Pathogens for blackberry biocontrol

Dr Louise Morin
Principal Research Scientist

Forum *Managing Crown Land Boundaries*, Cudgewa, 18 August 2016

CSIRO HEALTH AND BIOSECURITY
www.csiro.au

CRC Weed management
Australian Government
Defeating the Weed Menace
Rural Research and Development for Profit
Keeping Australian farmers at the cutting edge
Australian Government
Department of Agriculture and Water Resources
NSW Government Local Land Services Murray
mla MEAT & LIVESTOCK AUSTRALIA
CSIRO

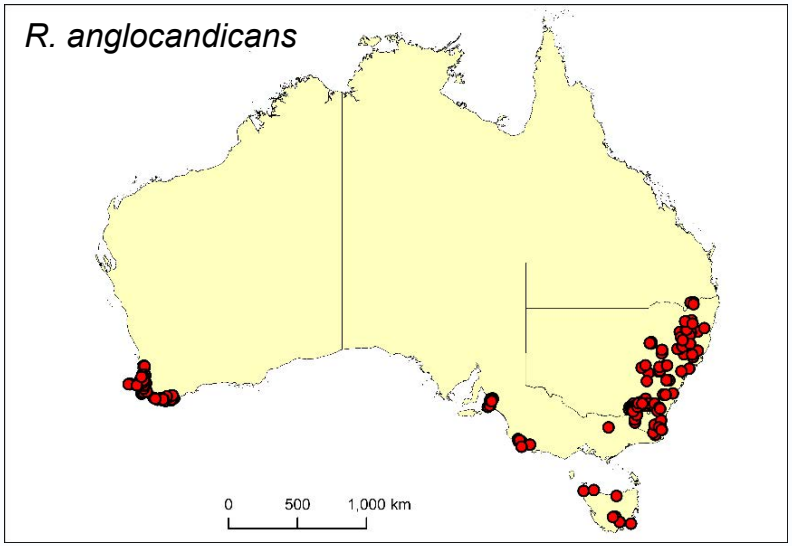
Blackberry in Australia

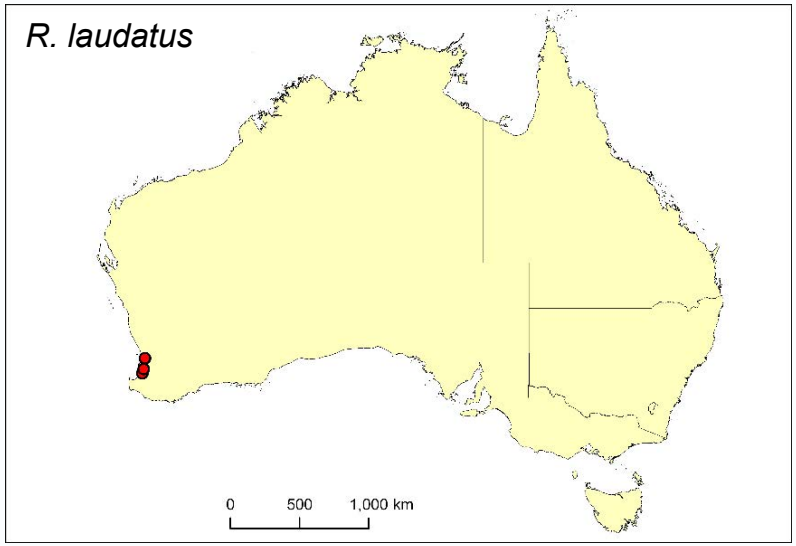
European blackberry

- *Rubus fruticosus* agg.
- at least 14 different but closely-related species naturalised
- *Rubus anglocandicans* – the most widespread

North American blackberry

- Several species naturalised, but taxonomy difficult
- introduced as horticultural plants, e.g. Loganberry
- *Rubus laudatus* – an emerging problem in WA

