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The Death of Grass: The biology and role of the mealybug

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CRICOS No. 00213J

This mealybug: *Heliococcus summervillei*



Has caused dieback in

- Cooroy, Queensland 1926
- Atherton Qld 1938
- New Caledonia 1998-2003
- **Atherton 2016**
- Puerto Rico 2019
- Barbados 2020

Also found :

- on sugar-cane in Pakistan (1975)
- rice in West Bengal (1987)

New variant

Identified by Mark Schutze, Biosecurity Qld.

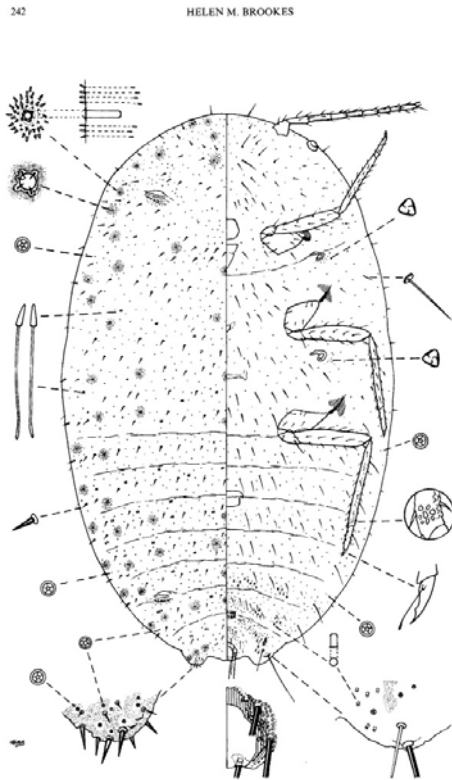


FIG. 1.—*Heliococcus summervillei* sp. n., adult female.

H. summervillei adult female. H. Brookes.

Heliococcus summervillei Brookes 1978

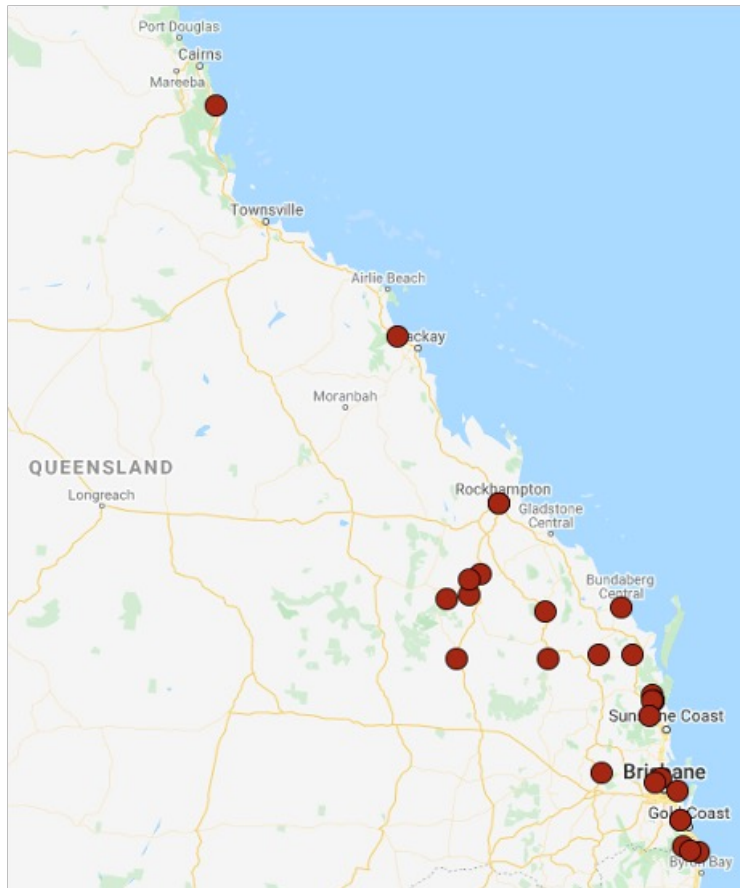
Old variant:

- Cooroy, Queensland 1926
- Atherton Qld 1938
- New Caledonia 1998-2003
- Puerto Rico 2019
- Barbados 2020

New variant: Atherton Tablelands 2016.

