

The efficacy of Ambitious on mature Hayward vines for controlling *Pseudomonas syringae actinidiae* (Psa)

A report for Grochem:

14th July, 2015

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1.0 Trial information

1.1 General details

Trial code	FSEXP21415-16
Trial title	The efficacy of Ambitious on mature Hayward vines for controlling <i>Pseudomonas syringae actinidiae</i> (Psa)
Location	Pukehina
Crop	Kiwifruit vine (<i>Actinidia deliciosa</i> cv. Hayward)
Trial design	Randomised complete block design
No. of replications	6
Plot size	1 female vine (strip male configuration)
Equipment	Solo motorised knapsack sprayer
Pressure	15 bar
Nozzle	Hollow cone
Water rate	Approx. 800-1200L/ha equivalent for dilute applications

1.2 Treatment details

#	Product	Rate/100L	5/10	25/10
1	Untreated control	-		
2	Actigard	200g/ha	✓	✓
3	Ambitious	75ml	✓	✓

2.0 Methodology

2.1 Spray methodology

Actigard and Ambitious were applied at 3-weekly intervals, with the first application timed for the emergence of the first leaves.

2.2 Assessment methodology

Prior to disease expression 20 shoots were tagged within each plot (10 each side of the leader) for the purposes of later assessment. Shoots that were chosen were floral, generally non-terminating (where possible), of a similar age, and of average vigour (very high or very low vigour shoots were avoided).

The incidence and severity of Psa infection was recorded across two days on the 14th and 15th November 2014. The surface of the first 5 leaves on each tagged shoot were assessed for characteristic dark brown to black irregular spotting. A severity score of 0 to 5 was used, where 0 indicated 0% leaf area covered in spots, and 5 indicated 75% or more leaf area covered in spots. A severity scoring sheet can be found in appendix 5.6. From these scores, the severity value was calculated using the method of Townsend and Heuburger (1943), described in Kremer & Unterstenhofer (1967), whereby;

$$P = \frac{\text{sum of } (n \times v)}{Z \times N} \times 100$$

where;

P=percentage of infection

n=number of leaves in each category

v=numerical values of categories

Z=numerical value of highest category

N=total number of plant parts

Using the same tagged shoots as above, the severity of bud rot (browning) and eventual bud loss (dropping off) was also determined pre- and post-flower, respectively. From the 4th to the 5th November 2014, the severity of “browning” was calculated by scoring flower buds on a scale of 0 to 4 (see appendix 5.5). The severity value was calculated using the equation above.

Once flowering was completed and set fruit had become obvious, final bud loss was assessed by counting the number of fruit on each tagged shoot. Percentage loss of flower buds could then be calculated comparing initial flower numbers to final fruit numbers.

Symptoms of phytotoxicity were also noted if observed.

2.3 Data analysis

There were a total of 16 treatments in this trial. Data means were entered into ARM 9 Statistical Software and subjected to Bartlett's test for homogeneity of variance, followed by a suitable transformation if required (as stated in the text where appropriate). A one way ANOVA was then carried out, followed by the Duncan's New MRT test. Raw data has been presented in Appendix 5.6.

2.4 Additional data

Wind, rainfall, temperature, humidity and drying condition observations were made subjectively at the time of application (Appendix 5.2, 5.3).

3.0 Results and discussion

3.1 Severity of leaf spotting

A small amount of spotting became evident on the 25th October, but significant levels didn't appear until the 11th November, suggesting an infection event towards the end of October.

Ambitious was as effective as Actigard for reducing the severity of leaf spotting. Both treatments were significantly better compared to the untreated control.

Table 2: Severity of leaf spotting

	Product (Rate/100L)	# of applications (starting)	14-Nov*
1	Untreated control	-	32.33 (1.52) ^a
2	Actigard (200g/ha)	2(5/10)	10.38 (1.06) ^b
3	Ambitious (75ml)	2(5/10)	13.29 (1.15) ^b
n			20
F-value			9.60***
LSD (p=0.05)			0.19

Statistical results were based off analysis of all 16 treatments

*Data transformed (log (x+1)). De-transformed (weighted) means displayed. LSD value relates to transformed values displayed in brackets.

***<0.001

3.2 Percentage loss of flower buds

The first brown buds were evident from the 22nd October, and became progressively worse during the following week.

Table 3 shows the severity of bud rot, or browning pre-flower, and the final percentage of bud drop post-flower. Neither Actigard nor Ambitious resulted in significantly lower severity of sepal browning compared to the untreated control, although Actigard was numerically much lower in comparison. Ambitious was ineffective at reducing the percentage of bud loss, while Actigard significantly reduced losses by 20.7% by fruitset.

Table 3: Severity of bud rot pre-flowering, and final percentage bud loss after flowering

	Product (Rate/100L)	# of applications (starting)	Severity bud rot	% bud loss
1	Untreated control	-	33.90 ^a	46.97 ^a
2	Actigard (200g/ha)	2(5/10)	19.66 ^a	26.23 ^b
3	Ambitious (75ml)	2(5/10)	28.54 ^a	50.83 ^a
n			20	20
F-value			3.35***	3.15***
LSD (p=0.05)			12.51	16.72

Statistical results were based off analysis of all 16 treatments

***<0.001

3.3 Crop tolerance

A reddening of leaves and flower buds was evident after the first application of Ambitious, a reasonably typical response from CPPU. Other effects included larger, greener, thicker leaves, thicker fruit stalks, and a change in the appearance of fruit (more exterior hairs, and generally shorter in length). None of these effects were measured.

4.0 Summary

Overall, there was a high level of disease challenge within the trial; the untreated control experienced 32% severity leaf spotting and nearly 47% loss of flower buds due to bud rot.