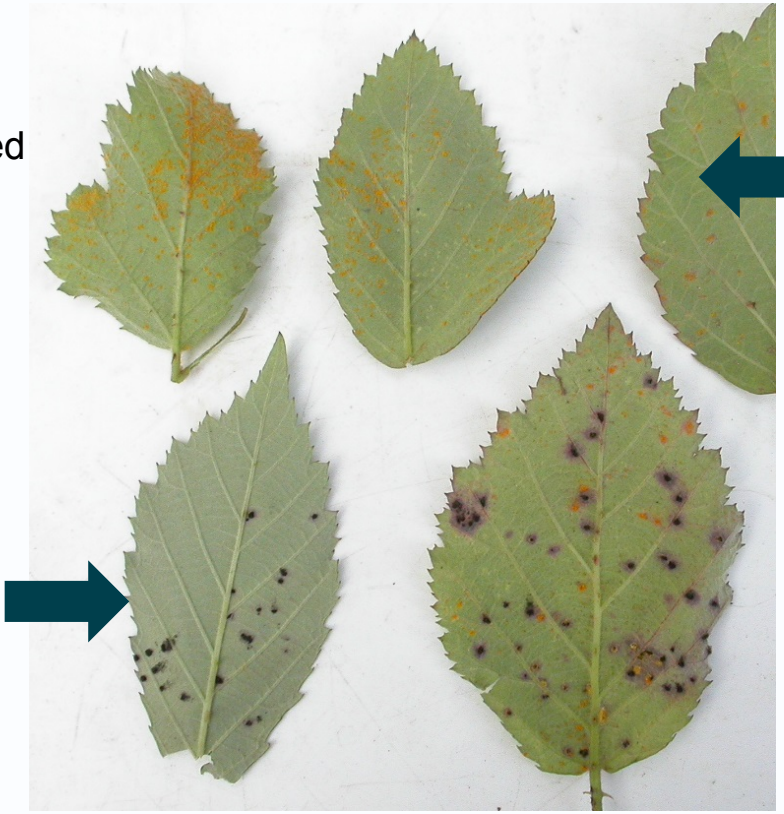




Rust fungi on blackberry in Australia

Leaf-rust fungus
Phragmidium violaceum

1984 – unauthorised introduction
1991 – F15 strain introduction
2004 – 8 additional strains introduced



Cane & leaf-rust fungus
Kuehneola uredinis

Cosmopolitan
Affects commercial cultivars

Impact of leaf-rust fungus (*P. violaceum*)

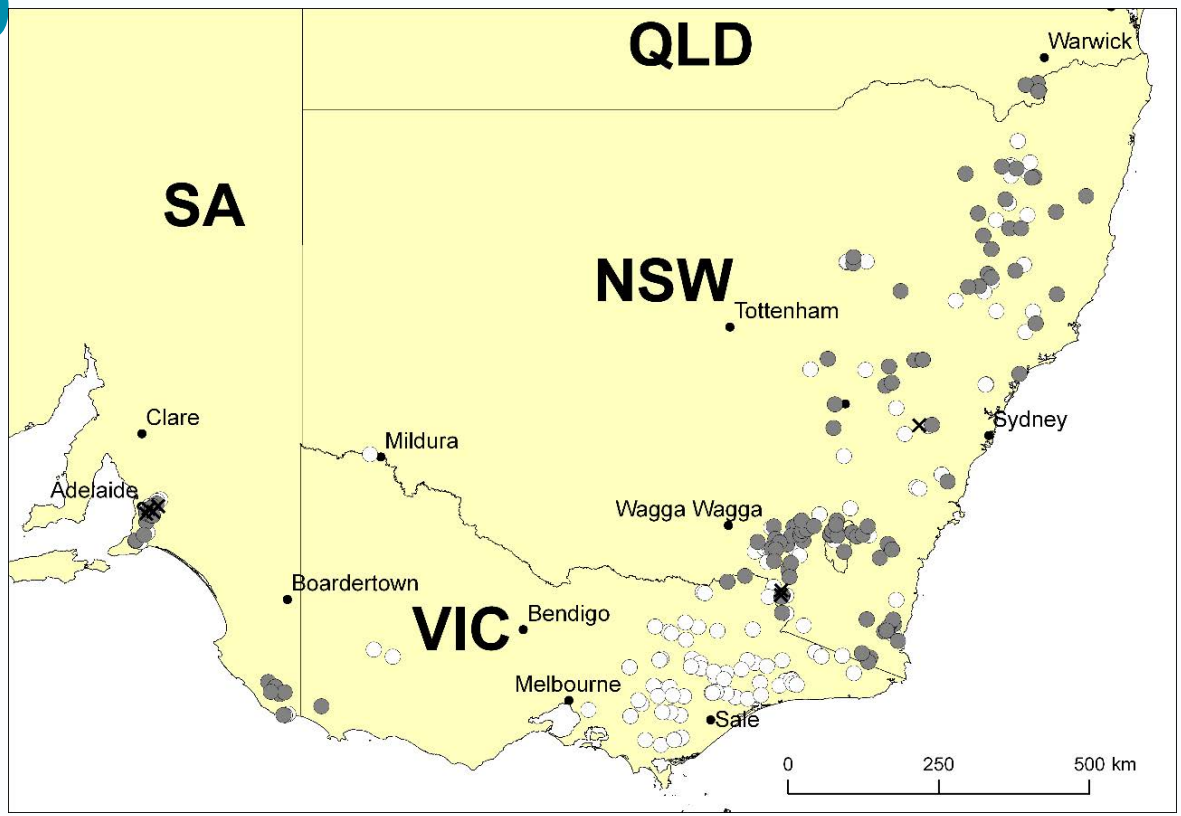
First record in 1984

Source: E. Bruzzese

Impact of leaf-rust fungus

Source: K. Evans

Large-scale releases of leaf-rust strains in 2006-09



Grey circle = Infection from at least one of the strains seen on inoculated canes after the release; Open circle = No feedback received after the release; Cross = No sign of infection after the release