Similar to that found on sugar-cane in Pakistan, (1975)

Distribution and hosts



H. summervillei with pasture dieback

Schutze, M.K, D.J. Tree, C. Hauxwell, A.B. Dickson & P.J. Gullan 2019.
The Mealybugs Strike Back: the return of *Helicococcus summervillei* and Queensland pasture dieback.
Aus. Ent. Soc. Conference 2019, Abstracts p. 126.

- *Bothriochloa bladhii* (Australian bluestem)
- ***Bothriochloa insculpta* (Creeping blue-grass)**
- *Brachiaria decumbens* / *Urochloa decumbens* (Signal grass)
- ***Cenchrus ciliaris* (Buffel grass)**
- *Chloris gayana* (Rhodes grass)
- *Dichanthium sericeum* (Queensland bluegrass)
- *Digitaria eriantha* (Pangola)
- *Lolium rigidum* (Annual ryegrass)
- ***Megathyrsus maximus* (Guinea grass)**
- *Melinis repens* (Red Natal grass)
- ***Panicum maximum* (green panic, Gatton panic)**
- *Paspalum dilatatum* (Dallis grass)
- ***Paspalum mandiocanum* (Broad-leaved paspalum)**
- *Paspalum notatum*
- *Setaria splendida* (Setaria)
- *Themeda triandra* (Kangaroo grass)
- *Urochloa oligotricha* (Urochloa)

AND

- ***Saccharum officinarum* (sugarcane)**

NOT LEGUMES OR BRASSICAS

The end point: the death of grass



Before death: the symptoms...



Induced symptoms buffel grass 2020.
C.Hauxwell, QUT

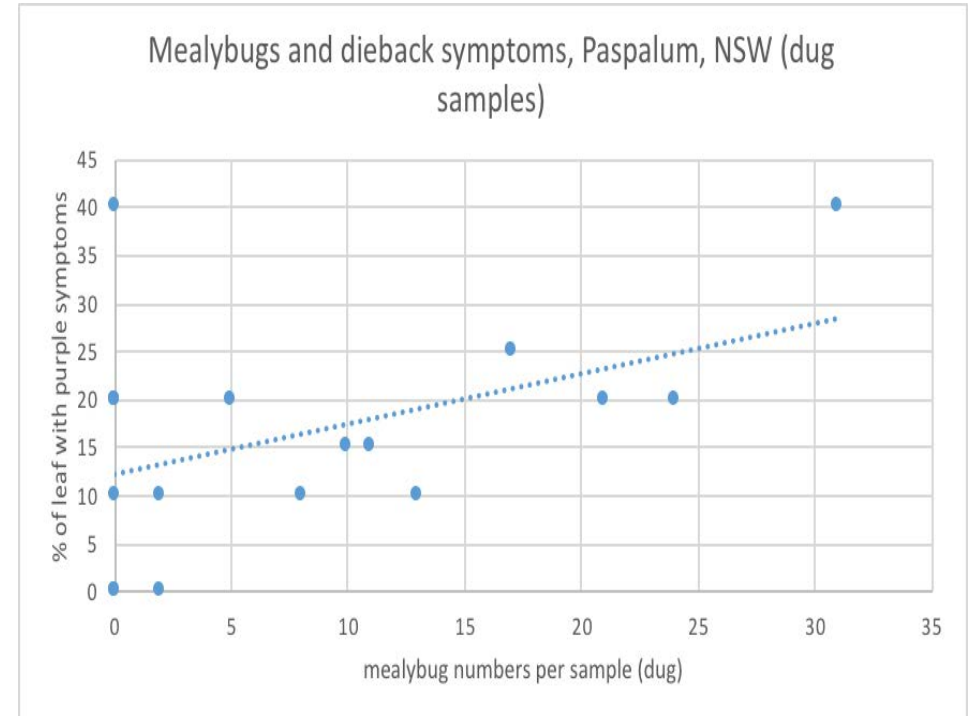
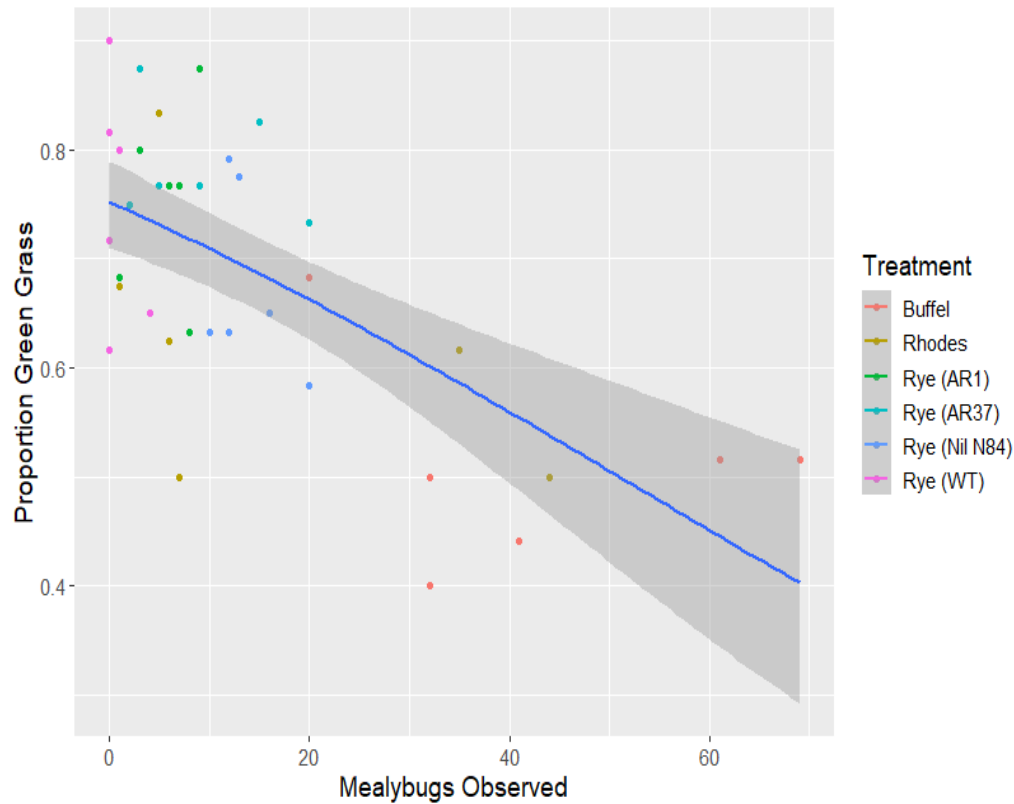


