The New Zealand Institute for Plant & Food Research Limited

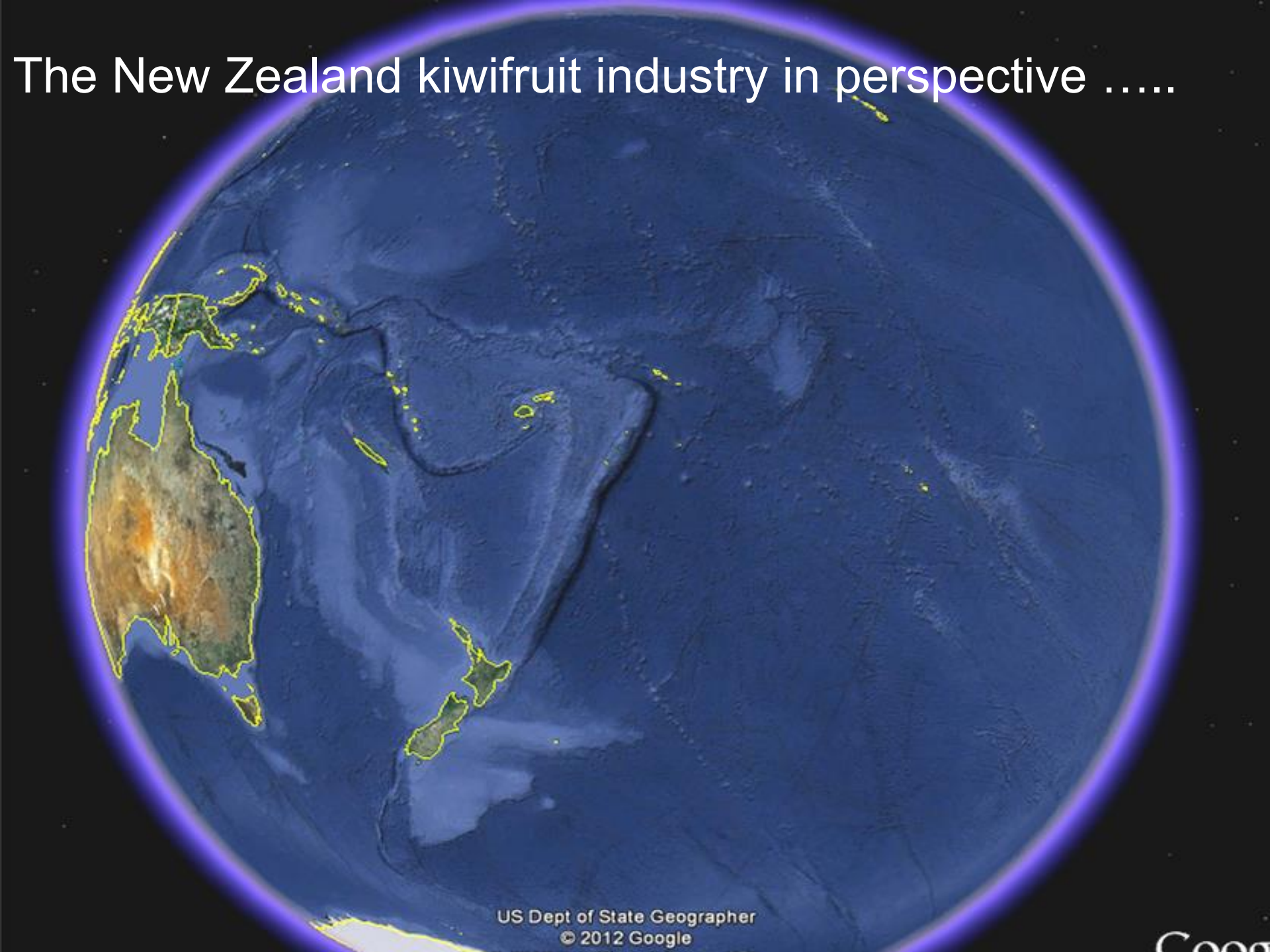
Produrre kiwi nell'era della Psa

The New Zealand kiwifruit industry in presence of Pseudomonas syringae pv. *actinidiae*

Joel L Vanneste

MACFRUT 2013 Cesena, Italy

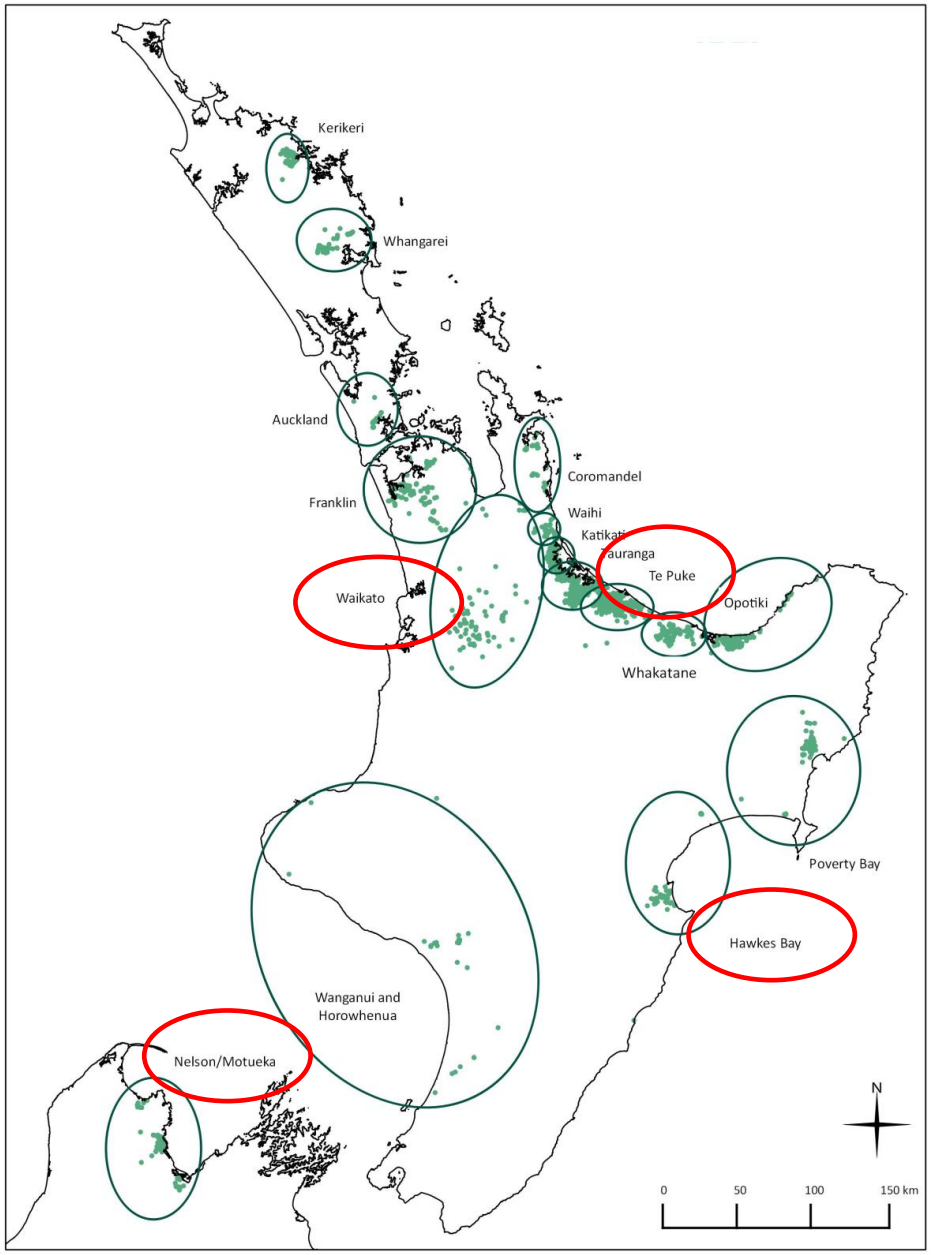
The New Zealand kiwifruit industry in perspective …..



The New Zealand kiwifruit industry in perspective …..