Impact of leaf-rust fungus

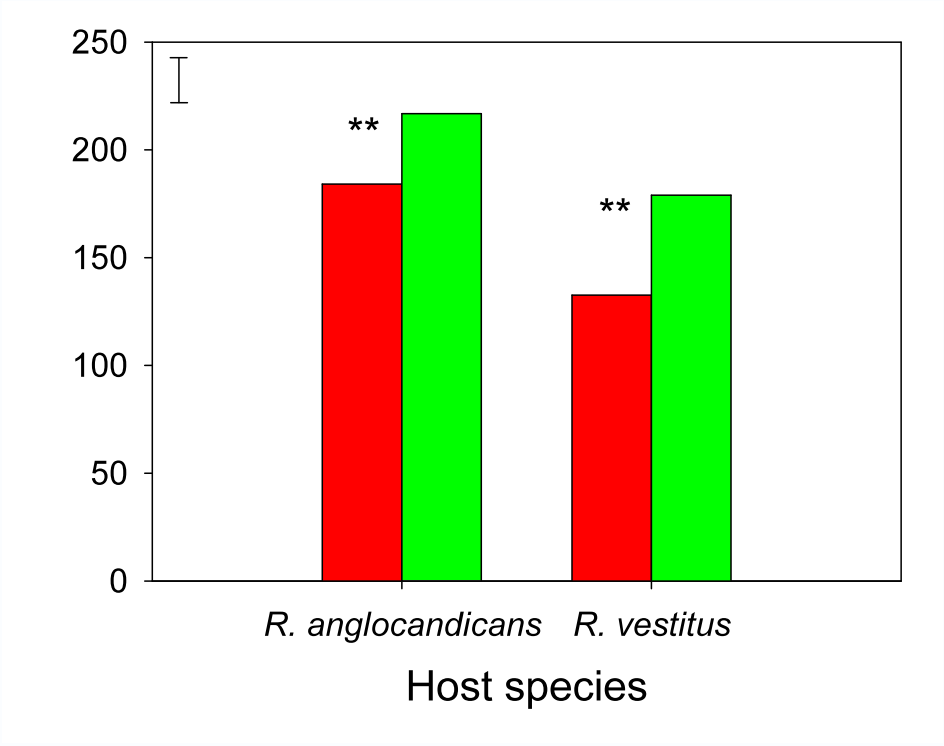
Field trial – fungicide exclusion – within one season

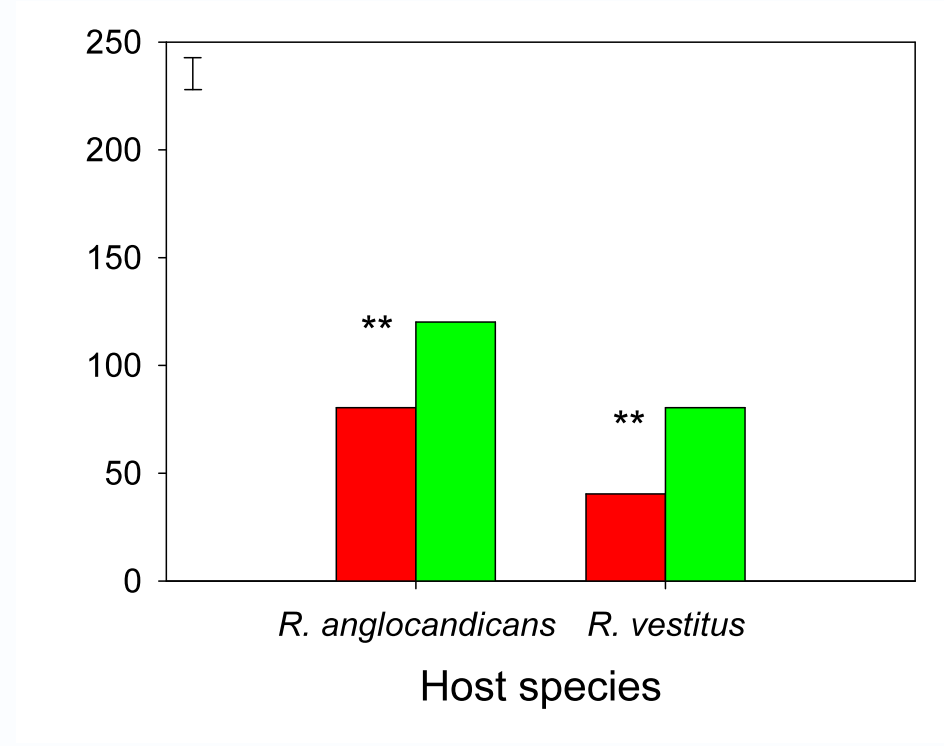
Krawaree, NSW Feb. 08

	Rust-infected	Rust-free
No. fruits / floricane laterals	16.8	30.3 *
No. leaves / floricane laterals	5.95	7.15 *

Impact of leaf-rust fungus

Shadehouse experiment – fungicide exclusion – within one season





Green = rust-free

Red= rust-infected

Other fungi on blackberry in Australia

Leaf-spot fungus – *Sphaerulina*

Cane anthracnose fungus – *Elsinoë veneta* (causes blotchy purple and grey lesions)

Photos: Pacific Northwest Management Handbook

Exotic fungus with potential for biocontrol?

