



The New Zealand Institute for Plant & Food Research Limited

Plant & Food
RESEARCH

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Psa – disease progression in orchards 2010 - 11

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First symptoms – leaf spots and blossom and fruitlet death (November 2010)



Dark areas at junction of shoot and cane



Followed by shoot dieback (8th November 2010)



Removal of vines in orchards with Psa (15th November 2010)



Three areas of study for our team.

Monitoring the spread of disease in commercial orchard blocks.

To understand the disease cycle in New Zealand

Spread within vine wood

To help with orchard management decisions such as “how much of the vine needs to be removed” .

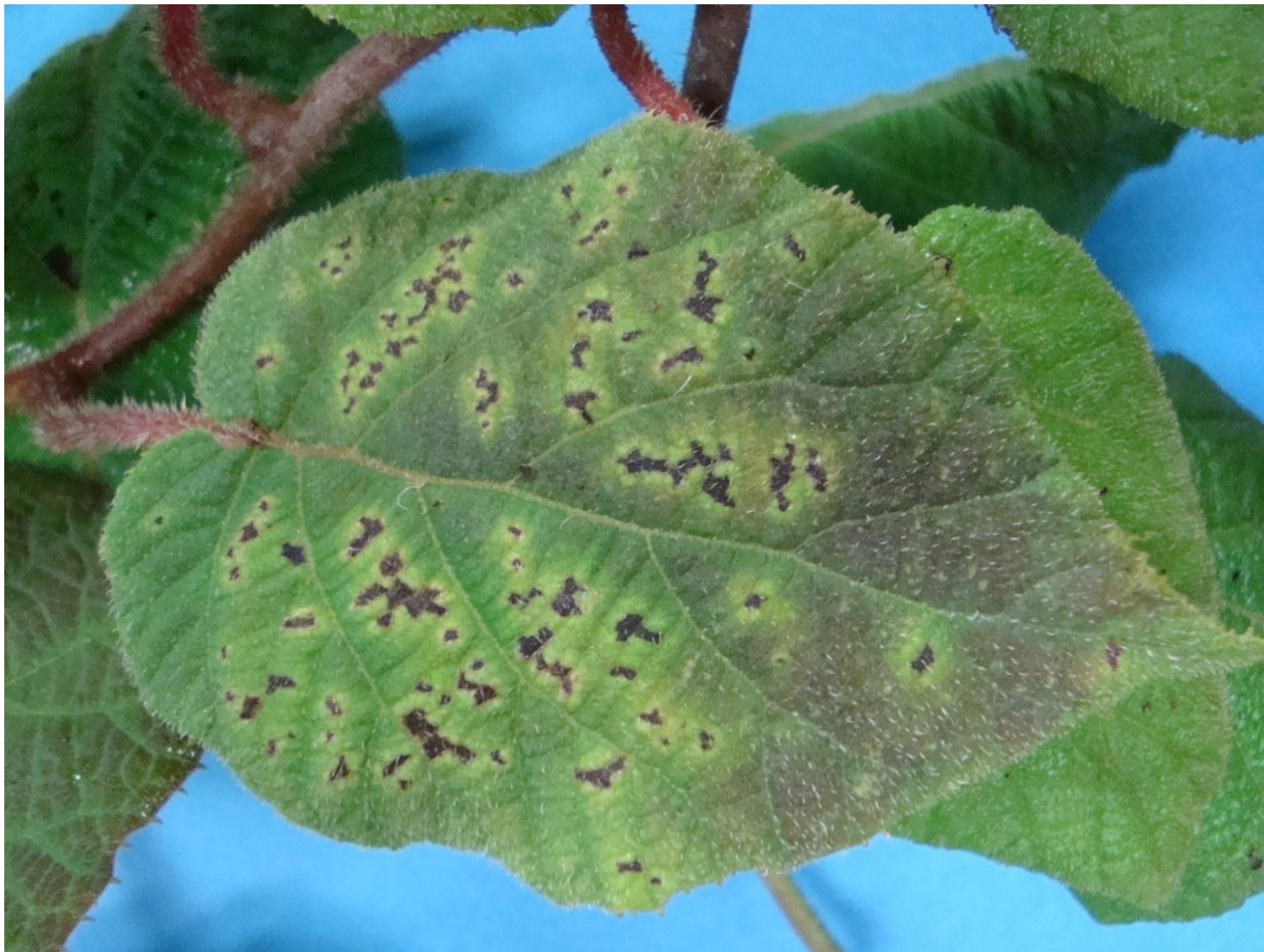
Documenting the development of disease in Te Puke Research orchard – where about 54,000 vines are monitored