Symptoms of mealybugs!



Very early symptoms in Urochloa
C. Hauxwell, QUT

Increased mealybugs = more symptoms... ...but more often it is presence/absence



Correlation in variety tests ($p < 0.001$)

2 insecticides under permit

Permit Number	Description	Date Issued	Expiry Date	Comments
PER8742 3	Confidor 200 SC Insecticide (imidacloprid) Grass pastures Pasture mealybug (<i>H. summervillei</i>)	Feb- 21	Feb- 24	New minor-use permit. Issued for NSW and Qld only. APVMA requires residue data for the renewal of the permit.
PER8848 2	Movento 240 SC Insecticide (spirotetramat) Various pastures Pasture mealybug (<i>H. summervillei</i>)	Sep- 19	Sep- 22	New emergency permit. Issued for NSW and Qld only. APVMA requires additional residue data for the renewal of the permit.

Systemic insecticides target leaf and roots

Movento (Spirotetramat)

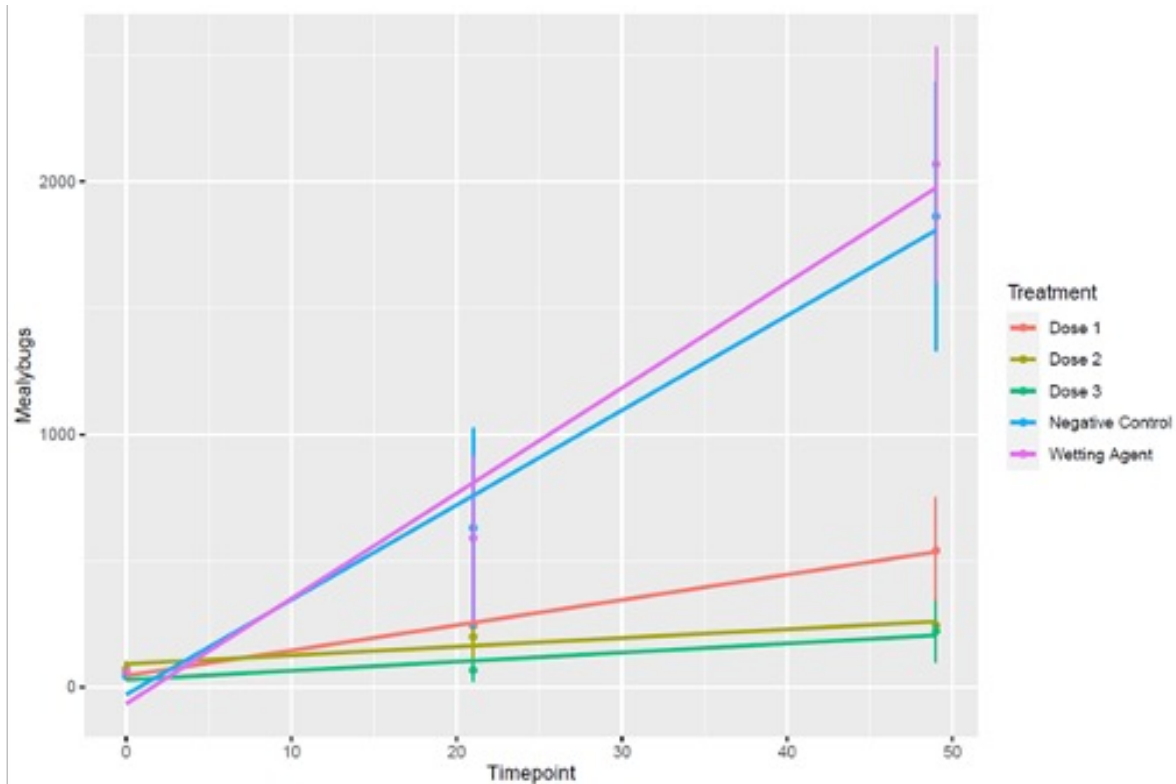
Imidacloprid: 6 month exclusion period

Only for incursion management

Not for large areas

Useful for small, emerging patches in spring and summer – so monitor!