Purple blotch fungus – *Septocyta ruborum*

- Can cause cane dieback
- Infects commercial blackberry cultivars in Europe and USA
- Found in NZ in 2007 on hybrid blackberry
- Similar to *Septoria rubi* that already occurs in Australia
- Biocontrol potential?

Photo: Washington State University

Blackberry decline

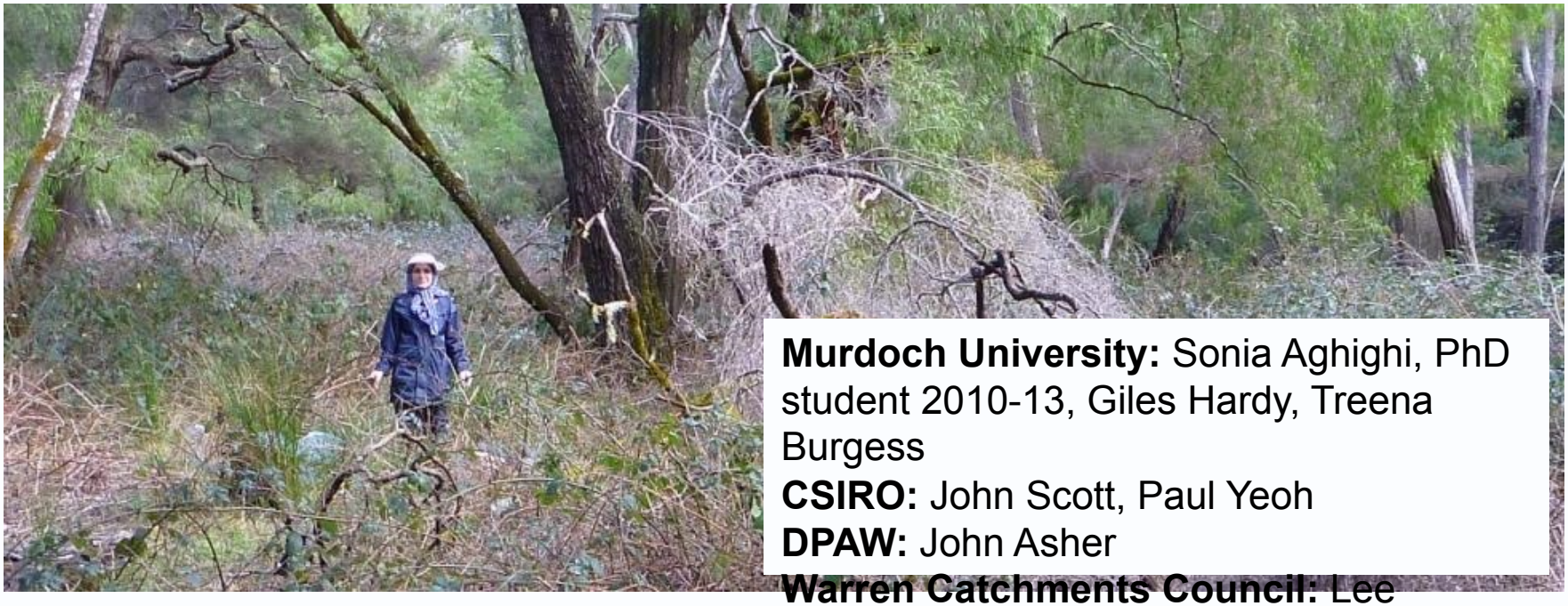
MURDOCH UNIVERSITY
PERTH, WESTERN AUSTRALIA