To identify vines with some resistance to Psa

Leaf spotting with halo (spring onwards)



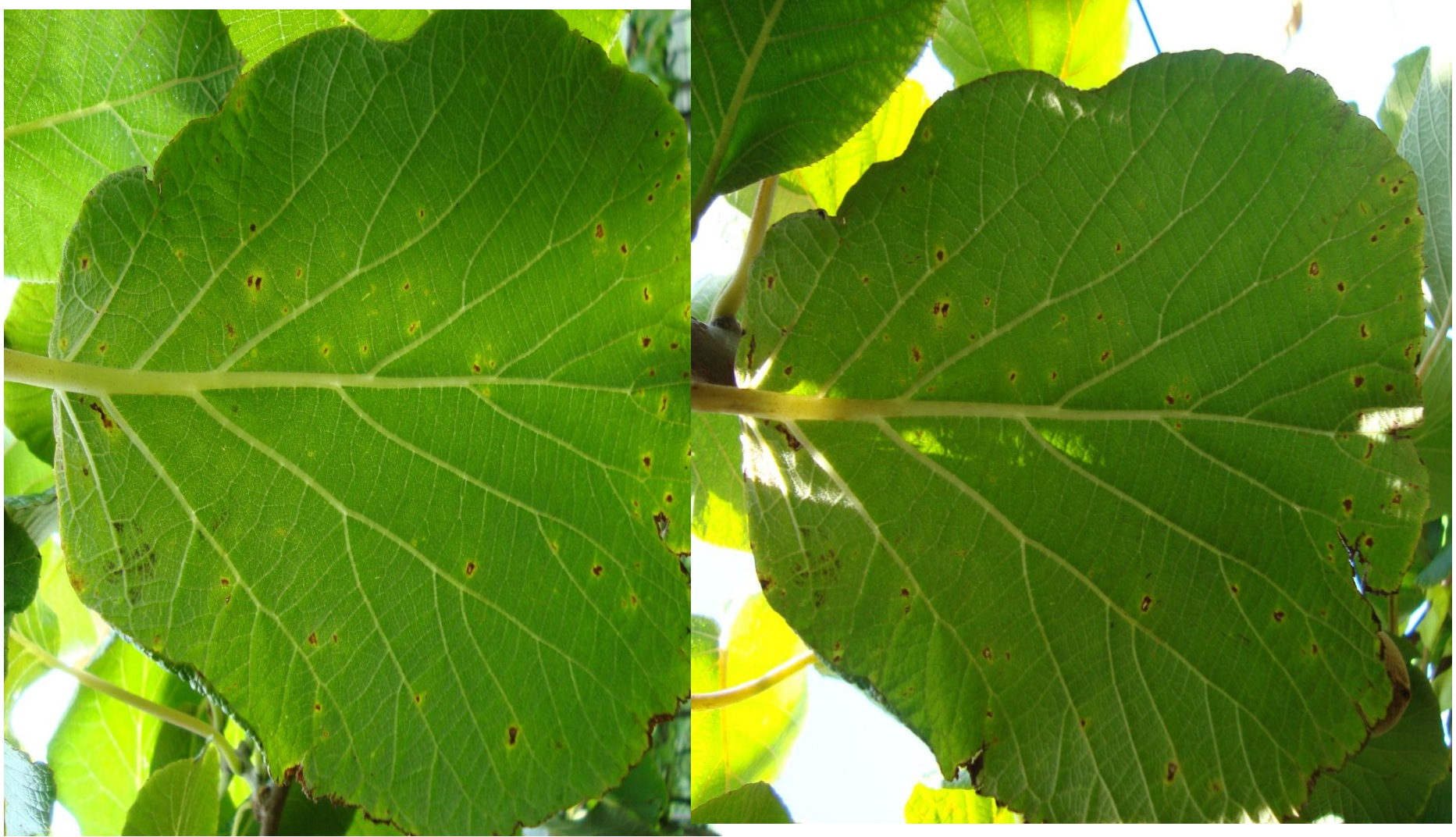
Blocky/angular spots with halo (spring onwards)