Insecticides are effective



Screenhouse tests 2020, 2021

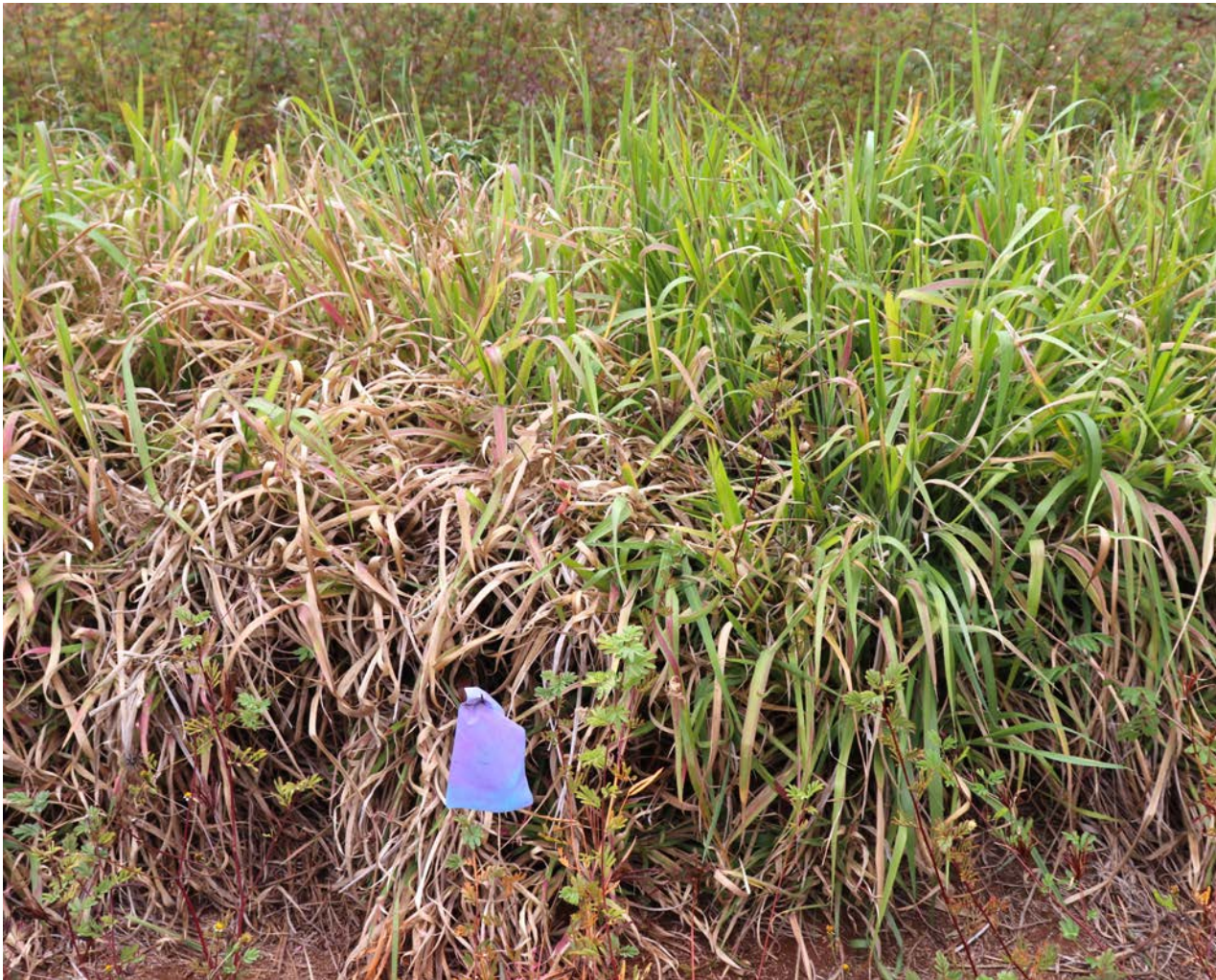
- Spirotetramat, Imidacloprid & rates
Buffel, Rhodes & sugarcane

Field trials: 2019, 2020, 2021, 2022

- Buffel, Bluegrass
- Spirotetramat (and rates),
Imidacloprid
- New products (Sivanto)
- Microbial products

2 applications 2-3 weeks apart

Chemical control: Spirotetramat, Imidacloprid



Significant reduction in mealybug numbers with

Recovery and growth of treated grass plots

Decline and death of grass in untreated plots

Dieback insecticide trial
Untreated left, Treated right. Birkdale 2019.
Photo: Don Loch



Dieback in buffel grass infested with first adult mealybugs.
Edward Bryans, QUT

How fast can they kill?



Dieback in buffel grass infested with first instar mealybugs.
L.Oliver, QUT

- Buffel grass in sterile vermiculite.
- First symptoms: 4 days
- All treated plants with symptoms by 21 days.
- Mortality 30 days to 3 months.
- **But** in the field / screenhouse can take much longer – is strongly seasonal
- **There's time!**

How does 'dieback' happen?



Sucking pest: Feeds on sap

- Saliva injected
- **Suppression of plant defenses (JA/SA crosstalk) within 24 hours.**
- Genes JA biosynthesis downregulated
- Genes SA response upregulated
- Plant may live but: unproductive
- **Plants die from secondary infections (*Fusarium*)**

