Landcare Research
Manaaki Whenua

Microbes, mites and broom-galls: unseen links, complex associations?

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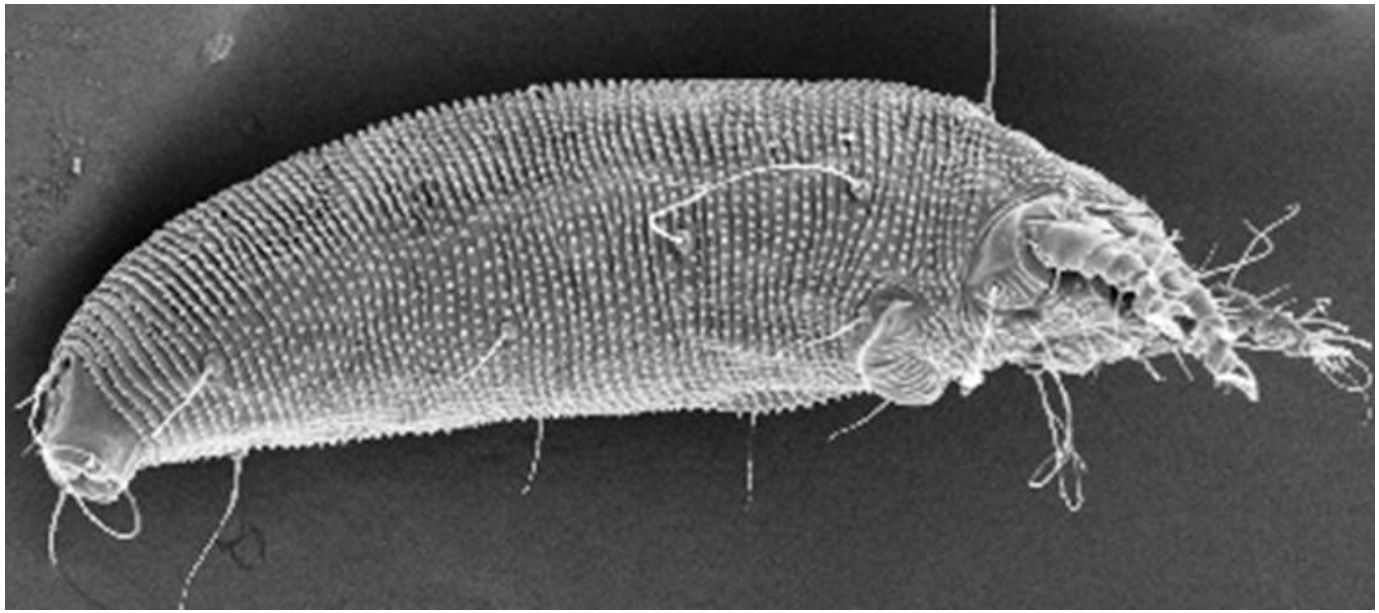
Talk overview

- Background
- Formation of galls
- Gall ecology
- Link to pathogens
- NZ inoculation experiment
- Microbial surveys
- Future work

Background

- Scotch broom serious weed in much of NZ affecting pasture, forestry and ecosystems.
- Eriophyid Gall mite, *Aceria genistae,* was introduced in 2008 to control broom