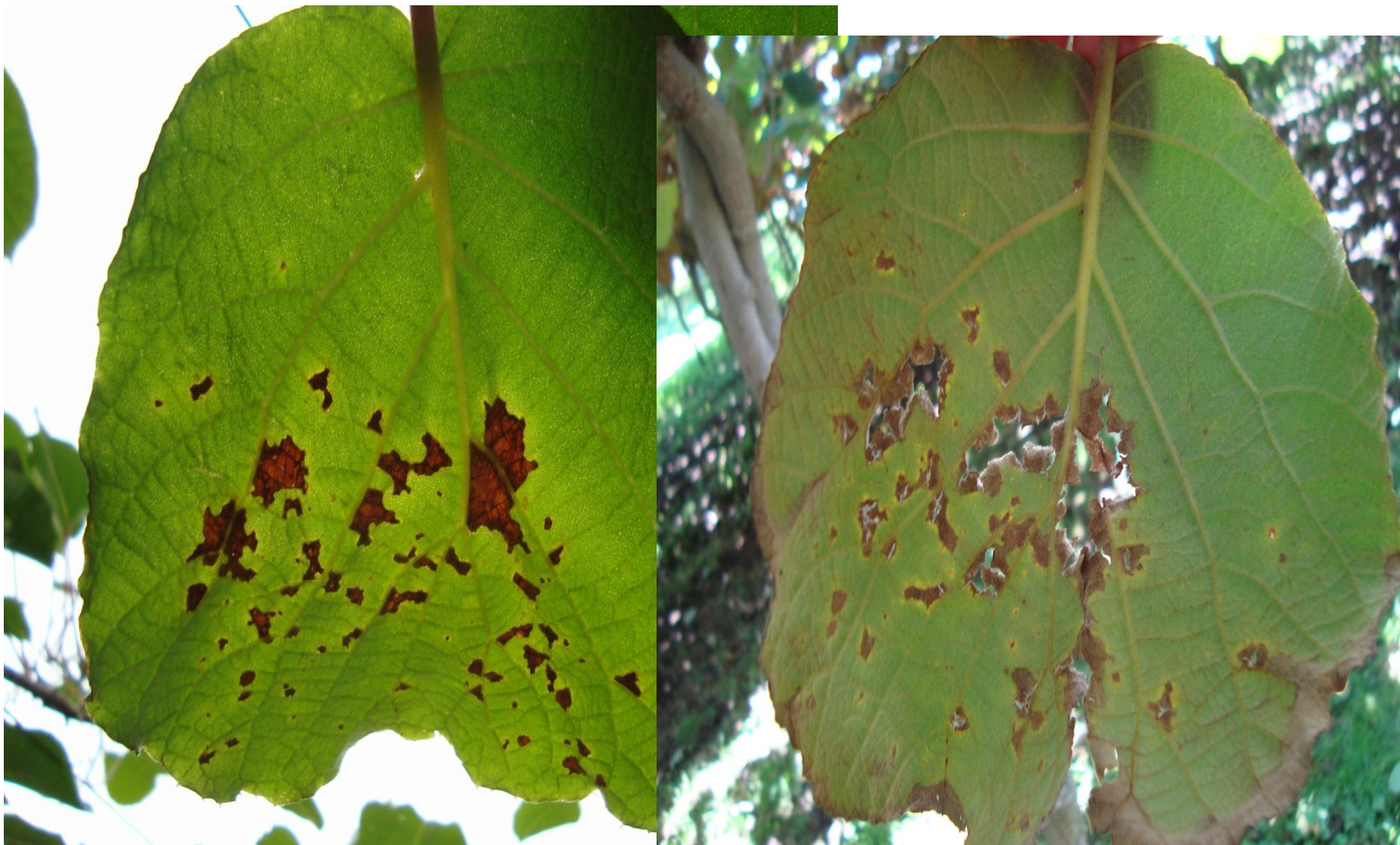
Blocky/angular spots without halo (spring onwards)