CPSM
Centre for Phytophthora Science and Management

Department of Parks and Wildlife

WARREN CATCHMENTS COUNCIL

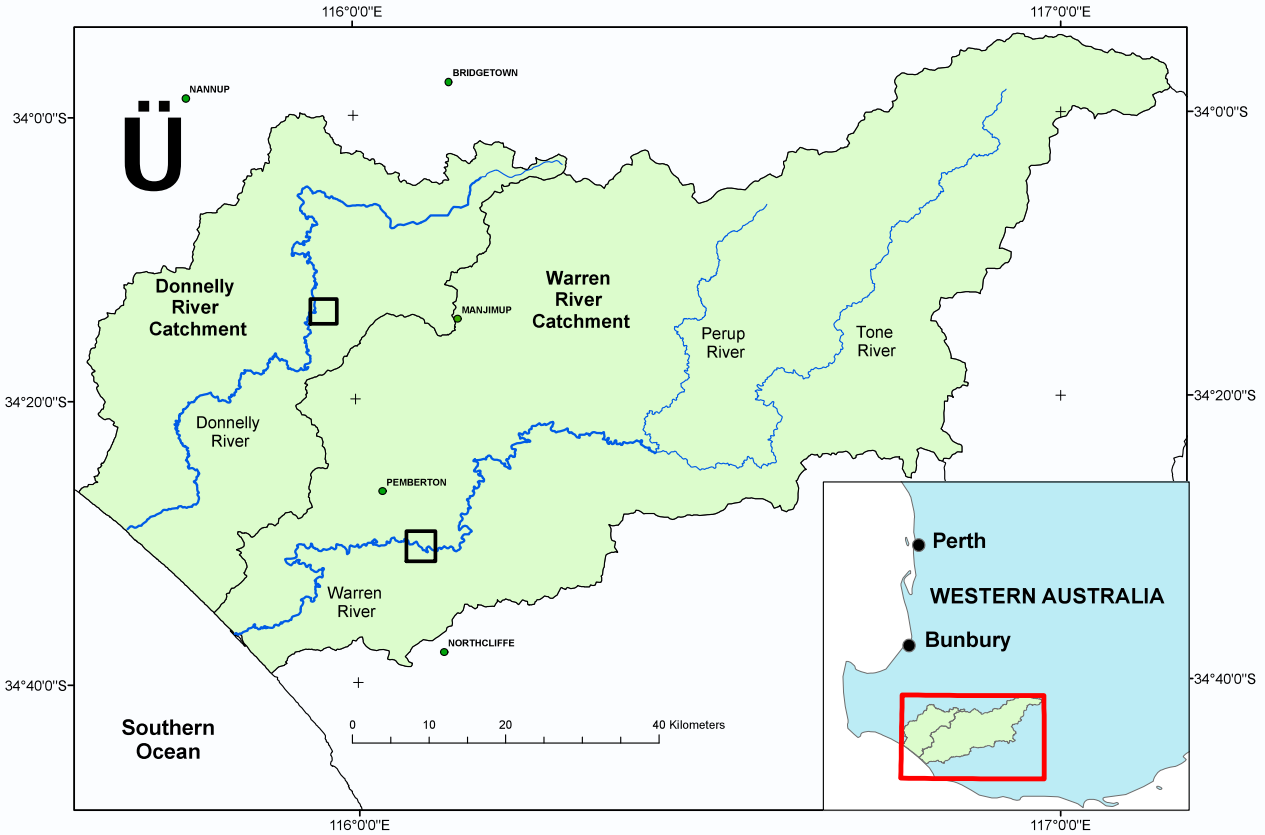
CSIRO



Murdoch University: Sonia Aghighi, PhD student 2010-13, Giles Hardy, Treena Burgess
CSIRO: John Scott, Paul Yeoh
DPAW: John Asher
Warren Catchments Council: Lee Fontanini

CSIRO

Blackberry decline - WA



Location of the Donnelly and Warren River catchments in Western Australia, and the two sites (black open squares) where blackberry decline was first recorded in 2007.

