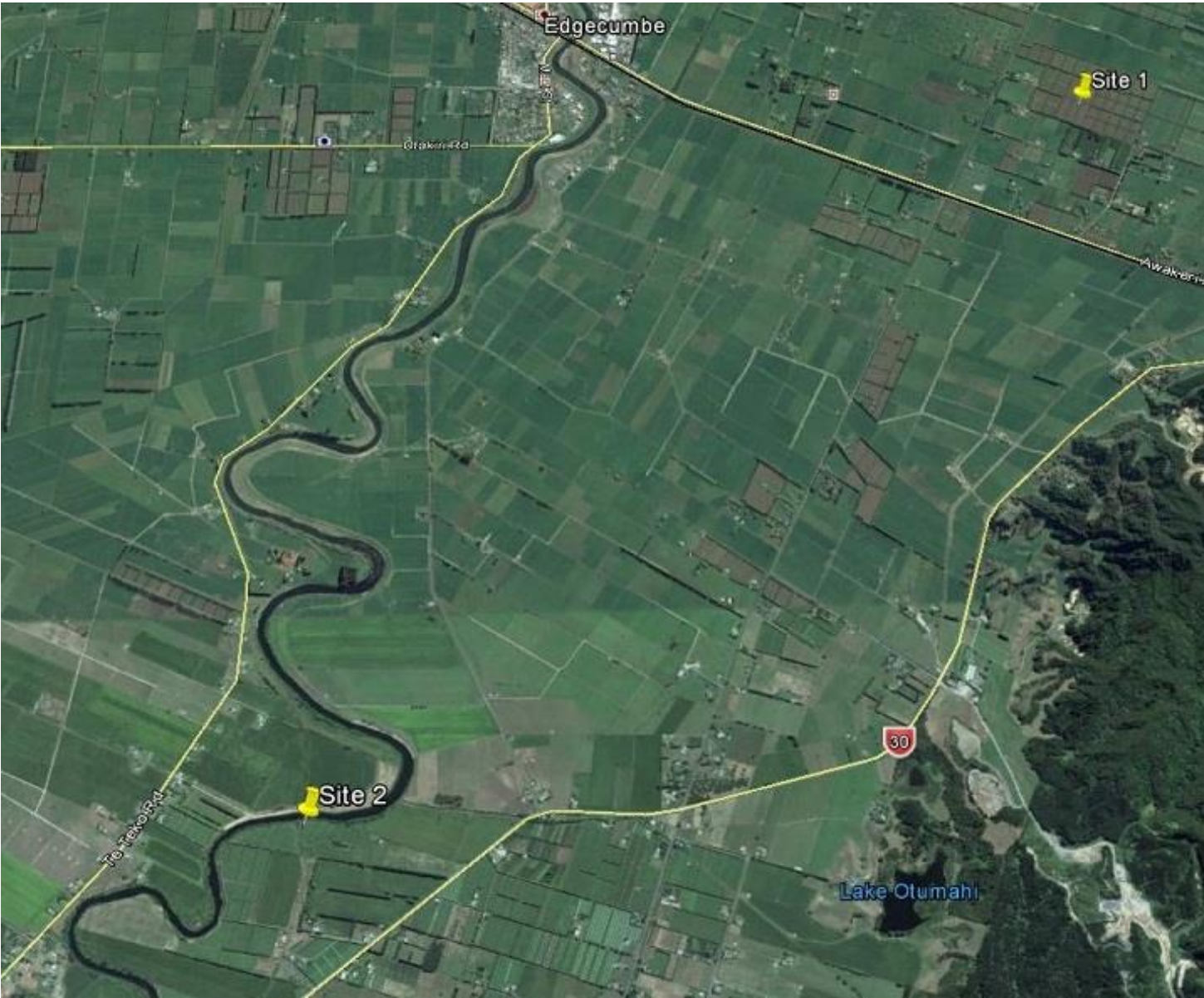
These results indicate that a single application about mid-way between bud break and flowering provides a further opportunity for growers to enhance control of the leaf symptoms of Psa disease.