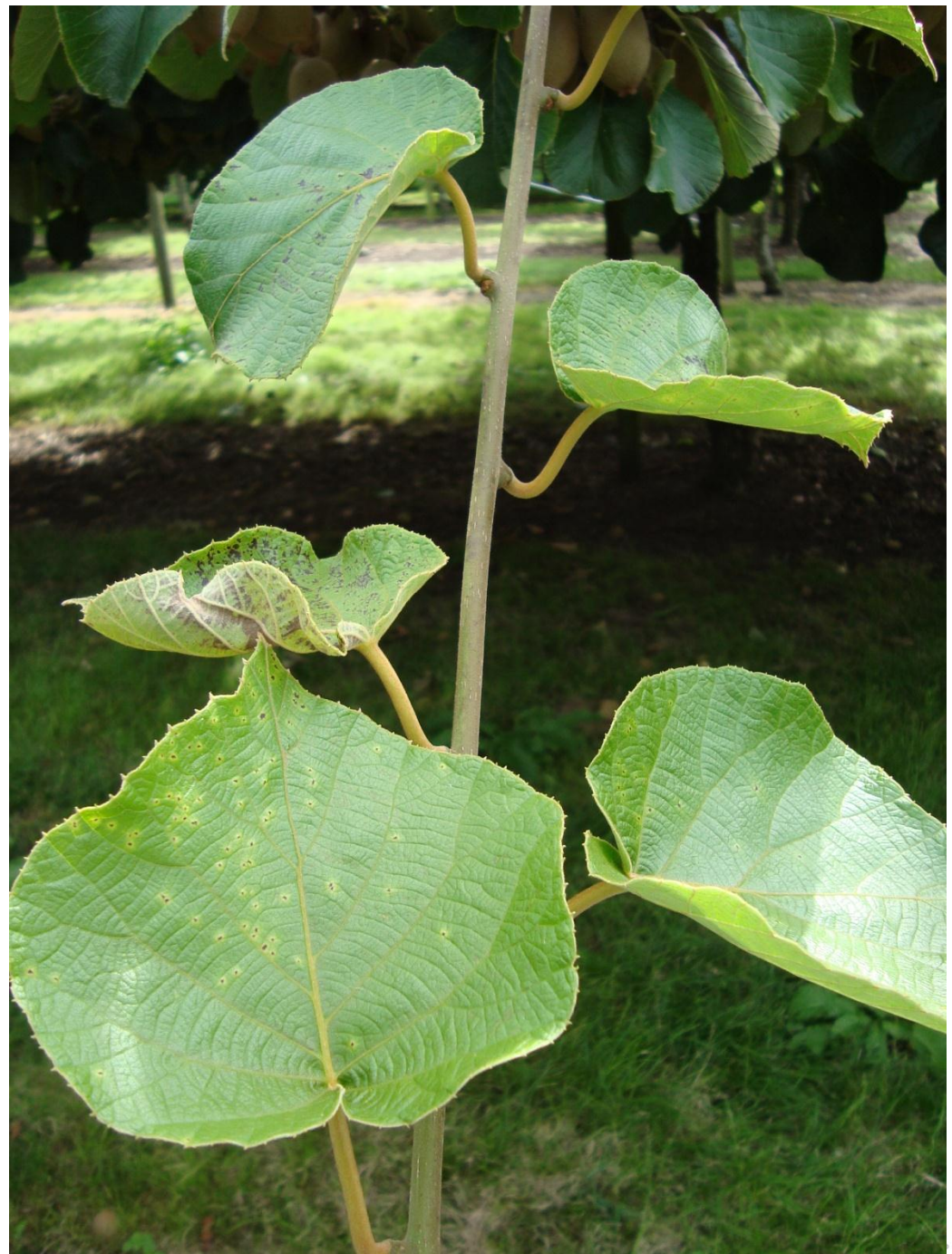
Leaf spot development – Hort16A (December to March)



Leaf spot development – Hayward (December to March)