- **2011 exports from New Zealand horticulture industry NZ$ 3.5 billions**
- **2011 Exports from kiwifruit industry NZ$ 962 millions** (600 mEuros)
- **Kiwifruit industry is the largest horticultural export industry in New Zealand**
- **Last 11 years number of kiwifruit trays exported has doubled**
- **Av. OGR (Orchard Gate Return) for green kiwifruit NZ$41 830** (26 000 Euros) (export vol 79%, value 67%)
- **Av. OGR for gold kiwifruit NZ$90 911** (56 000 Euros) (export vol 21%, value 33 %)

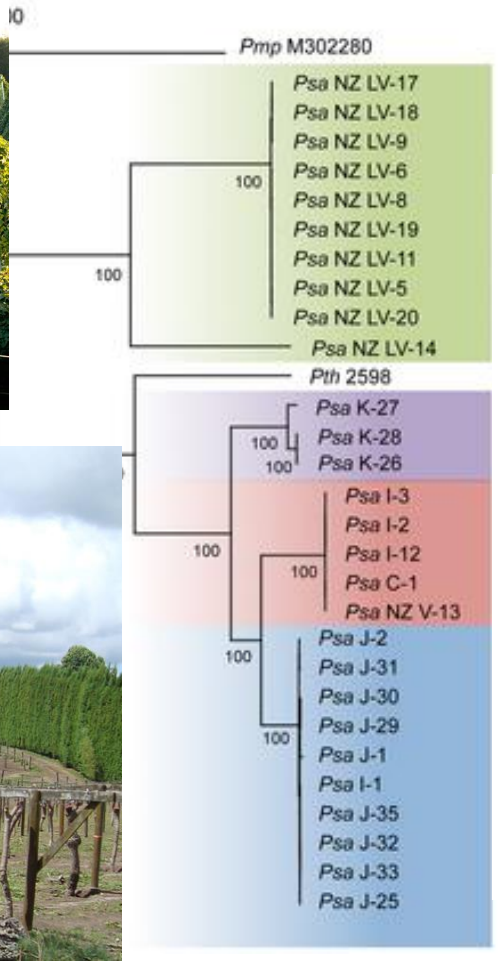
November 2010 detection of Psa in New Zealand



Two populations of Psa in New Zealand (Psa-V and Psa-LV)

Vanneste JL et al. Plant Disease 2013

Phylogeny of Psa based on Whole Genome Sequence



Biovar 4: **Non systemic** and produce no toxin

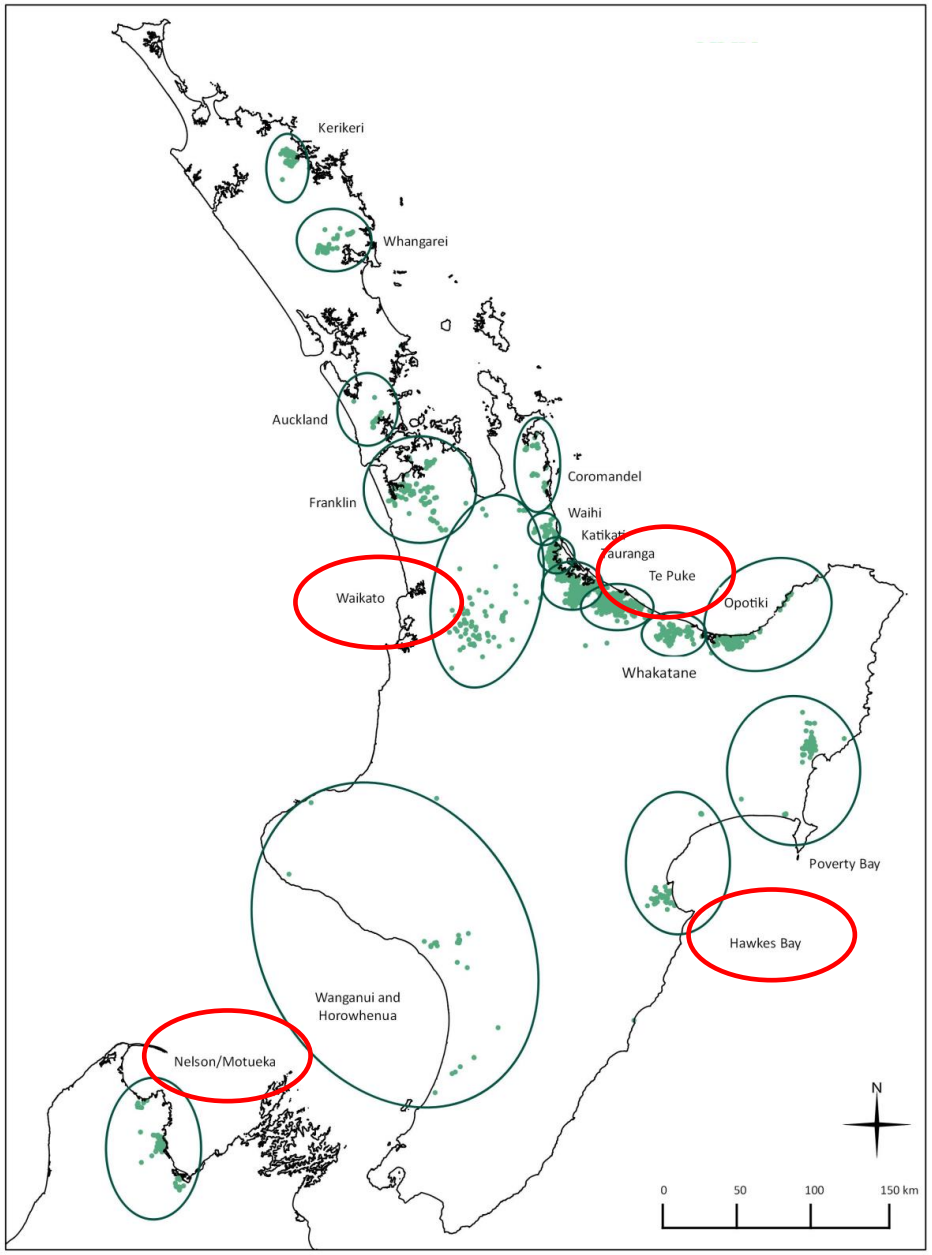
Biovar 2: **Systemic** and produce coronatine

Biovar 3: **Systemic** and produce no toxin

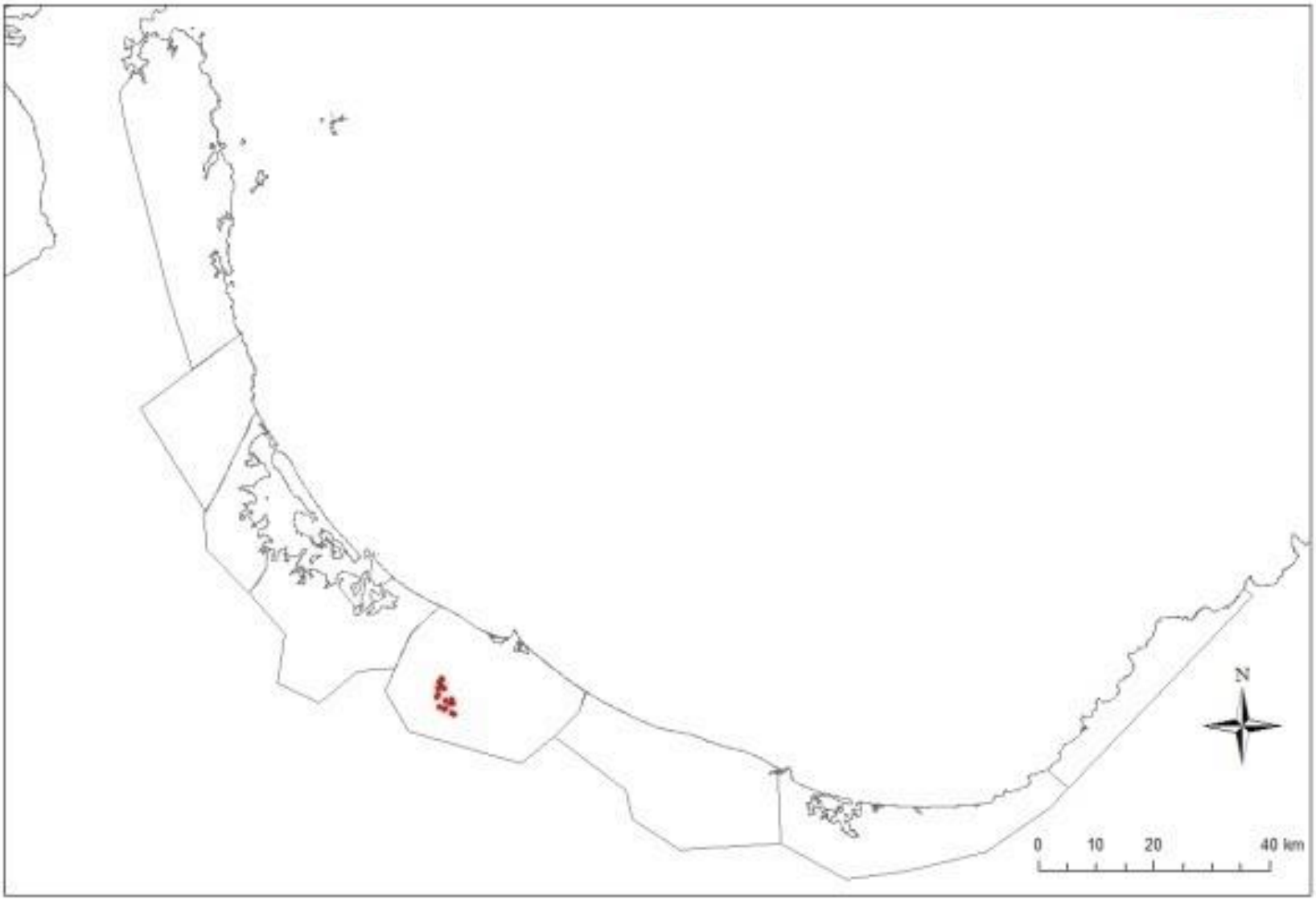
Biovar 1: **Systemic** and produce phaseolotoxin

McCann, et al. 2013 PLoS Pathog
Vanneste et al. 2013. Plant Disease

November 2010 detection of biovar 3 Psa in New Zealand



Bay of Plenty December 2010



What is the situation today? (18 September 2013)