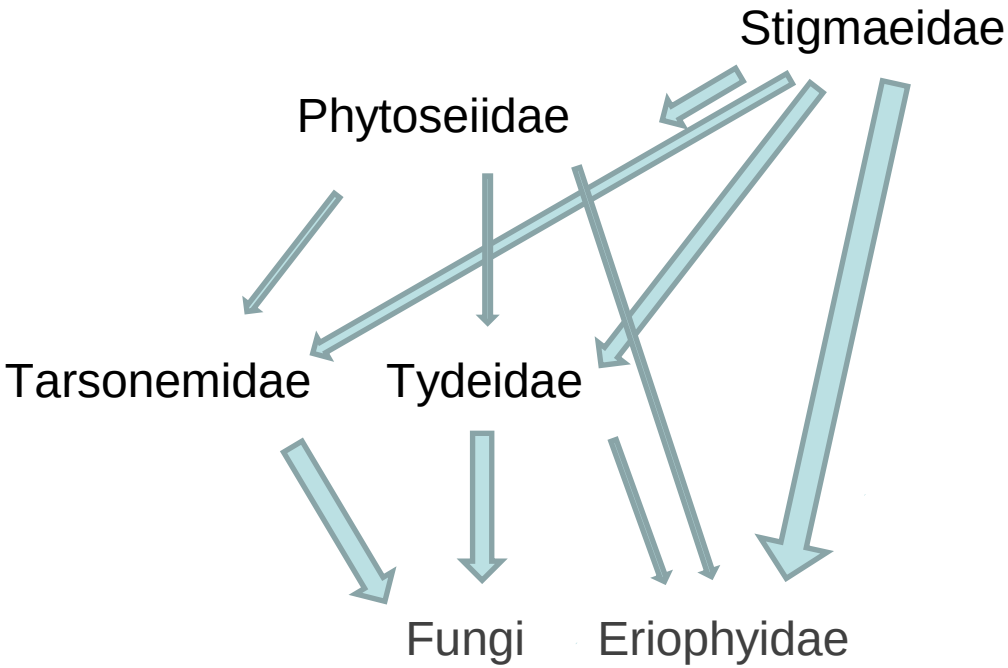
Broom-gall formation

- Mites feed on buds
- Development of distorted mass of small leaves
- Transformation into irregular, rounded, pubescent galls (5 – 30 mm)
- Death of branches and sometimes whole plants

Severely attacked broom at Lincoln – very promising biocontrol agent

What is going on in this new resource – some ecology

- Our studies show that lots of NZ mites have colonised the galls – a complex miniature food web



How do the mites form galls?

- Before the mites arrived similar but smaller galls were occasionally observed on broom in NZ

No gall

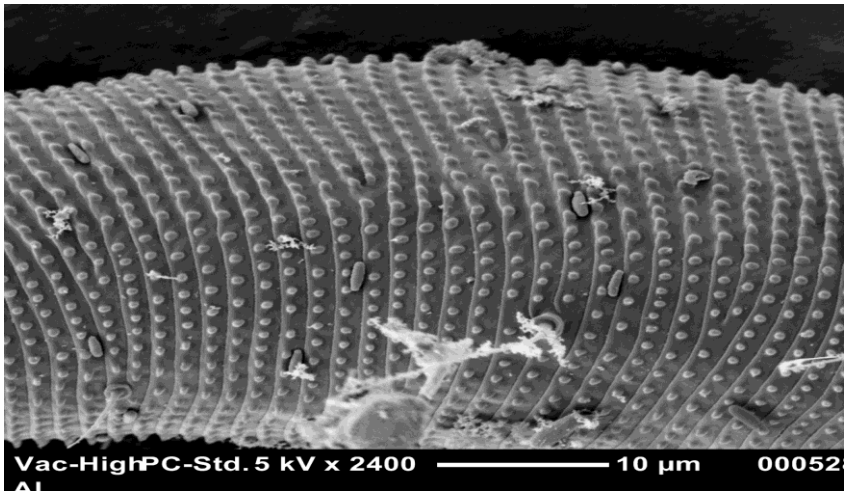
Galls with mites

Gall without mites

- Overseas research in 2008 showed that a related gall mite increases the frequency and severity of mango malformation disease
- Is the broom mite doing something similar with a pathogen that was previously only causing occasional small galls in NZ?

Interaction between mites and microbes?

- SEM showed presence of microbes on surface of mites
- Same size as bacteria isolated from galls
- Could mites be transmitting a gall-forming pathogen?



- Also raises the issues of what biota might have arrived on the mites when they were introduced into NZ

Dissecting the roles.....