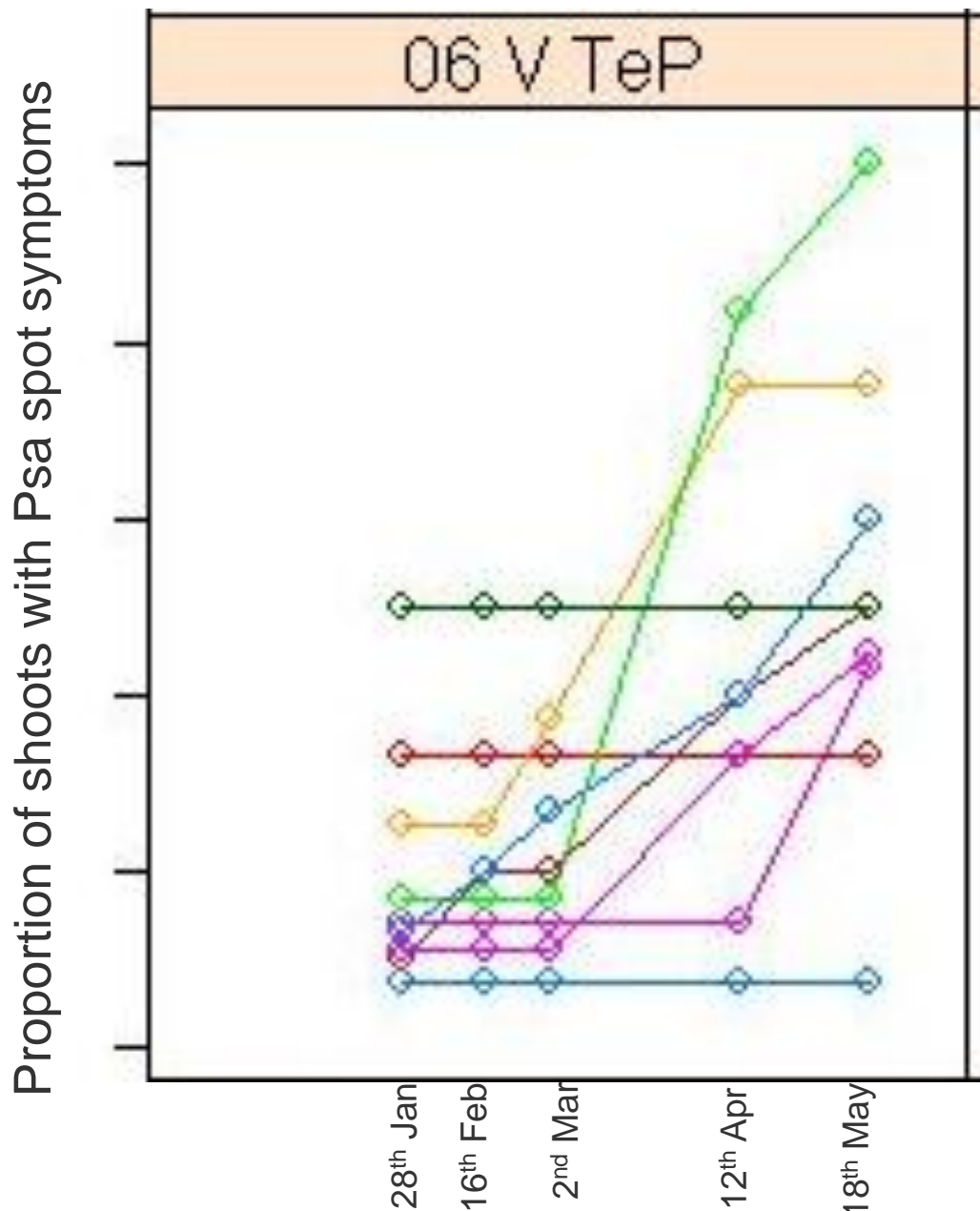
Where are the spotty
leaves on the vine?



Monitor the same shoots and canes on 14 orchards throughout the season



Disease progression in Psa V orchard



Summary – spread in orchards study

Measurements made on at least 14 orchards with symptoms of Psa
(one block each orchard and 50 bays)

1. Hort16A
2. Hayward
3. LV – low virulence
4. V – high virulence

Leaf spotting

- Little change in number or size of leaf spots throughout summer

Spread in orchards

- Psa was active and capable of starting new leaf infections throughout summer

Wood symptoms - March 2011



White ooze



August 8th 2011 Gold



Mid July 2011 ('Hort16A orchard with deliciosa trunks)