- Out of 3293 kiwifruit orchards in New Zealand 2262 orchards affected by Psa biovar 3
- 10388 hectares of orchards where Psa biovar 3 has been identified
- 75 percent of New Zealand kiwifruit hectares are on an orchard affected by Psa biovar 3
- New regions getting infected, Whanganui being latest region declared affected by Psa biovar 3

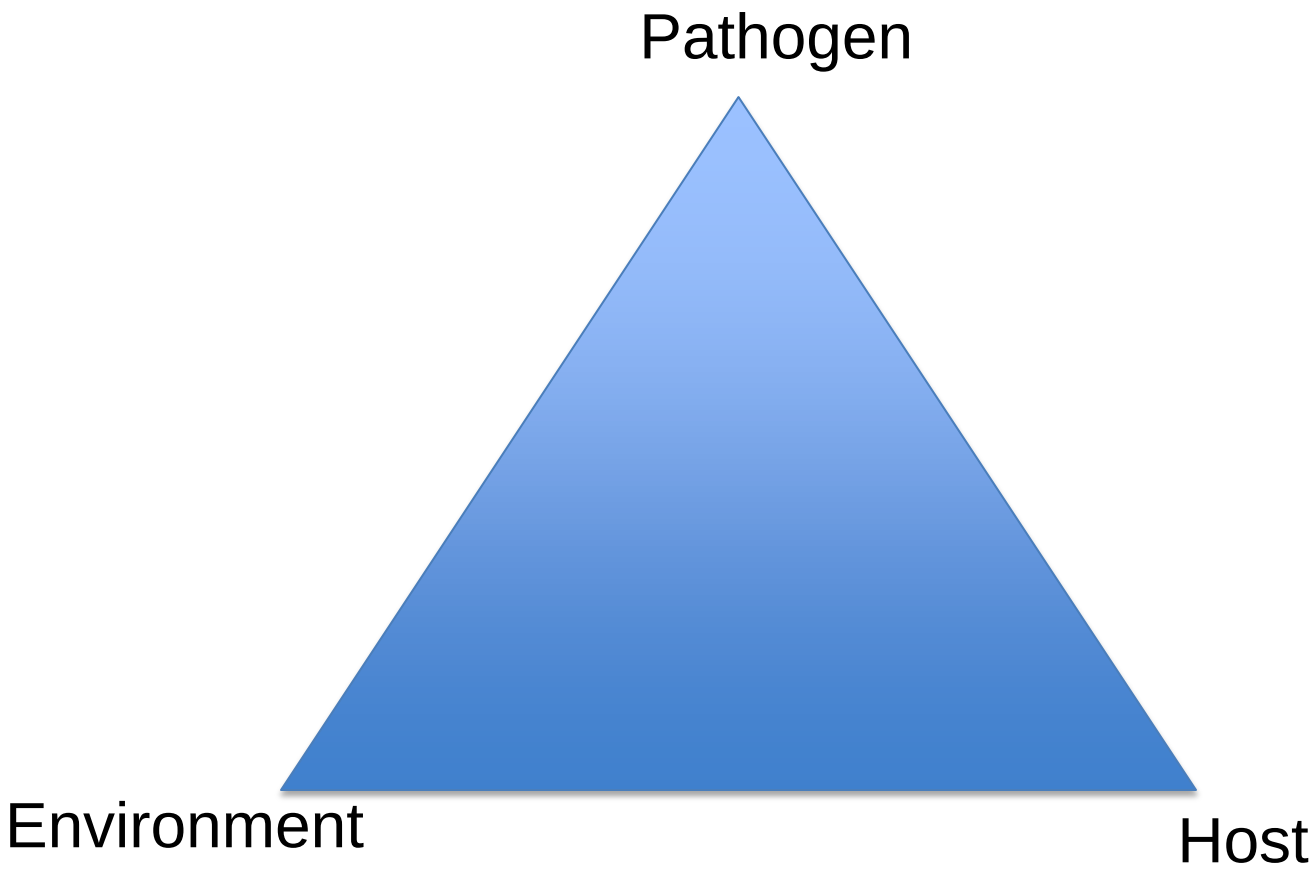
Cost of Psa in New Zealand (2012 study)

- **In less than 2 years over 2000 orchards affected (70%)**
- **Est of cost over the next 5 years: NZ$ 310 - 410 million** (191- 253 mEuros)
- **Est cost over a 15 years period NZ$885 million** (547mEuros)
- **Between 2012-2016, 360 to 470 FTEs lost in the Bay of Plenty alone**

Cost of Psa in New Zealand (2013 estimate)

- **Response to Psa discovery NZ $ 42 million** (26 mEuros)
- **In Te Puke alone over 1 000 ha of Hort16A cut out**
- **Approx. 2100 ha grafted on new variety (G3) NZ$ 60 000/ha for a total of $ 60 million** (37mEuros)
- **Less than 100% production levels for new cultivars and Hayward**
- **Reduction of capital land value 450K/ha to 100K/ha for Gold and 250K/ha to 150K/ha for Hayward. Total loss $ 2 billion** (1.24 b Euros)

The disease triangle can explain why Psa such a problem in New Zealand



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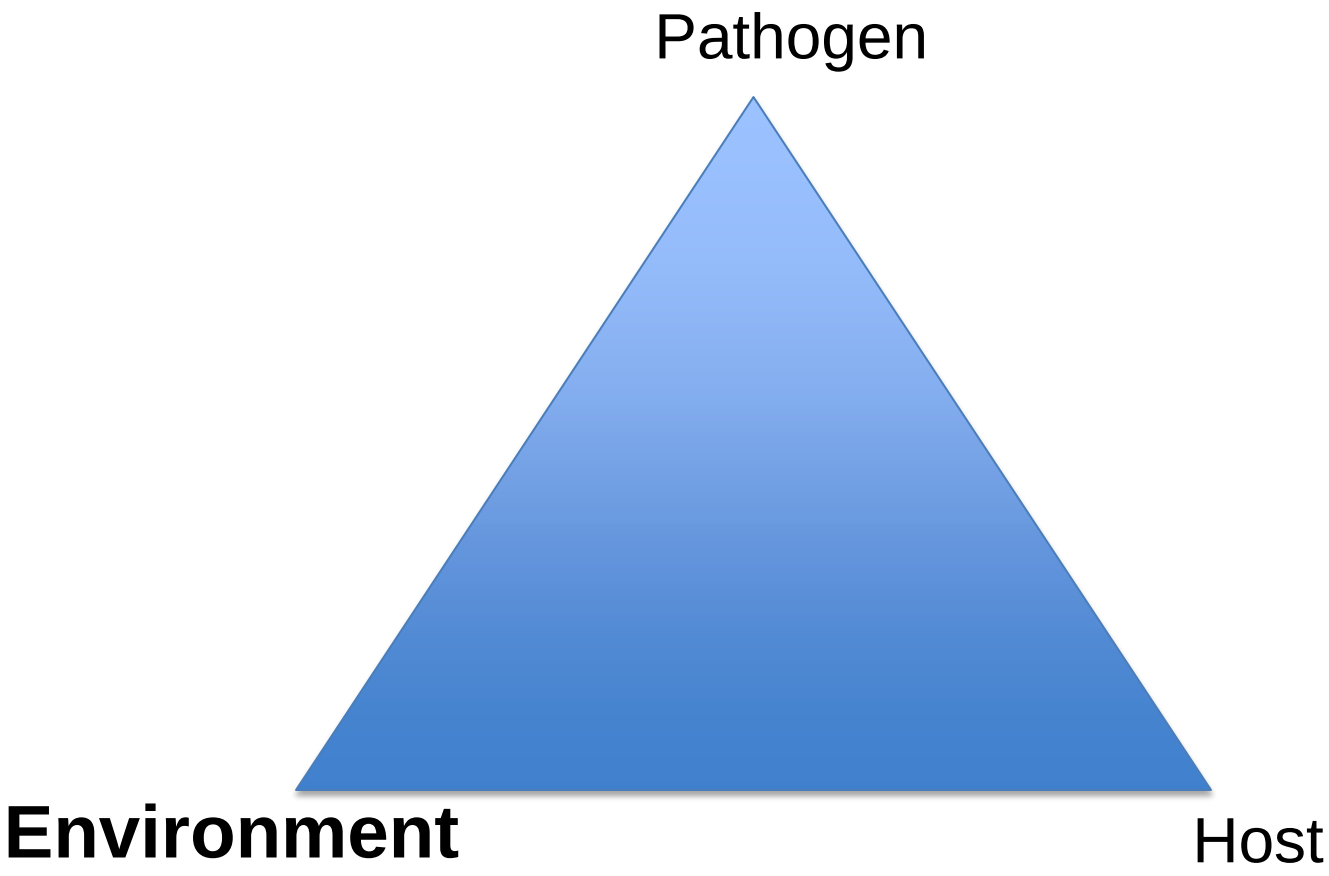
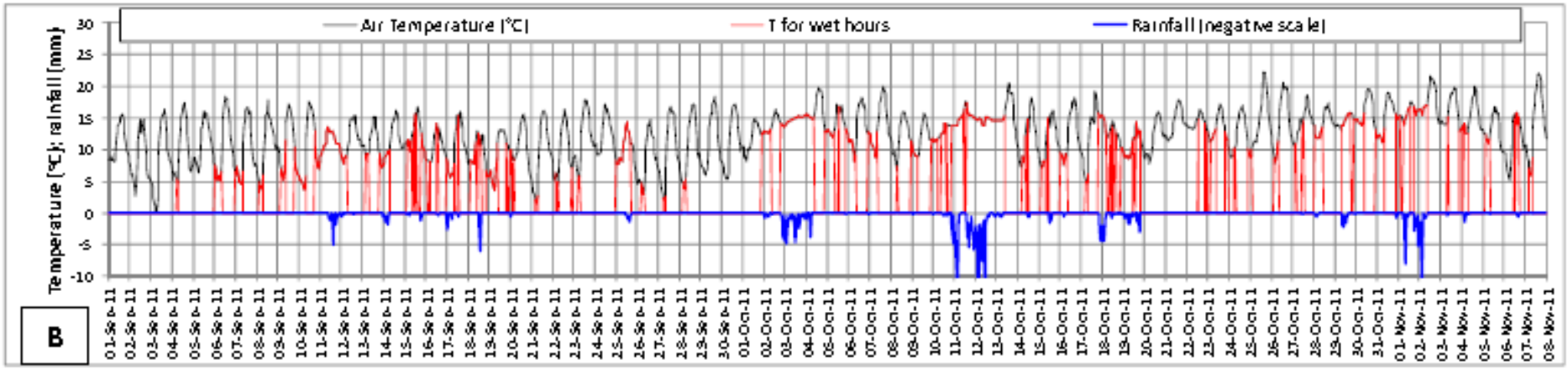