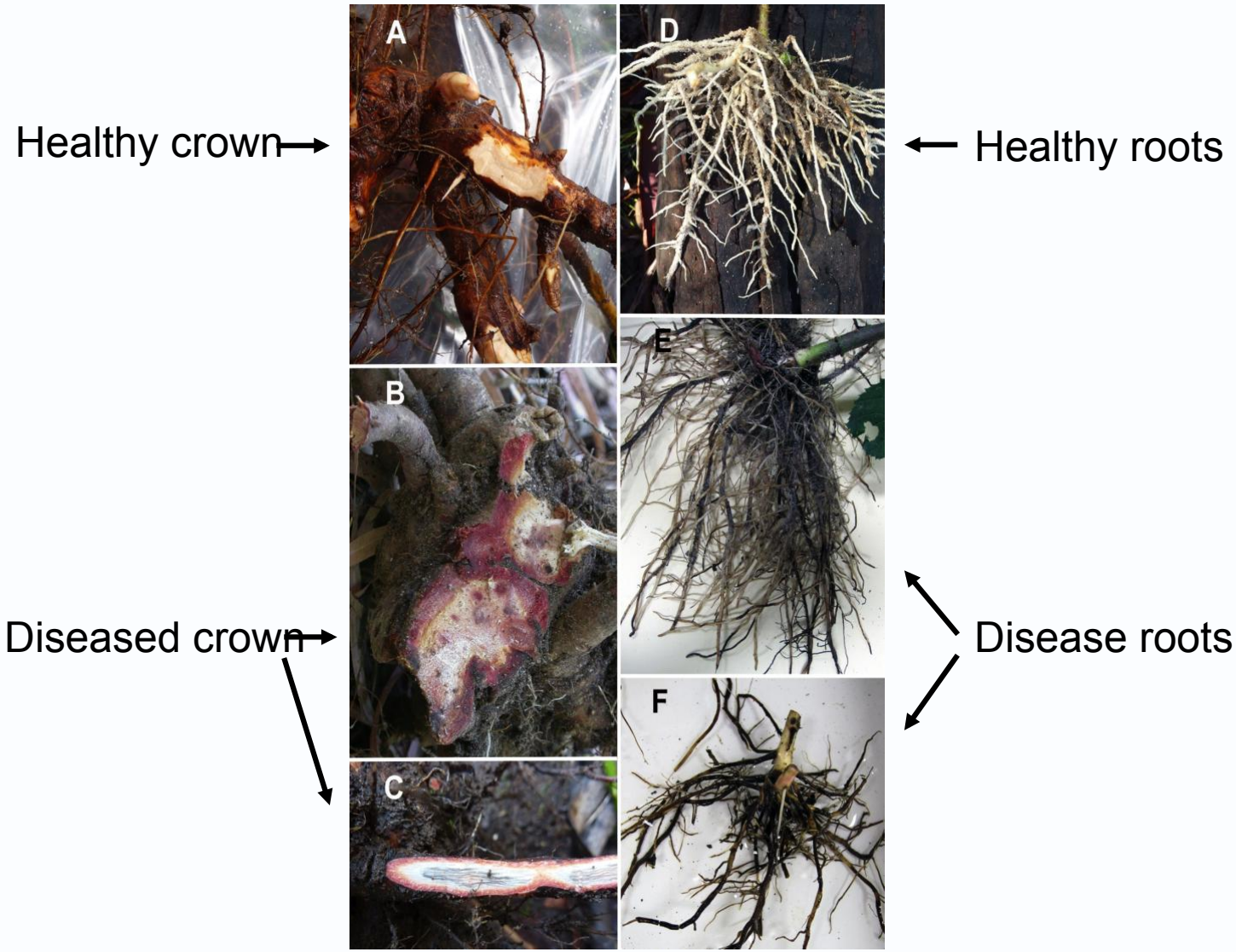
Blackberry decline – Warren River

October 2005

August 2008

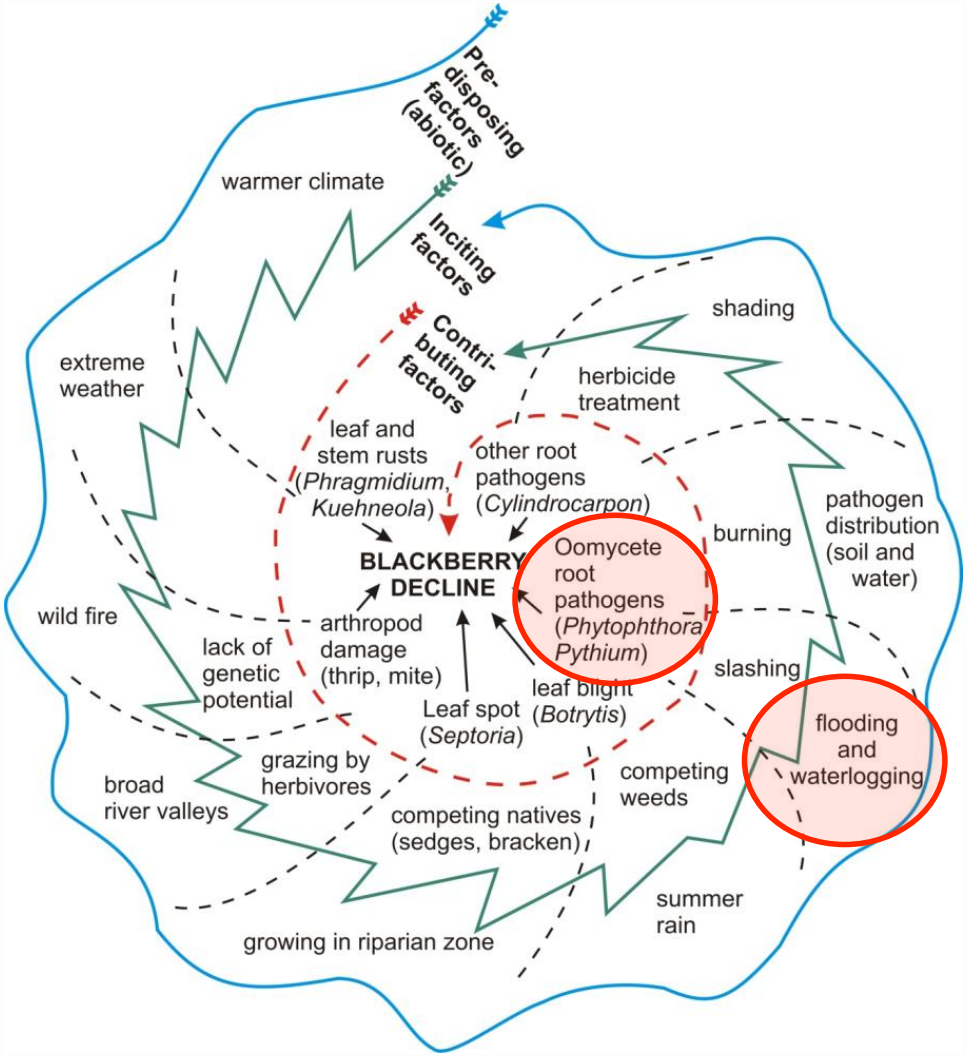
October 2014

Blackberry decline - symptoms