Acarology – ecology

- Dissection of galls and isolation of mites
- Interactions between different mites
- Mite feeding trial
- Selective *miticide* spray trial
- Selective *fungicide* spray trial

Plant pathology

- Surface sterilisation of galls and stems
- Effect of *artificial* inoculation of microbes in/on broom
- Isolation of fungi and bacteria from French and New Zealand broom galls and stems
- DNA sequence identification

NZ inoculation experiment

- Microorganisms were recovered from broom galls
- Three fungi and one bacterium were selected and inoculated on broom seedlings
- Seedling height was recorded every 2 weeks, wet and dry weights of root and aerial biomass at the end of trial, presence/absence of galls
- Experiment was repeated three times

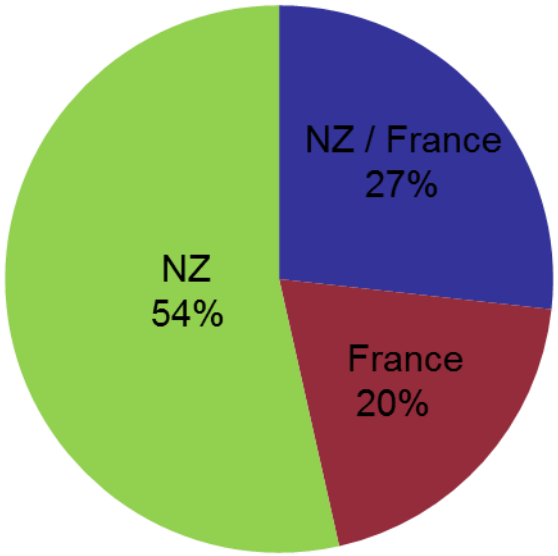
Absence of evidence

- Microbes were recovered from inoculated plants
- No differences between treatments
- Microbes isolated from galls were not able to induce gall formation
- *Aceria genistae* primary gall forming agent – our hypothesis for gall-formation with a vectored pathogen is rejected

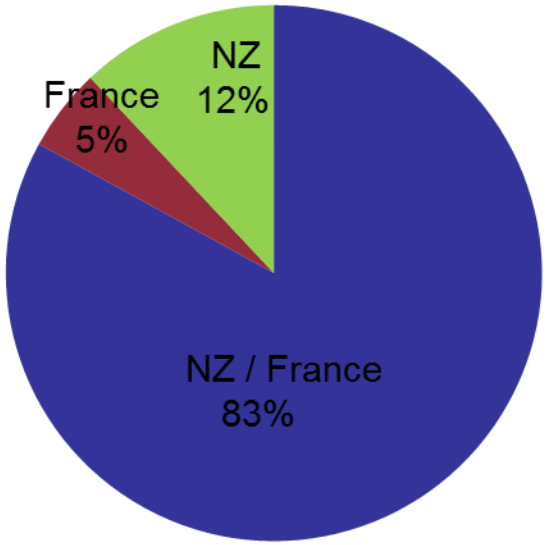
Microbial complexity

- Rich microbial biota in galls in France and NZ.
- Some only in France, some only in NZ, and some common to both.

Microbe diversity



Microbe frequency



Microbial complexity

- Could some new to NZ have arrived on the mite?
- Lack of baseline data in NZ makes current comparisons difficult.
- So we can’t be sure whether the detection of “overseas” organisms in NZ broom galls indicates introduction or lack of local detection.
- Modern molecular techniques are revealing all sorts of new stuff!

Current studies

- Trophic-levels studies investigating mite-mite interactions i.e. predator prey dynamics.
- Selected mite-fungi feeding trials - to determine mite-fungal feeding preferences.
- Potential further microbe-broom studies using fungi from overseas.
- Examination of the role of other microbes in gall formation e.g. viruses.

Thank you

With help from: Daniel Than, Peter Johnston, Bevan Weir, Duckchul Park, Sarah Hoffman, Simon Fowler, Lynley Hayes, Professor Eric Polevsky, Chris Winks and Lindsay Smith

Funding from: Landcare Research Capability Fund; Beating Weeds II