Climatic considerations:

- Disease less active above 20˚ C, no infection above 25˚ C
- Most active when average temperature over 10 days is between 10˚ C and 20˚ C



Summer Bay of Plenty Ave temp below 20˚ C

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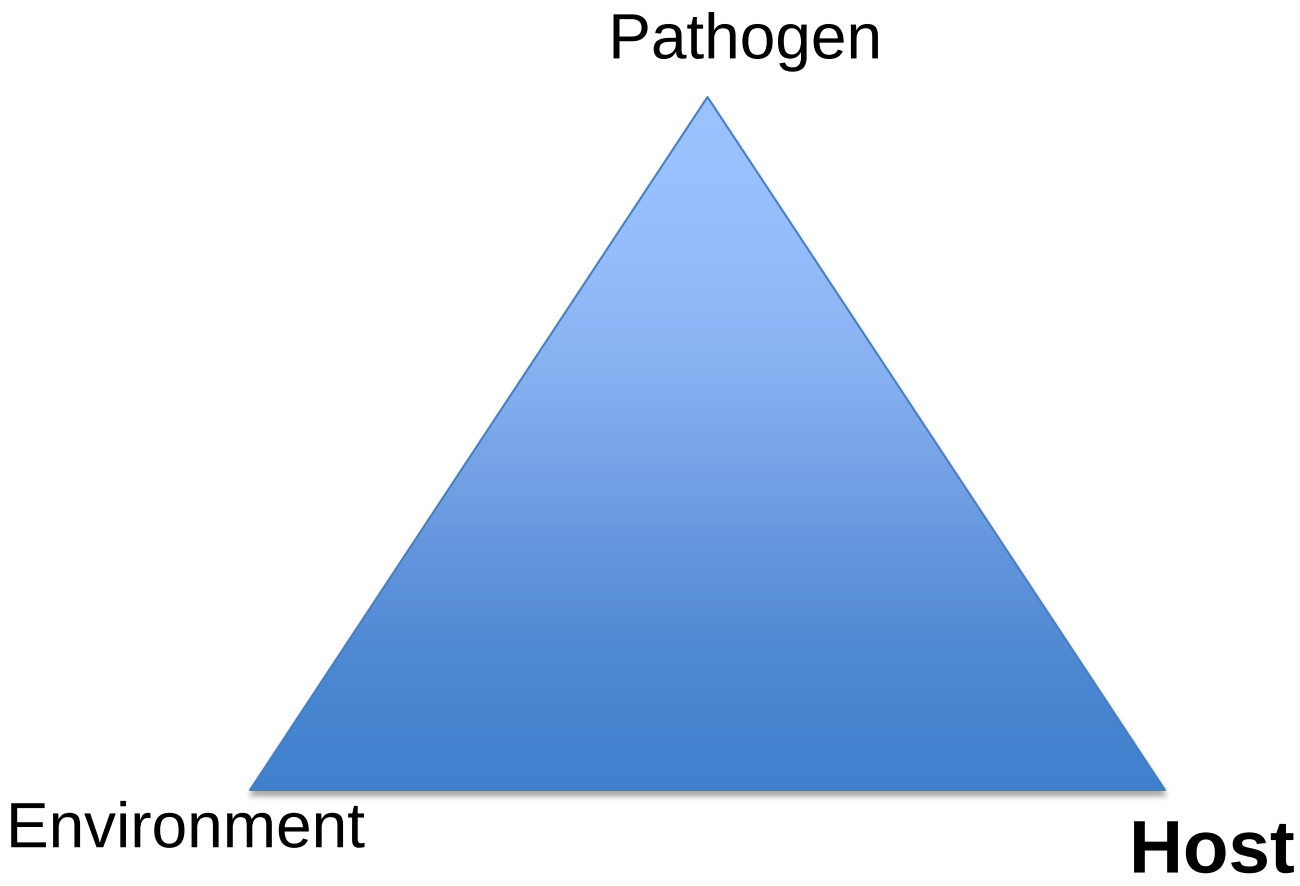
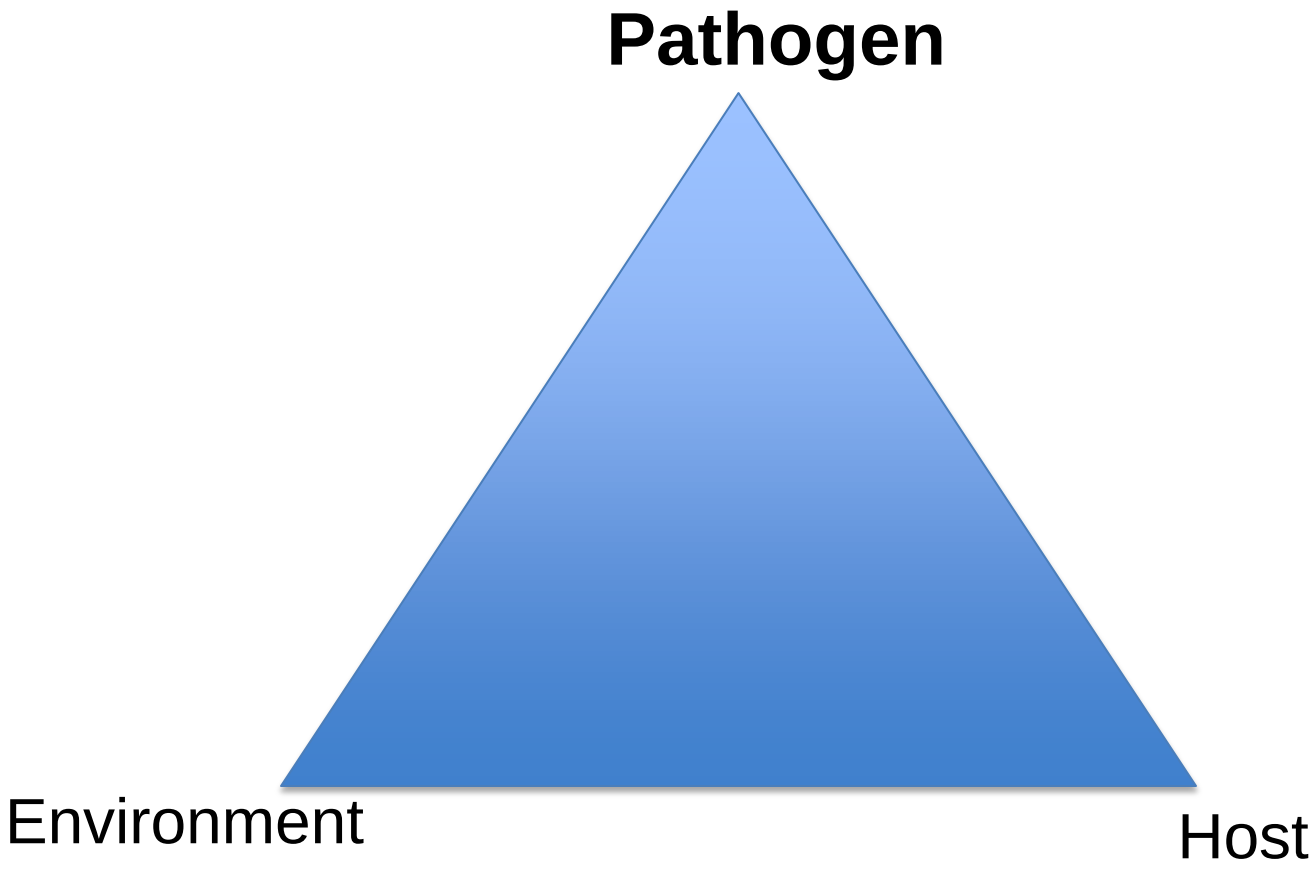