Aghighi et al. 2013. Plant Disease 98:580-589

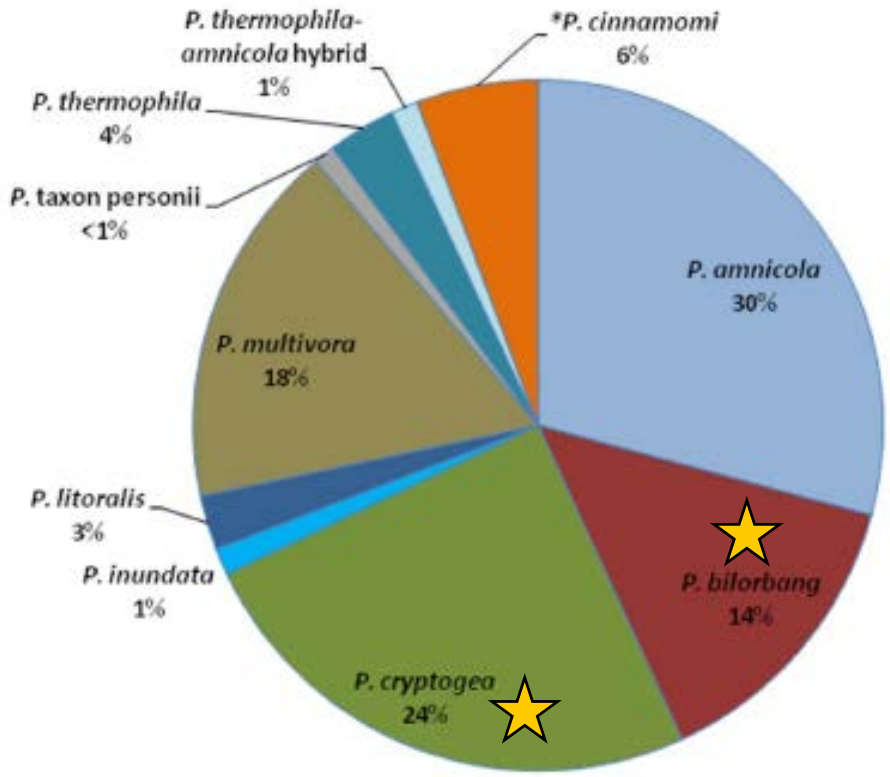
Blackberry decline – complex of factors



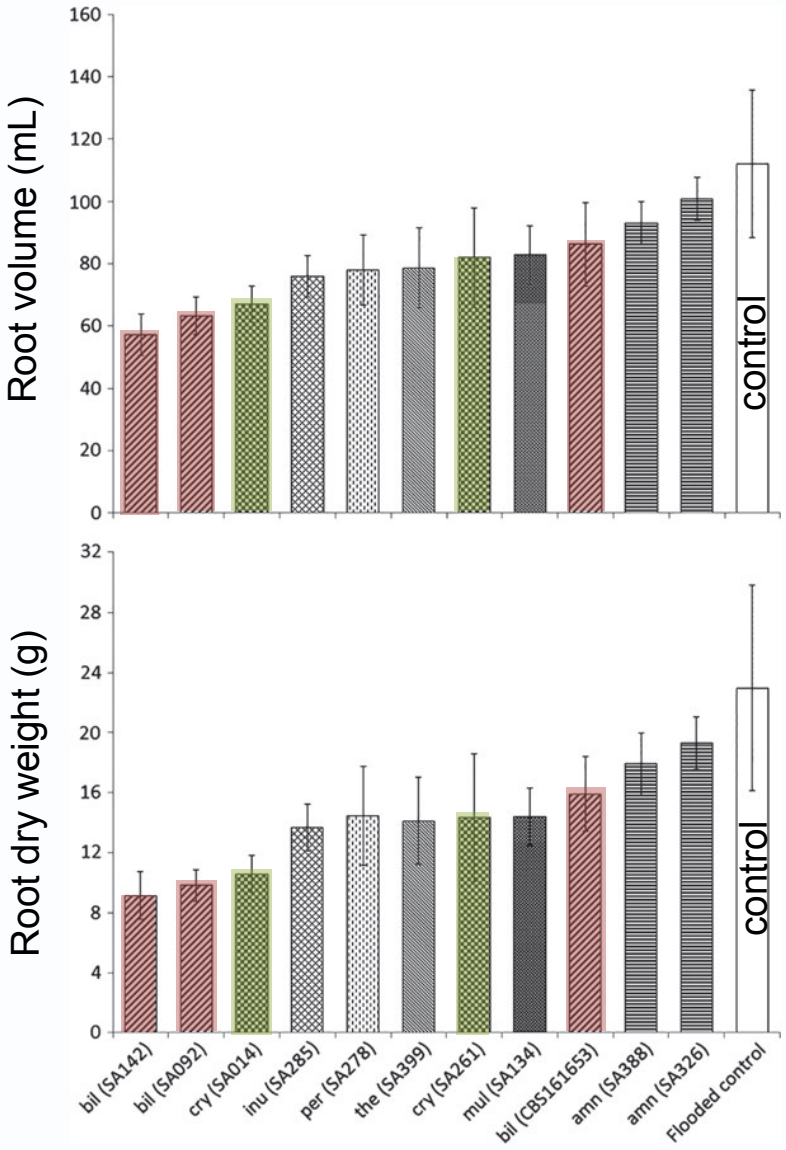
Aghighi et al. 2014. Plant Disease 98:580-589