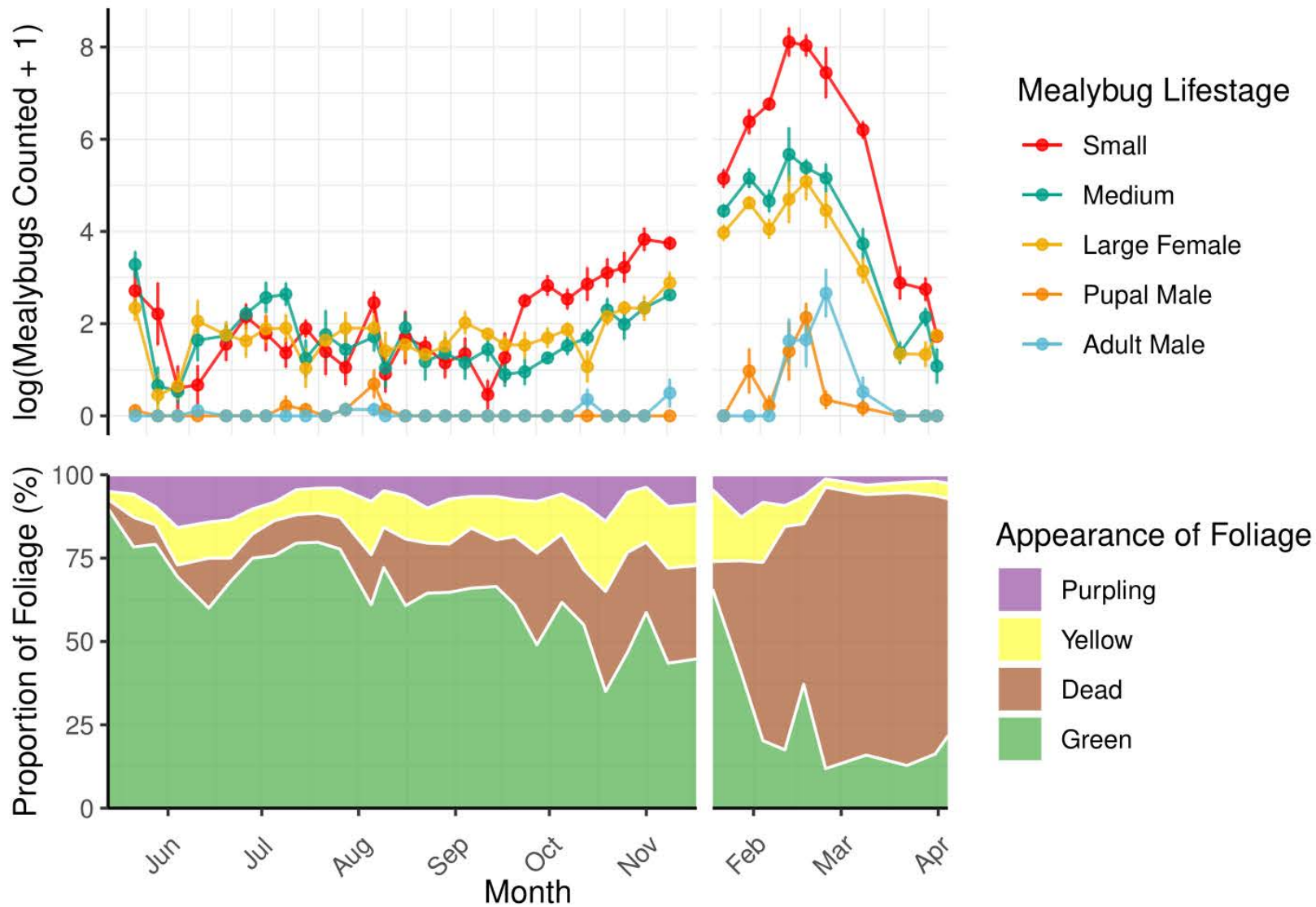
Biology and reproduction

Pasture Mealybug Population Sex Ratio



- Reproduction is exclusively sexual (at least in the lab)
- Mated (pink) females do not feed...
- ...disperse by crawling...
...move frequently and rapidly between leaf, crown and soil in response to dry, cold
- **Nymphs feed on leaf**
- Disperse by wind

Seasonal biology: the key to management



Sampling: Let us count the ways



Transects and sweep nets at Brendale, May 2020.
L. Oliver, QUT

- Transects & quadrats
- Cut leaf & soil cores
- Full destructive sampling
- Seasonal monitoring
- Natural enemies
- Plant endophytes
- Soil microbiota

Monitoring resilient and recovered sites as well as chronic and severe infestations.