Narrow genetic base

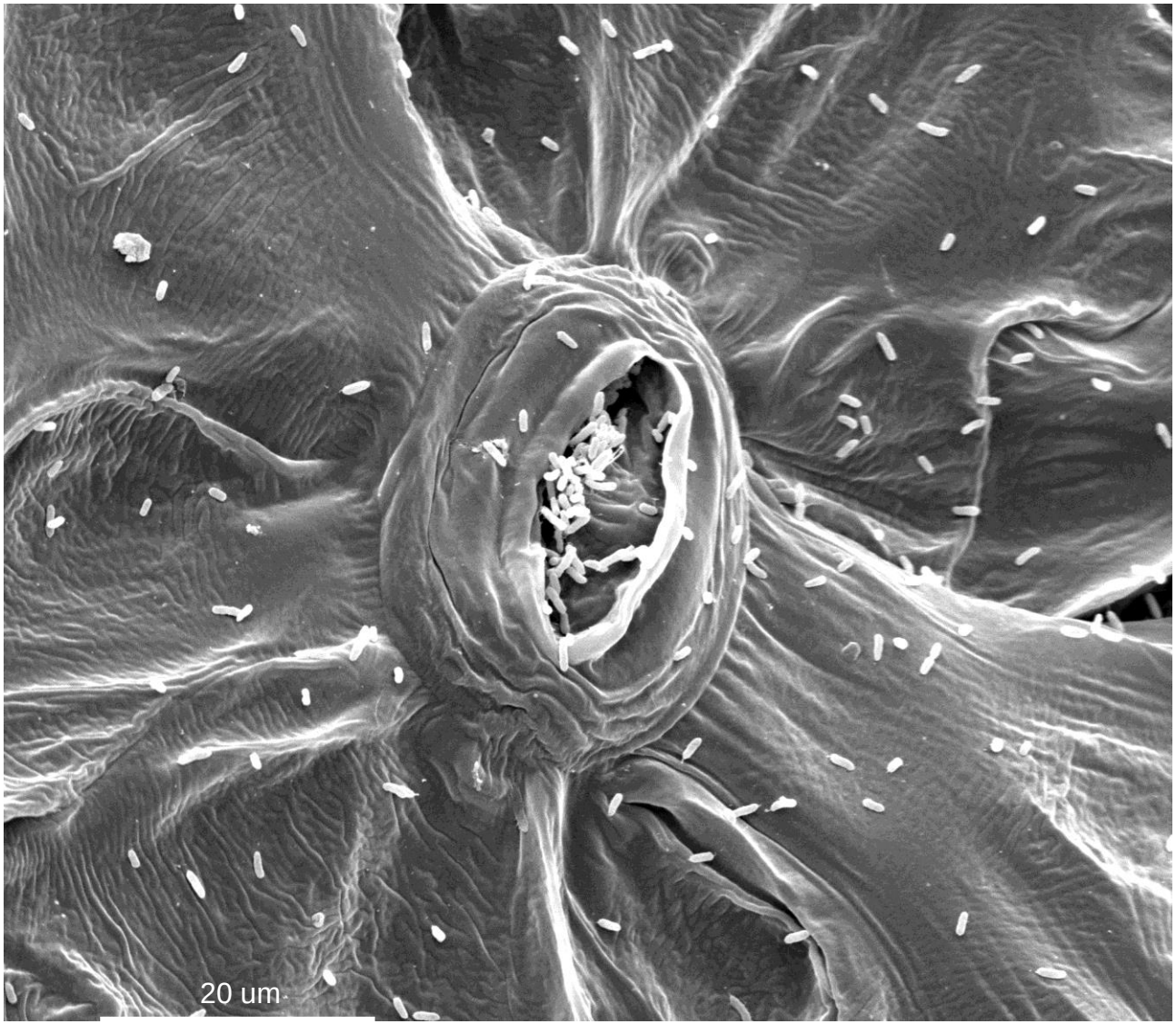
Monoculture

The disease triangle can explain why Psa such a problem



Inoculation of lower leaf surface

Day 1



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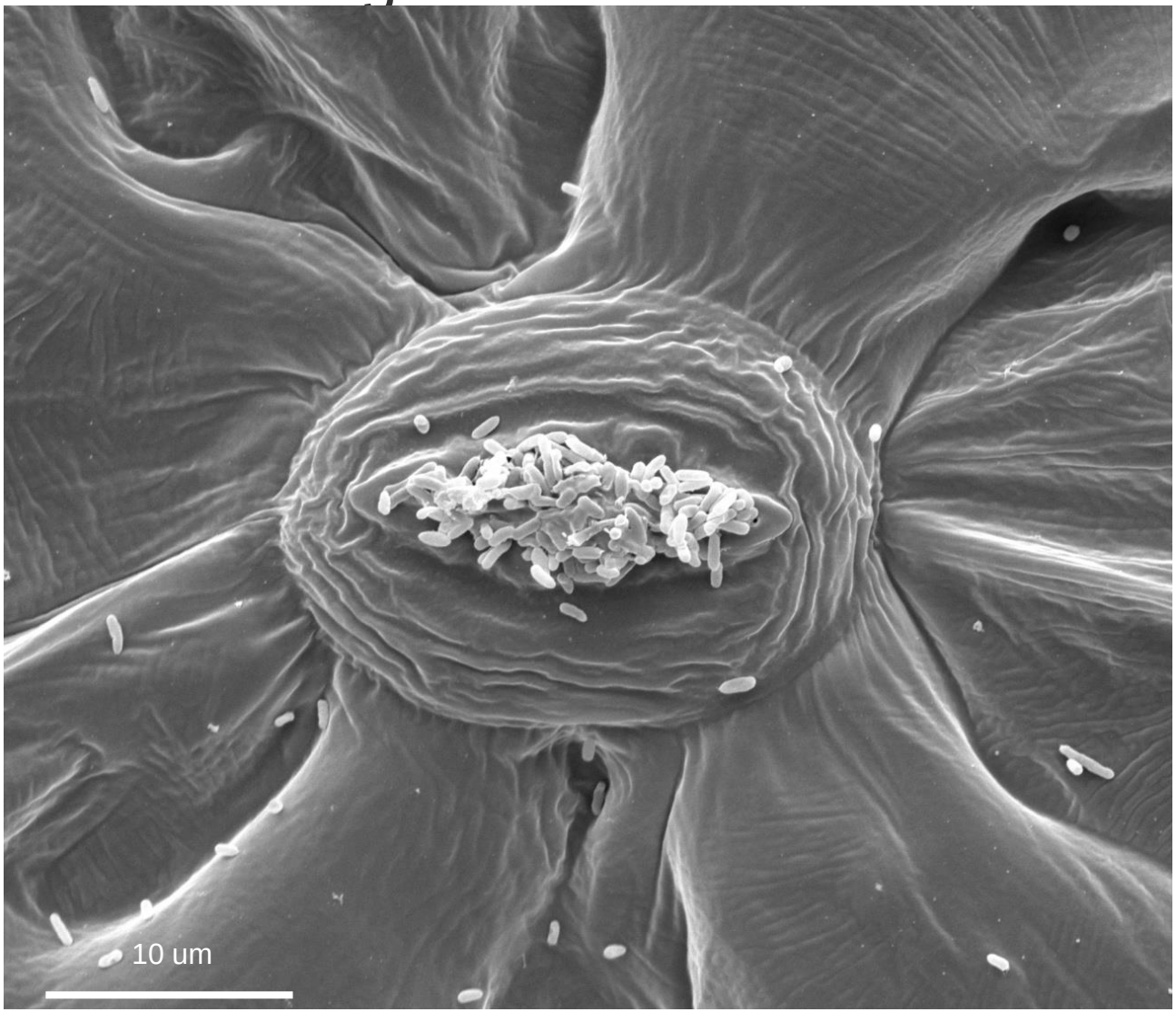
Colonisation of the stomata and bacteria exuding from stomata