Blackberry decline

Phytophthora species (n=162 isolates) recovered from blackberry decline surveys



Aghighi 2013



Aghighi et al. 2015

Blackberry decline – current work

Rural R&D for Profit Round 1: Fast-tracking and maximising the long-lasting benefits of weed biological control for farm productivity

Lead Rural RDC: MLA

Lead research provider – blackberry component: CSIRO

Project objectives (2015-18)

- Determine the potential of *Phytophthora bilorbang* as an inundative biological control tool for blackberry by developing prototype systems for its production and application, conducting host-specificity tests and evaluating its efficacy in field trials over two years.
- If promising, devise a plan for future large-scale delivery of *Phytophthora bilorbang* to land holders affected by blackberry. If not promising, make recommendations for next steps in the biological control of blackberry.

Blackberry decline – current work

So far we have:

- Tested different substrates to produce inoculum of *P. bilorbang* and identified a reliable solid-based system for experimental work.
- determined that *P. bilorbang* can only survive in colonised, un-dried vermiculite-based substrate stored at 4 and ~22°C for a period of up to 5 months.
- Performed a series of glasshouse experiments to replicate results of previous study.

But...

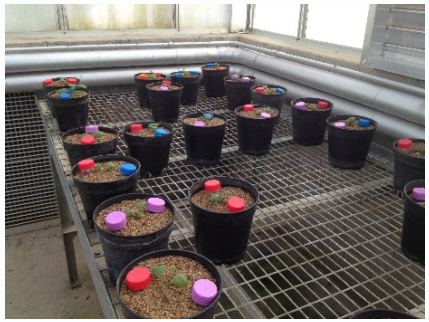
- results from glasshouse experiments were inconclusive. PhD student' isolates may have lost their pathogenicity in storage.

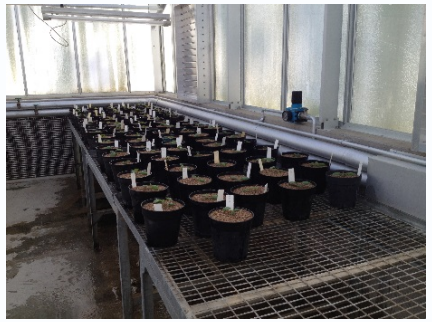
- Recollected new isolates of *P. bilorbang* and *P. cryptogea* from the field in May.

Blackberry decline – current work

Glasshouse experiment with new isolates

- *Phytophthora:*
  - 1- control;
  - 2- *P. bilorbang* alone;
  - 3- *P. cryptogea* alone;
  - 4- *P. bilorbang* + *P. cryptogea*
- Flooding (1-3 days):
  - 1- none;
  - 2- two events;





Blackberry decline – What's next?

Wait for results of current experiment (November at the earliest)

If promising

- Begin planning for host-range tests
- Begin consultation with relevant stakeholders in NSW/ACT, VIC, WA, to identify possible locations for field trials

If not promising

?

Will we be able to repeat this in field trials?

Before decline (Dec 2005)

Peak decline (Oct 2007)

After decline (Aug 2008)

Conclusion

no silver bullet

Thank you

CSIRO Health and Biosecurity Louise Morin
t +61 2 6246 4355
e louise.morin@csiro.au
w www.csiro.au

Acknowledgement

Kathy Evans (University of Tasmania), Robin Adair (formerly DPI Victoria), CSIRO staff in Canberra and Perth, Murdoch University staff