Ambitious was effective at reducing the severity of leaf spotting on Hayward, performing similarly to Actigard. The researcher believes this season was particularly favourable for this group of products, which take some amount of time to be effective, as the main leaf spot infection event for 2014 was not until the end of October. This meant that treatments such as Actigard and Ambitious had received 2 applications by the time they were significantly challenged by Psa, and therefore had sufficient time to “activate” or induce the response they need to inhibit levels of infection.

In comparison to leaf spot, Ambitious didn't appear to show any efficacy on reducing the levels of bud rot and bud loss, while Actigard showed a significant reduction.

It must lastly be noted that Ambitious resulted in increased canopy growth, with larger, greener, thicker leaves. Canopy condition was therefore visually better than both the untreated control and Actigard.

5.0 Appendices

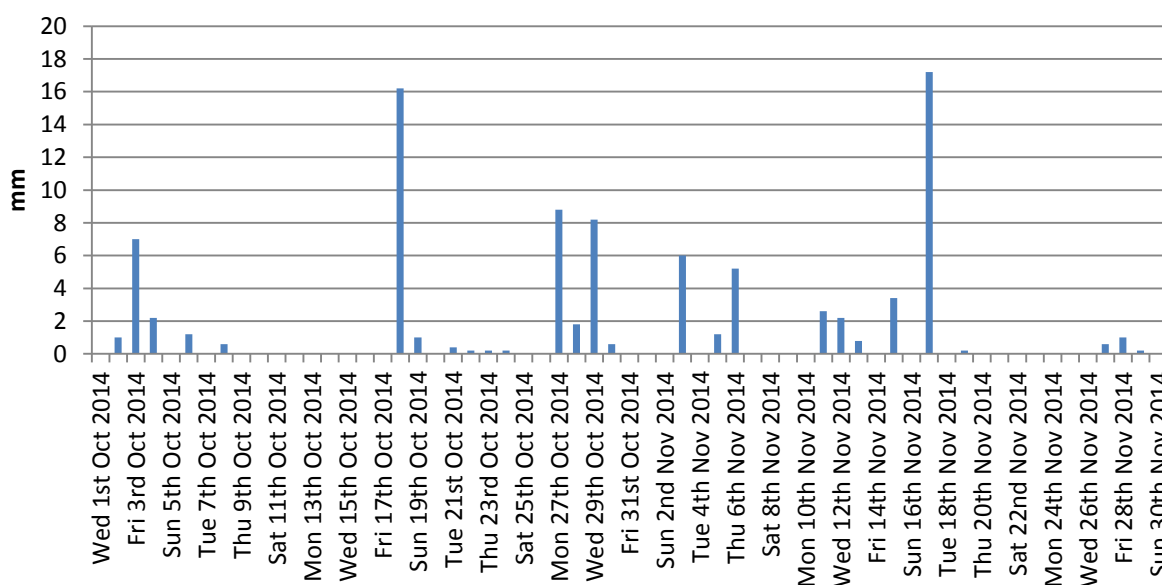
5.1 Acknowledgements

Thanks to the grower for the use of the trial site, and to Alastair and the crop monitoring team for assistance with assessments.

5.2 Application conditions

Date	Time	Wind	Temperature	Drying conditions	Comments
5/10/2014	0930-1530	15	17	Good	Frost night before
25/10/2014	0900-1500	5-15	20	Good	

5.3 Rainfall data








Rainfall data generated from Metwatch Online (Te Puke Research Station).

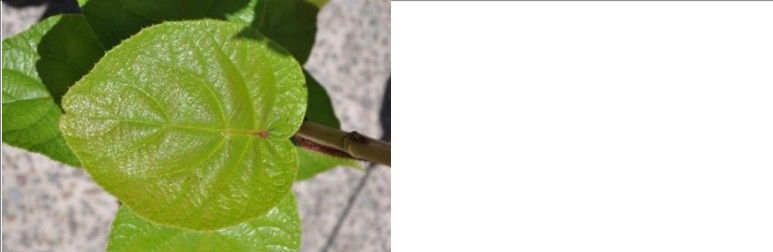





5.4 Products used

Active ingredient	Rate of AI	Trade name	Formulation	Source
Acibenzolar-s-methyl	500g/kg	Actigard	WG	Syngenta
Forchlorfenuron	10g/L	Ambitious	SC	Grochem

5.5 Flower bud browning severity score

<p>0: No browning</p>	
<p>1: Single spot or less than 25% total flower</p>	
<p>2: At least 25% total flower, but less than 50% total flower</p>	
<p>3: At least 50% total flower and less than 75%</p>	
<p>4: 75% to 100% of flower</p>	

5.6 Leaf spot scoring system

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

Description					Leaf spot severity	% bud loss	Severity bud rot
Trt	Treatment		Rate				
No.	Name	Rate	Unit	Plot	1	3	4
1	Untreated control			104	37.80	60.64	34.28
				211	28.60	18.50	10.35
				309	43.40	47.68	30.41
				401	26.20	60.55	37.96
				508	49.20	55.70	28.60
				605	45.65	38.75	61.79
Mean =					38.47	46.97	33.90
2	Actigard	200	g/ha	105	17.80	26.97	11.06
				214	17.20	47.84	27.42
				311	18.60	32.75	32.85
				416	11.60	22.10	21.79
				511	13.00	17.96	9.60
				609	9.00	9.74	15.24
Mean =					14.53	26.23	19.66
3	Ambitious	75	ml/100 l	115	17.00	50.84	27.23
				210	20.20	58.50	25.42
				301	26.00	36.60	33.10
				402	9.00	27.08	21.01
				506	17.80	59.07	37.98
				616	15.20	72.88	26.48
Mean =					17.53	50.83	28.54