Day 5



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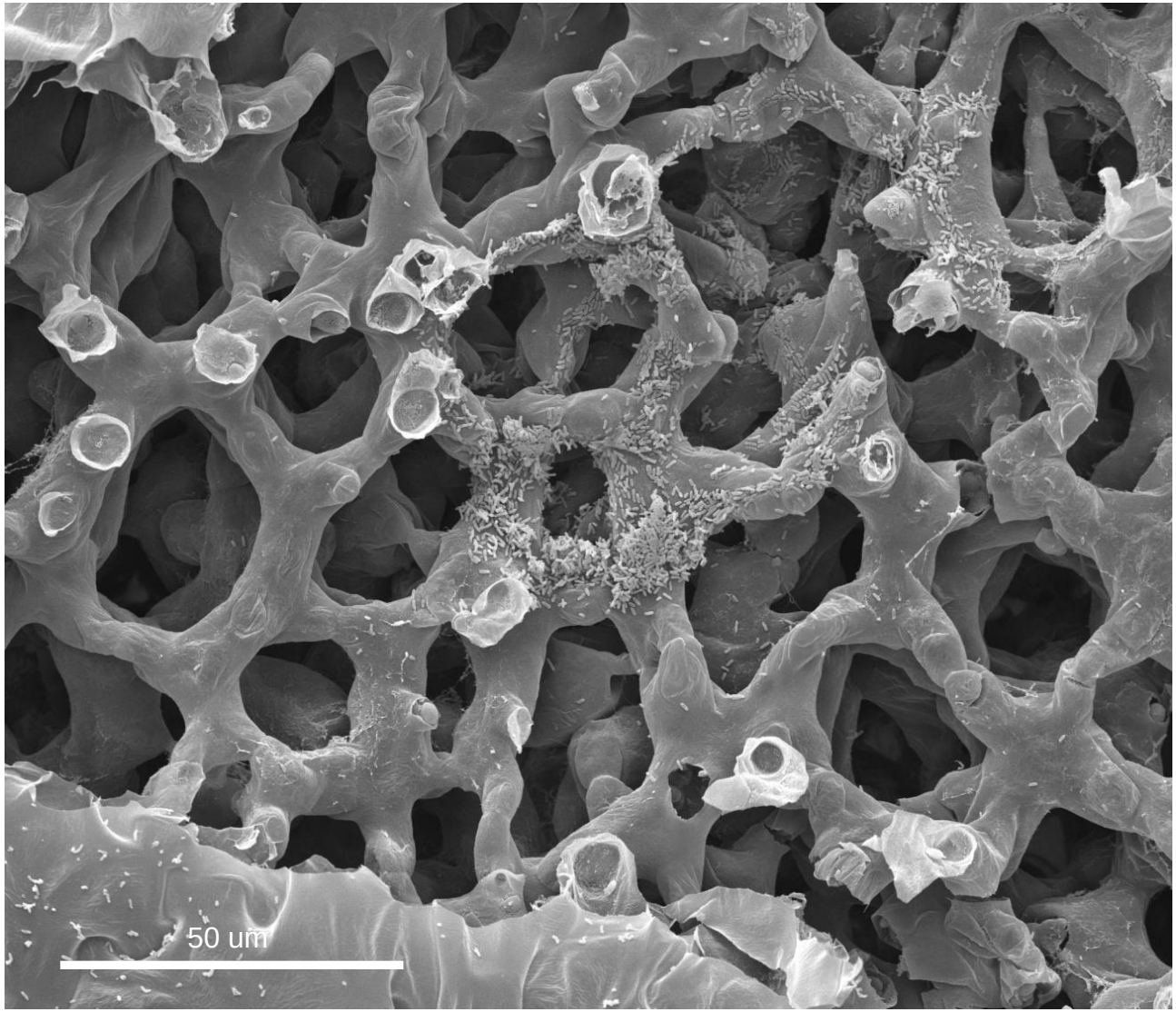
Colonisation of the tissues below the stomata



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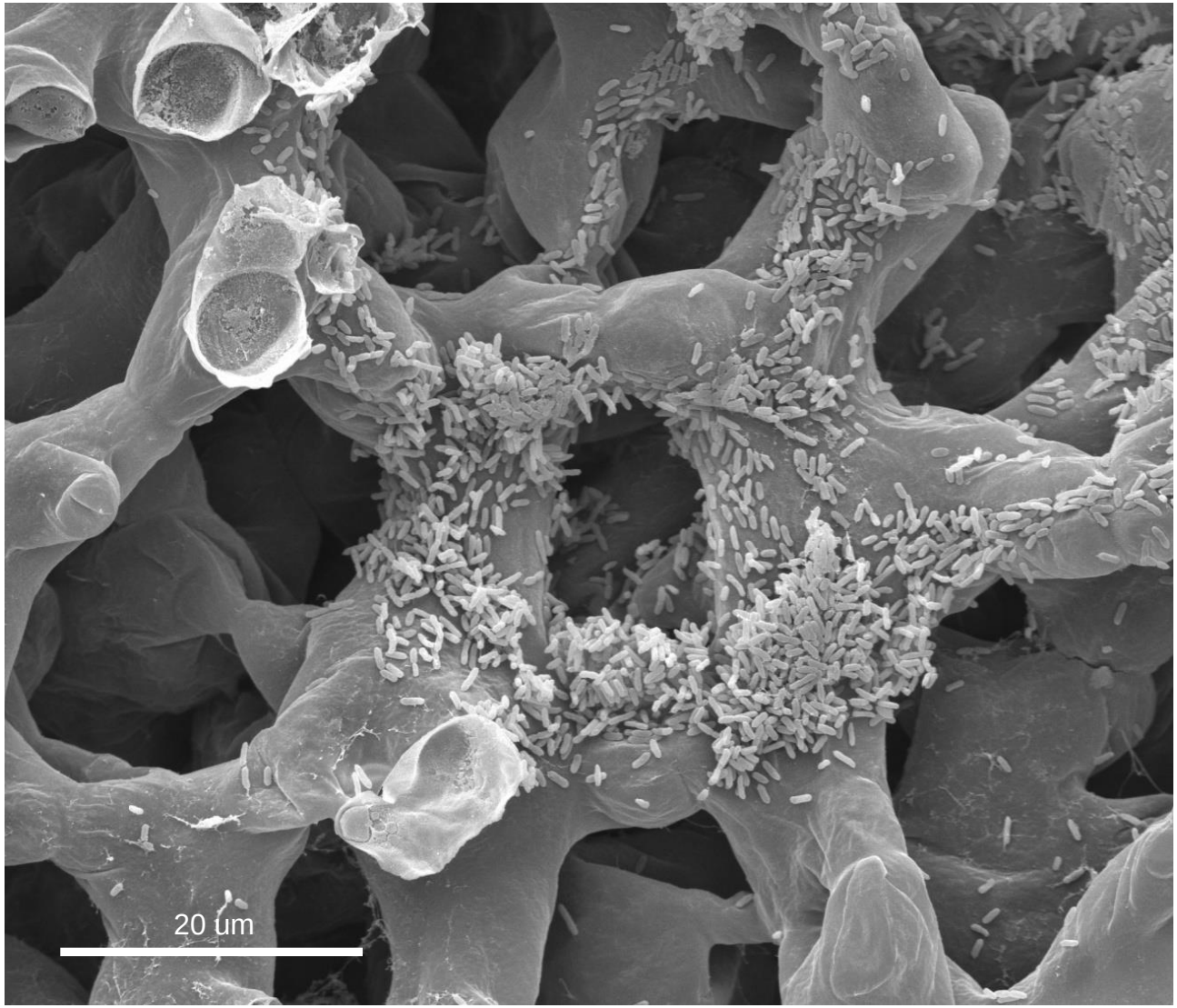
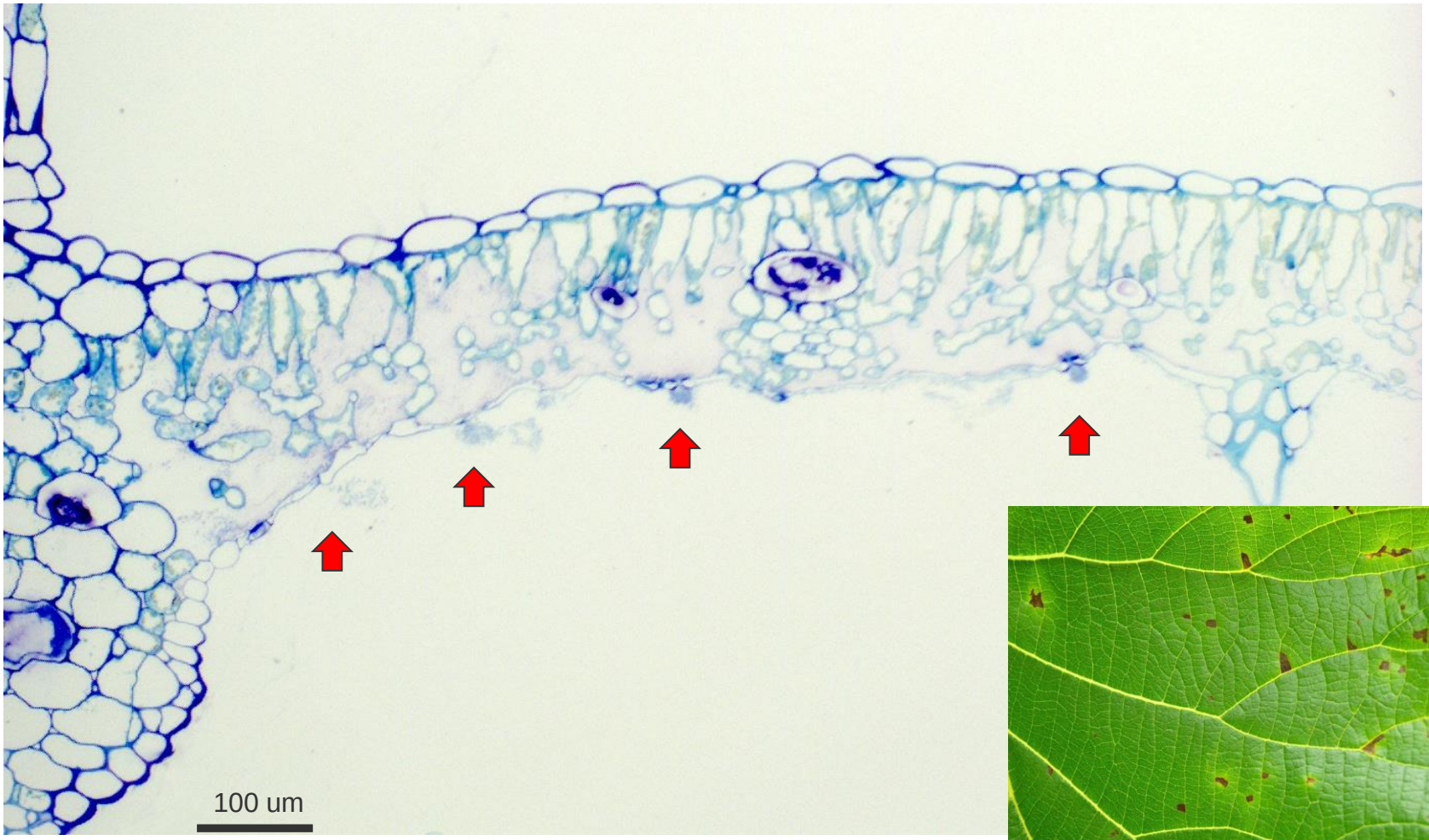