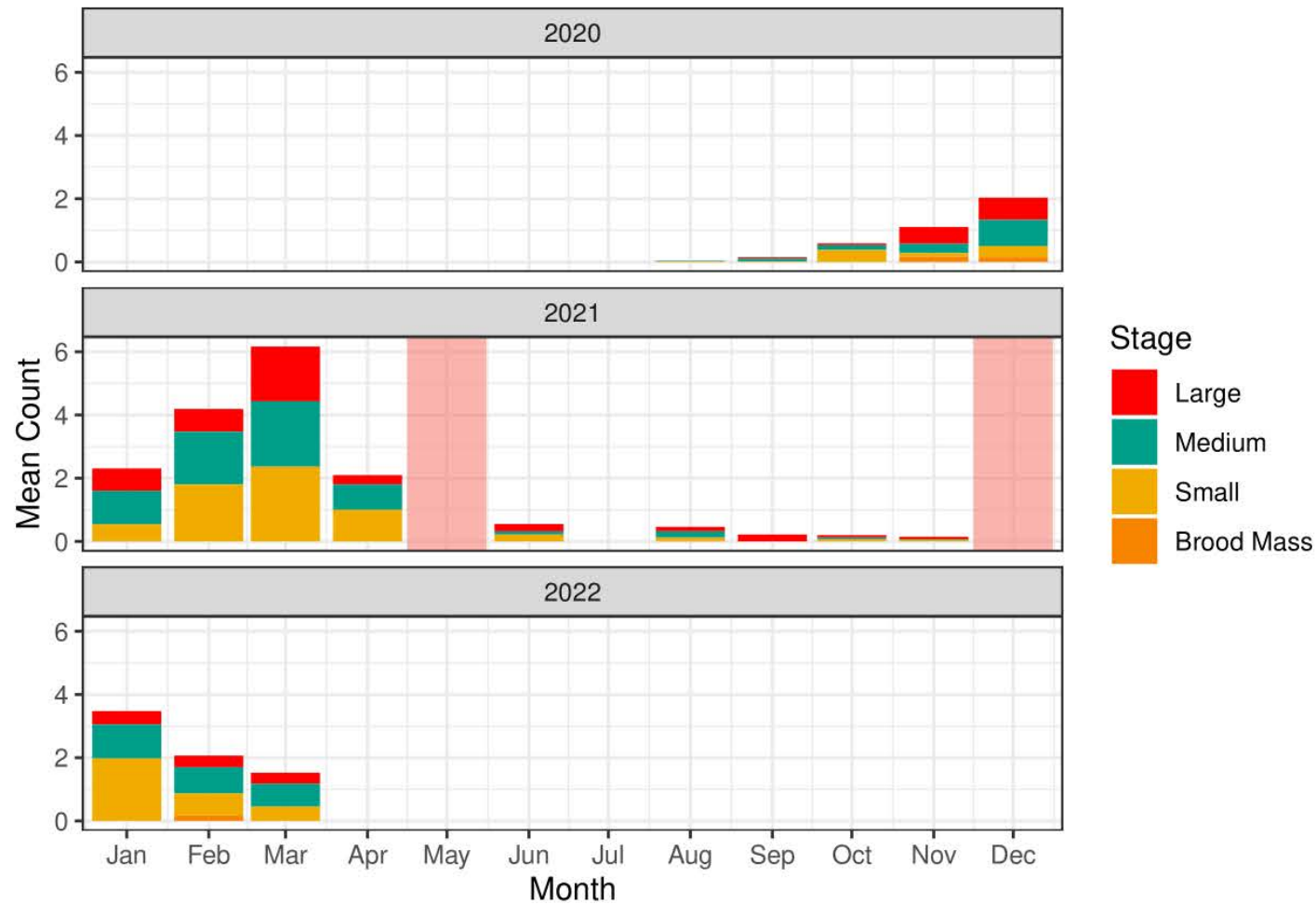
Get down and dirty

- Run a 50m transect
- Use a post hole shovel
- Carefully lift onto plastic
- Search from top to bottom for 10 minutes
- Use a hand lens
- Repeat 5 to 10 times along transect

- Don't try this from the ute!