Psa ooze (Hort16A leader) cut for 25 minutes



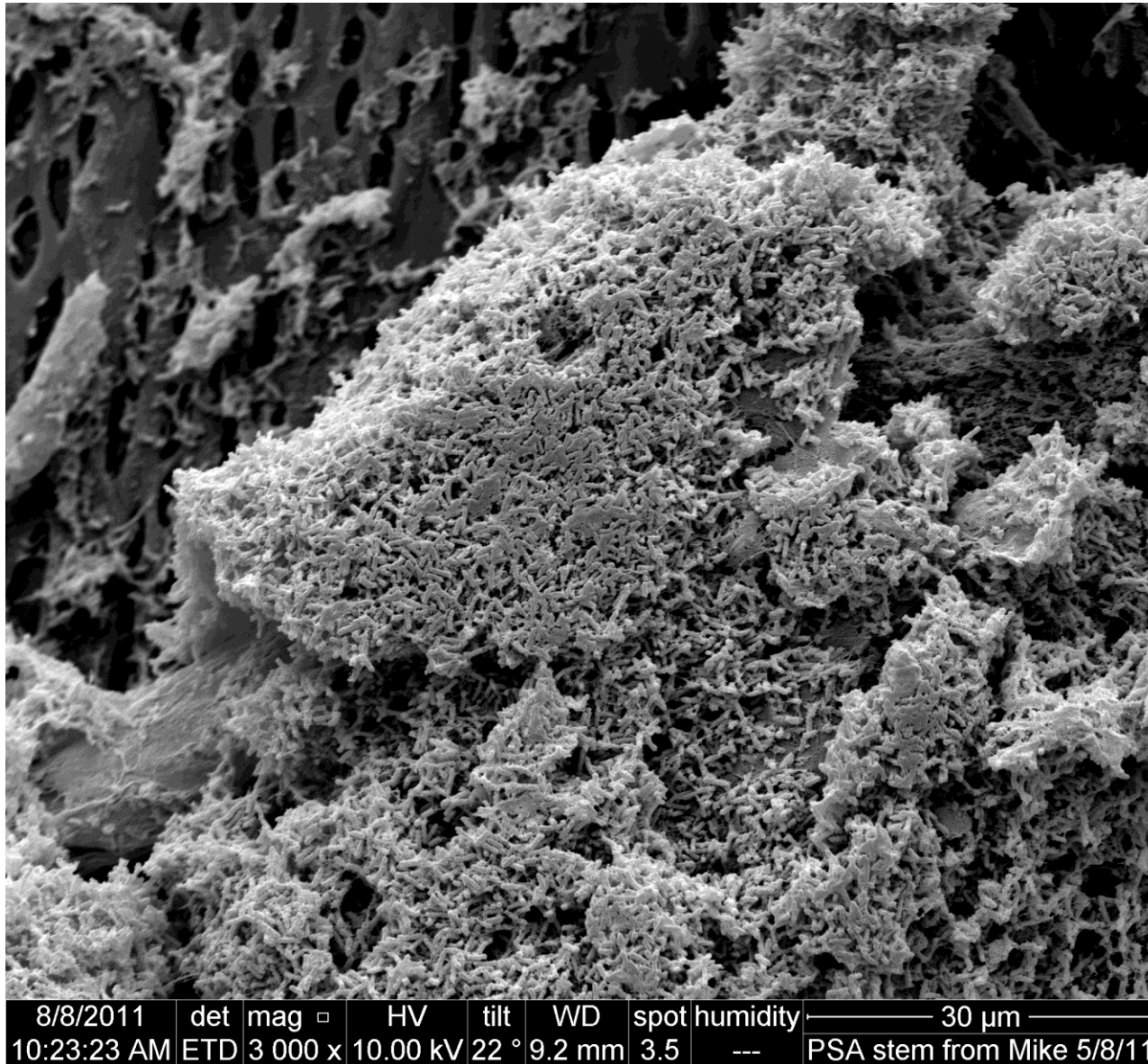
Video of oozing after cutting leader wood in Psa “V” orchard July 2011