Inoculated tissue – 5 days



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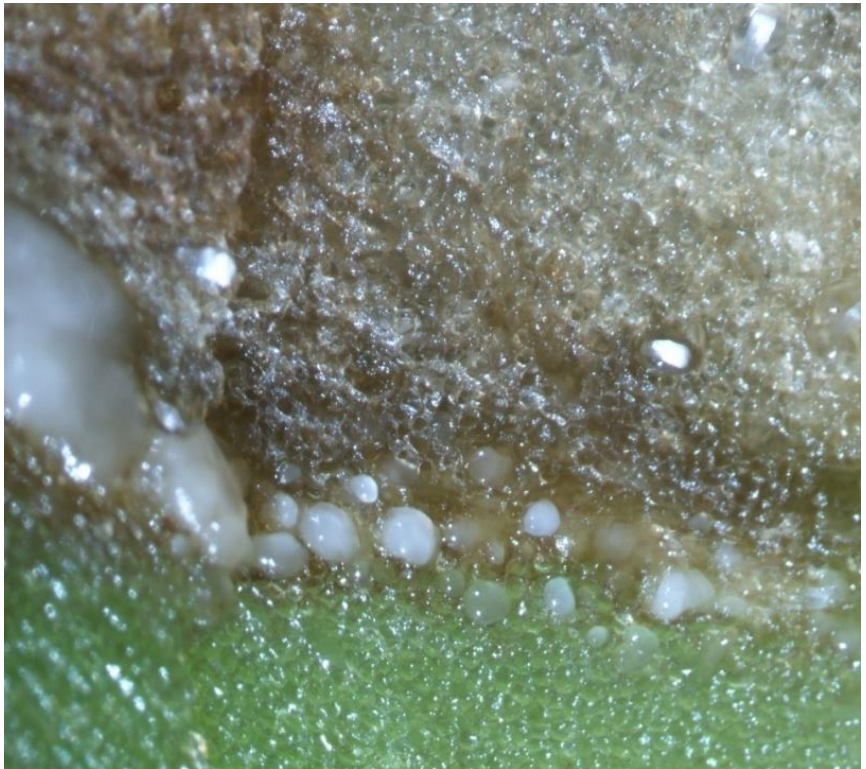
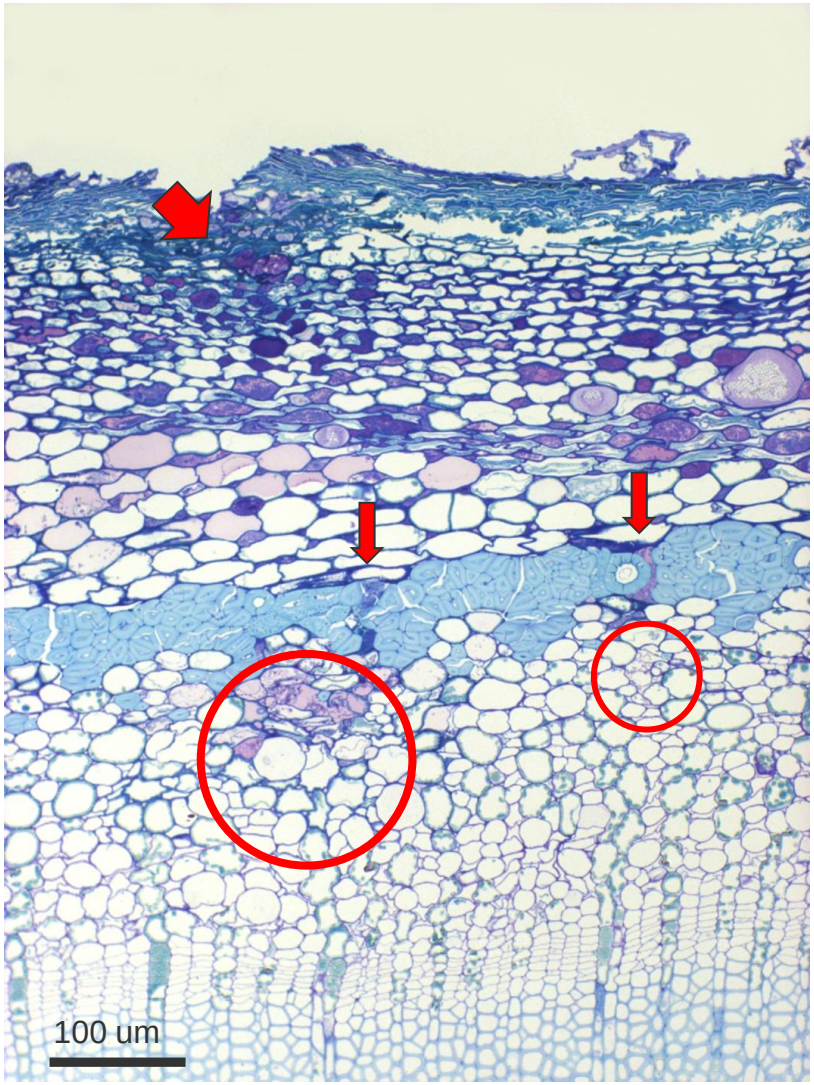
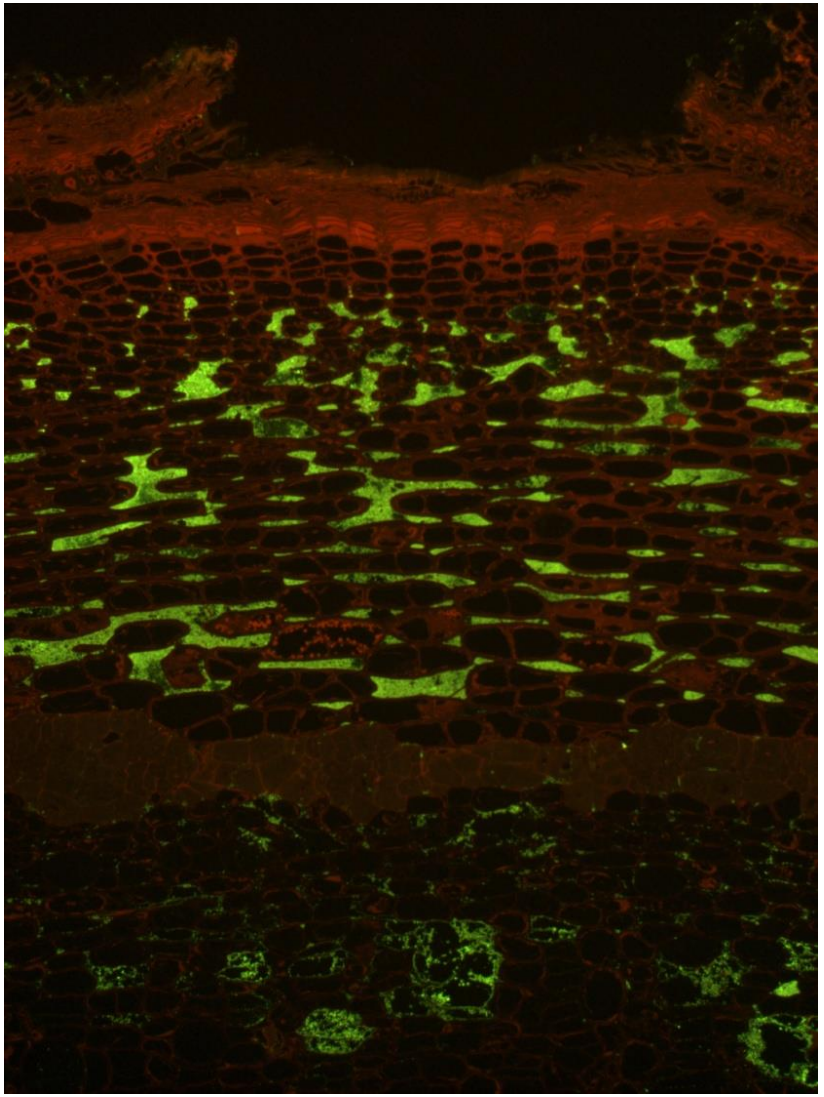
Leaf infection