9.0 Acknowledgements

HortEvaluation Ltd would like to thank

- Whatu Brown and Jacki McCormick, EastPack, for site one management
- Paul Manson and Bryan Grafas, Seeka for site two management
- Iain Latter, GroChem for trial design
- Catherine Cameron, AgResearch Ltd, for statistical analysis

Appendix 1: Site Locations



Appendix 2: Trial Layout

Site 1

Block 5 Layout. NB bays do not align from row 2 to row 4 as illustrated, because non-trial vines marked by X take up less than one bay each

X				
30,4				
29,2				
X				
28,1				
X				
27,6				
X				
26,3				
25,5				
24,1				
X				
23,5				
X	48,3			
22,3	47,2			
X	X			
21,6	46,4			
X	45,5			
20,2	X			
19,4	44,6			
18,6	X			
X	43,1			
17,1	X			
16,2	42,3			
15,4	X			
14,5	41,5			
X	X			
13,3	40,2			
X	39,1			
12,6	X			
11,5	38,6			
10,4	X			
9,2	37,4			
8,1	X			
X	36,3			
7,3	X			
6,1	35,6			
5,2	X			
4,5	34,4			
X	X			
3,4	33,5			
X	X			
2,3	32,1			
1,6	31,2			
M	F	M	F	M
1	2	3	4	5

6-14 Gold 3 young grafts

Row

alder shelter

frost fan

bays between rows 1-6 are marked with caution tape at both ends

Site 2

Block 7 Layout.

X								
X								
O								
X								
X								
X	O							
X	O							
X	O							
X	O							
X	X							
X	X	O						
X	X	X	O					
X	17,1	O						
X	X	X	O					
X	16,2	X						
X	X	8,2						
X	15,1	X						
X	X	7,1						
O	14,2	X						
X	X	6,2						
24,1	13,3	X	X					
X	X	X	X					
23,3	12,2	5,1	O					
X	X	X	O					
22,2	11,3	4,3	X					
X	X	X	O					
21,1	10,1	3,1	O					
X	X	X						
O	X	2,3						
20,2	9,3	X						
X	X	1,2						
19,3	O							
X								
O								
O								
M	F	M	F	M	F	M	F	
1-12	13	14	15	16	17	18	19	

Row

O New Female Graft

X Not used for Trial

Cryptomeria japonica shelter

bays between rows 12-19 are marked with yellow caution tape at both ends

Whakatane River

Open Drain

Culvert

Appendix 3: Grower Spray Programmes

Site One






24/9/2014	Kevin Shanks	Atom Sprayer	2562	Rural Supply1	1: 2: 3: 4: 5: 6	Du-Wett 40ml (Adjuvant conventional - all season) for Adjuvant/Additive/Surfactant. Nordox 75 WG 37.5g (Copper compounds organic) for Psa Management
24/9/2014	Kevin Shanks	Atom Sprayer	264	Rural Supply1	5A	Du-Wett 40ml (Adjuvant conventional - all season) for Adjuvant/Additive/Surfactant. KeyStrepto 60g (Streptomycin) for Psa Management. Nordox 75 WG 37.5g (Copper compounds organic) for Psa Management
07/10/2014	Kevin Shanks	Atom Sprayer	3297	Rural Supply1	1: 2: 3: 4: 5: 6: 5A	Du-Wett 40ml (Adjuvant conventional - all season) for Adjuvant/Additive/Surfactant. KeyStrepto 60g (Streptomycin) for Psa Management. Kocide Opti 50g (Copper compounds conventional) for Psa Management
16/10/2014	Kevin Shanks	Atom Sprayer	3768	Rural Supply1	1: 2: 3: 4: 5: 6: 5A	Du-Wett 25ml (Adjuvant conventional - all season) for Adjuvant/Additive/Surfactant. KeyStrepto 60g (Streptomycin) for Psa Management. Kocide Opti 50g (Copper compounds conventional) for Psa Management

Site Two

3/09/2014	10, 11, 12, 13, 2, 3, 4, 5, 6, 7, 8, 9,1	GA,HW	CK	Du-Wett Nordox 75 WG	35 70	280 560
29/09/2014	10, 11, 12, 13, 2, 3, 4, 5, 6, 7, 8, 9,1	GA,HW	CK	Actigard Du-Wett Kocide Opti	20 25 50	140 175 350
21/10/2014	3,2	GA	CK	Movento 100 SC Prodigy	96 40	960 400
1/11/2014	10, 11, 12, 13, 4, 5, 6, 7, 8, 9,1	HW	CK	Actigard Du-Wett Kocide Opti	20 40 70	200 400 700

Actigard was not applied on trial vines, including a buffer zone of two additional rows, at site two.

Appendix 4: Leaf Spot Scoring System

0: 0 leaf spots		
1: <5 small spots		
2: <25% leaf area covered in spots		
3: >25% but <50% leaf area covered in spots		
4: >50% but <75% leaf area covered in spots		
5: >75% leaf area covered in spots, necrosis	