Ooze from kiwifruit cane

Pseudomonas motility



Electron microscopy – Paul Sutherland/Ian Hallett



Where is Psa within vines? - from cane to crown



Orchard 3 result of Psa test

		cane	258.22.1						
		cane	258.21.1						
cane	255.20.1	cane	258.20.1	cane	259.20.1	cane	260.20.1	cane	261.20.1
cane	255.19.1	cane	258.19.1	cane	259.19.1	cane	260.19.1	cane	261.19.1
cane	255.18.1	cane	258.18.1	cane	259.18.1	cane	260.18.1	cane	261.18.1
cane	255.17.1	cane	258.17.1	cane	259.17.1	cane	260.17.1	cane	261.17.1
cane	255.16.1	cane	258.16.1	cane	259.16.1	cane	260.16.1	cane	261.16.1
cane	255.15.1	cane	258.15.1	cane	259.15.1	cane	260.15.1	cane	261.15.1
cane	255.14.1	cane	258.14.1	cane	259.14.1	cane	260.14.1	cane	261.14.1
cane	255.13.1	cane	258.13.1	cane	259.13.1	cane	260.13.1	cane	261.13.1
cane	255.12.1	cane	258.12.1	cane	259.12.1	cane	260.12.1	cane	261.12.1
trunk	255.11.1	cane	258.11.1	cane	259.11.1	cane	260.11.1	cane	261.11.1
trunk	255.10.1	cane	258.10.1	cane	259.10.1	trunk	260.10.1	cane	261.10.1
trunk	255.9.1	cane	258.9.1	cane	259.9.1	trunk	260.9.1	trunk	261.9.1
trunk	255.8.1	trunk	258.8.1	cane	259.8.1	trunk	260.8.1	trunk	261.8.1
trunk	255.7.1	trunk	258.7.1	trunk	259.7.1	trunk	260.7.1	trunk	261.7.1
trunk	255.6.1	trunk	258.6.1	trunk	259.6.1	trunk	260.6.1	trunk	261.6.1
trunk	255.5.1	trunk	258.5.1	trunk	259.5.1	trunk	260.5.1	trunk	261.5.1
trunk	255.4.1	trunk	258.4.1	trunk	259.4.1	trunk	260.4.1	trunk	261.4.1
trunk	255.3.1	trunk	258.3.1	trunk	259.3.1	trunk	260.3.1	trunk	261.3.1
trunk	255.2.1	trunk	258.2.1	trunk	259.2.1	trunk	260.2.1	trunk	261.2.1
trunk	255.1.1	trunk	258.1.1	trunk	259.1.1	trunk	260.1.1	trunk	261.1.1
	Vine 1		Vine 2		Vine 3		Vine 4		Vine 5

Is Psa in the roots? – in this case *A. chinensis*



Detection of Psa in a vine from scion to roots

Scion				1				Psa key		Not detected
				2						
				3						
				4						
Trunk				5						
				6						
				7						
				8						
				9						
Crown				10a	10b					
				11a	11b					
Roots	22	20	18	24	16	14	12			
	23	21	19	25	17	15	13			
				26						
				27						
				28						
				29						

Summary – in vine study

Method

- 25 vines in 4 orchards
- 3 times during the season – Autumn, Winter and Spring
- Isolations of bacteria for ID (i.e. live bacteria)

Interim summary (winter 2011)

- Live Psa can be detected in wood, using our sampling technique
- Canes, leaders and trunks
- Has been found in roots where a canker near ground level

Documenting Psa spread at T/P Research orchard



Diploid *A. chinensis* breeding block at TPRO 11/8/2011

Documenting the development of disease in Te Puke research orchard.



Killed shoots of Hort16A – late September







Summary

Spread in orchards - leaf spotting

- Psa was active and capable of starting new leaf infections throughout summer
- Little change in number or size of leaf spots throughout summer

Psa in wood

- Live Psa can be detected in wood, using our sampling technique
- Canes, leaders and trunks
- Has been found in roots where a canker near ground level
- The levels detected in trunks are lower than in symptomatic canes on the same vine.

Summary

How to manage Psa in vines - no one solution fits all.

Psa has been found in leaves, canes, leaders, trunks and roots.

Less in Hayward, so they may be slightly tolerant – consider rootstock.

If the infection is well established in the vine growers should remove the vine.

If the infection is light growers may choose to cut to the trunk and re-graft a less susceptible scion (if they can be identified).

Some growers may choose to rogue out any sign of secondary infection and hope to keep a crop on until harvest.

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