Infected cane (lenticel)





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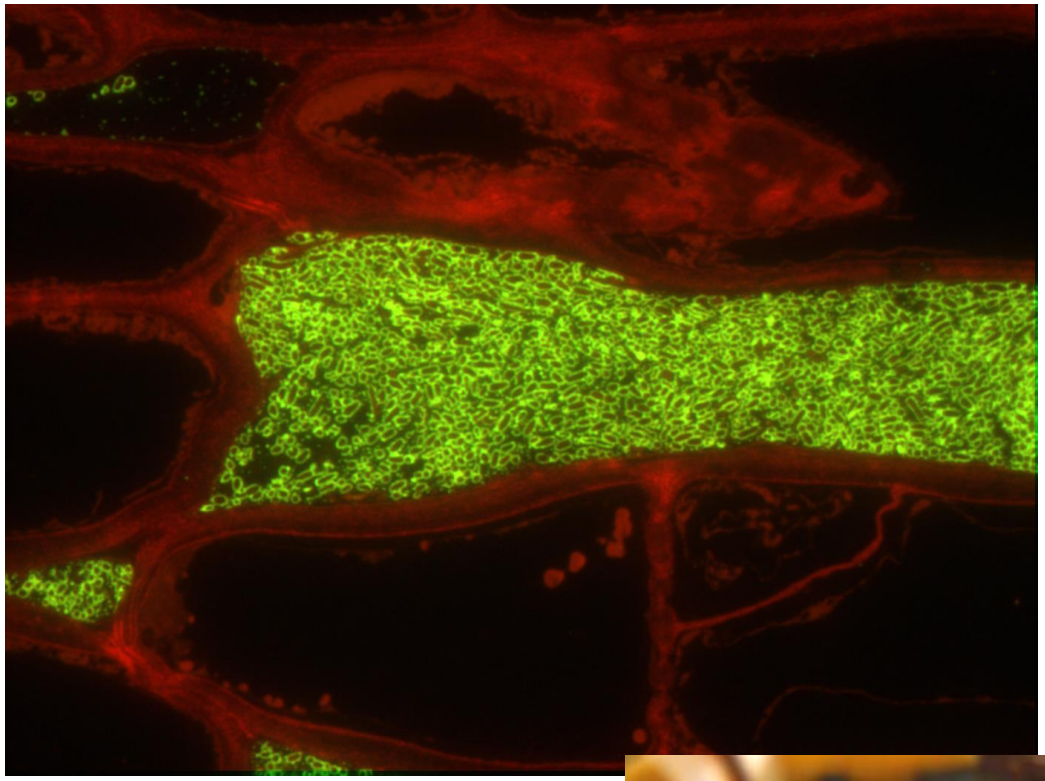
Psa infected cane cross-section 1000x



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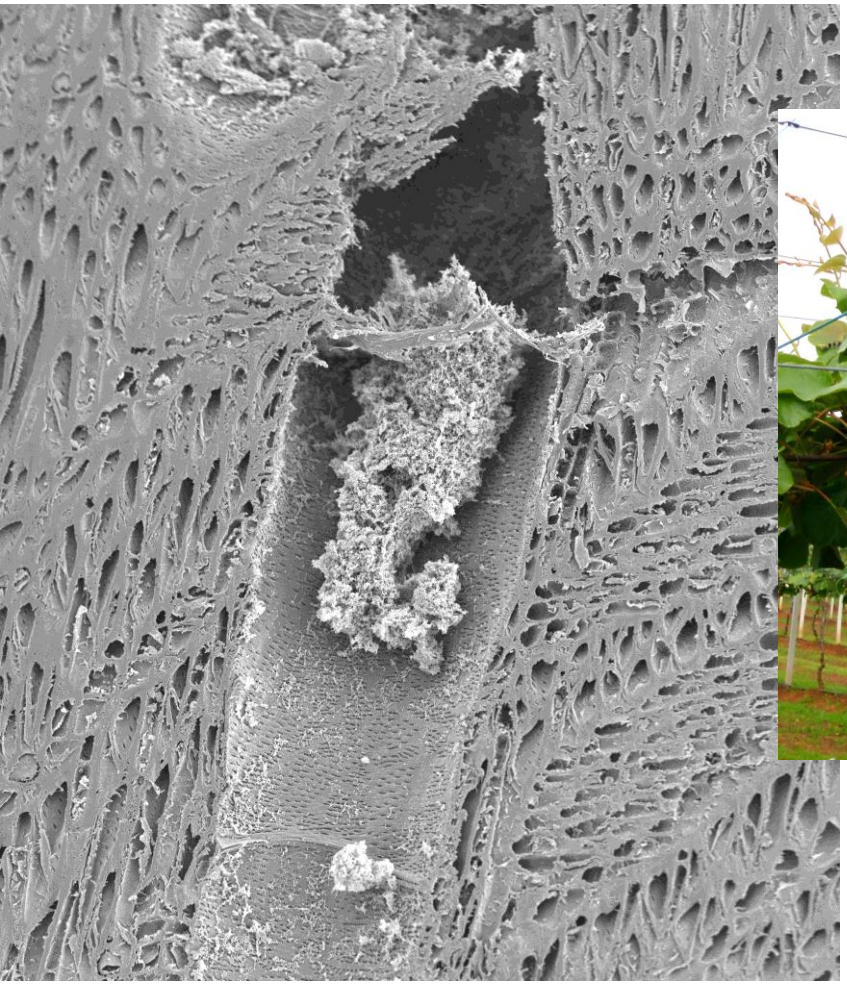
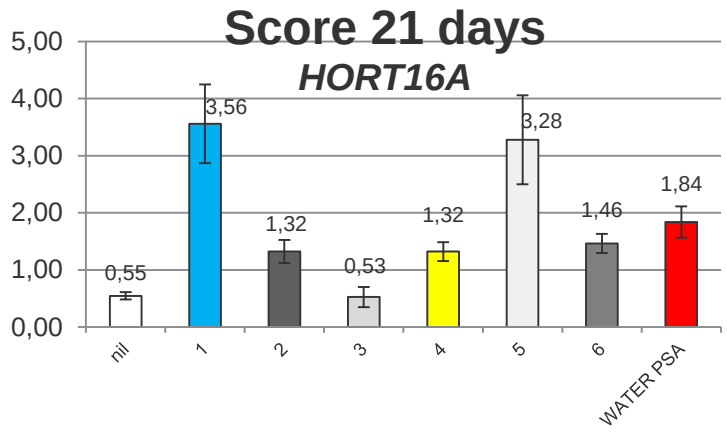
Colonisation of the xylem by Psa

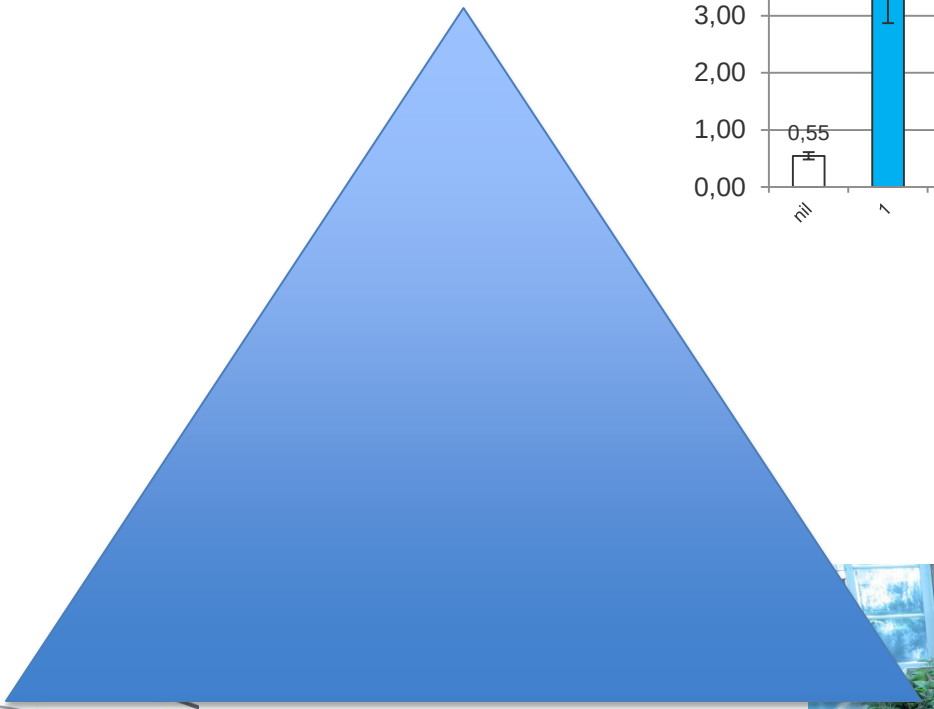


Paul Sutherland, Ian Hallett and Midori Jones

The solution to the Psa problem is in the disease triangle



Pathogen



Environment

Host

In conclusion

Plant & Food RESEARCH

RANGAHAU AHUMĀRA KAI

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