Sampling for pasture mealybugs.
C.Hauxwell, QUT

Seasonal biology: the key to management



‘Peak season’: small/medium feeding instars in warm months after rain

Mealybugs overwinter in refugia



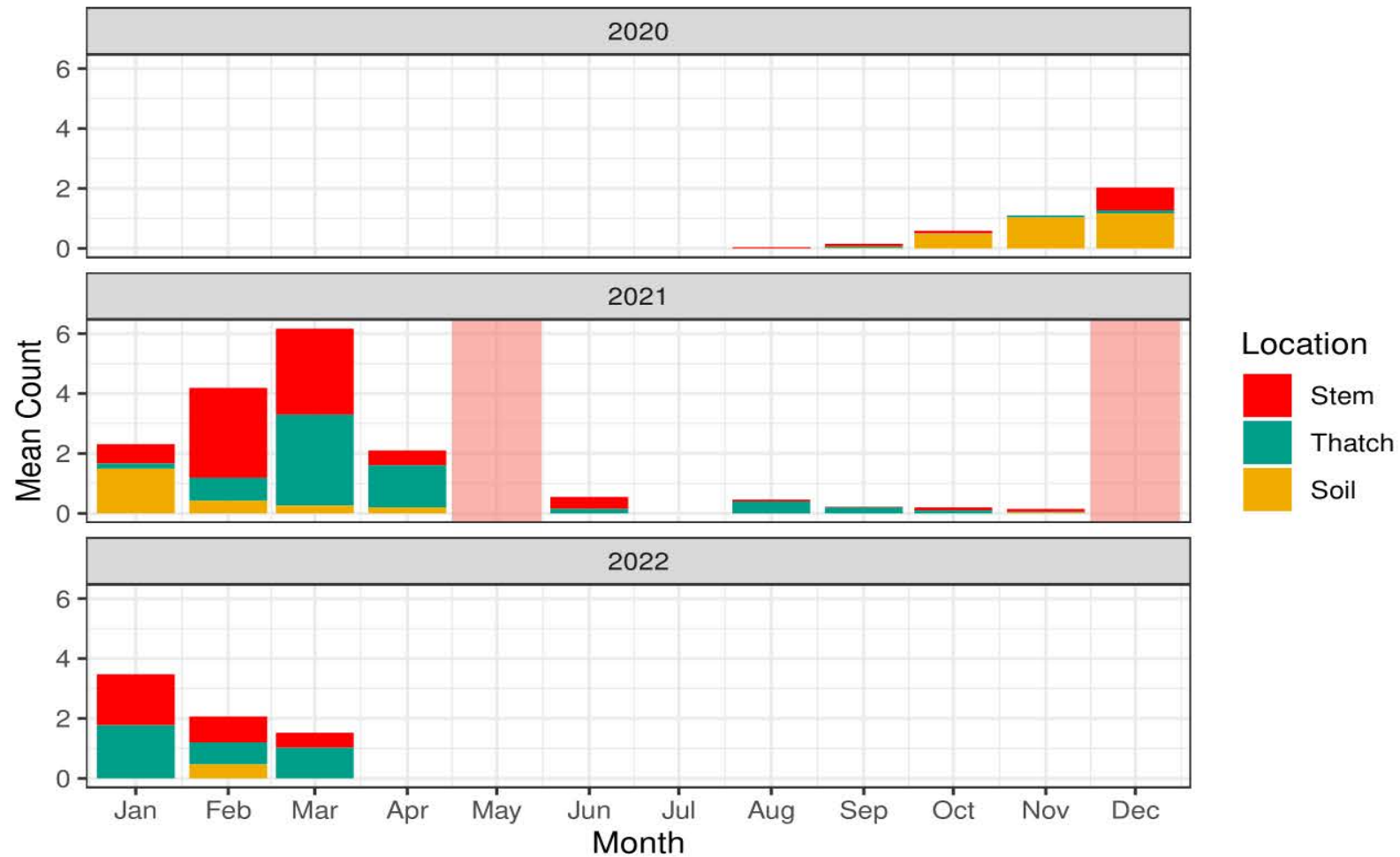
Inspection of roots and soil for pasture dieback mealybugs.
Photo: Ray Morgan



Mealybugs reproduce in soil.
Photo: C. Hauxwell, QUT.

- Move rapidly from leaf to refugia in winter and dry
- Under thatch & debris
- In soil via cracks
- Up to 900mm depth

Seasonal biology: the key to management



‘Peak season’: abundance on leaf in warm months after rain

Seasonal biology: to target control



H. summervillei male. G. Dickson QUT



Male with female. L. Oliver QUT



Adult females (arrow)

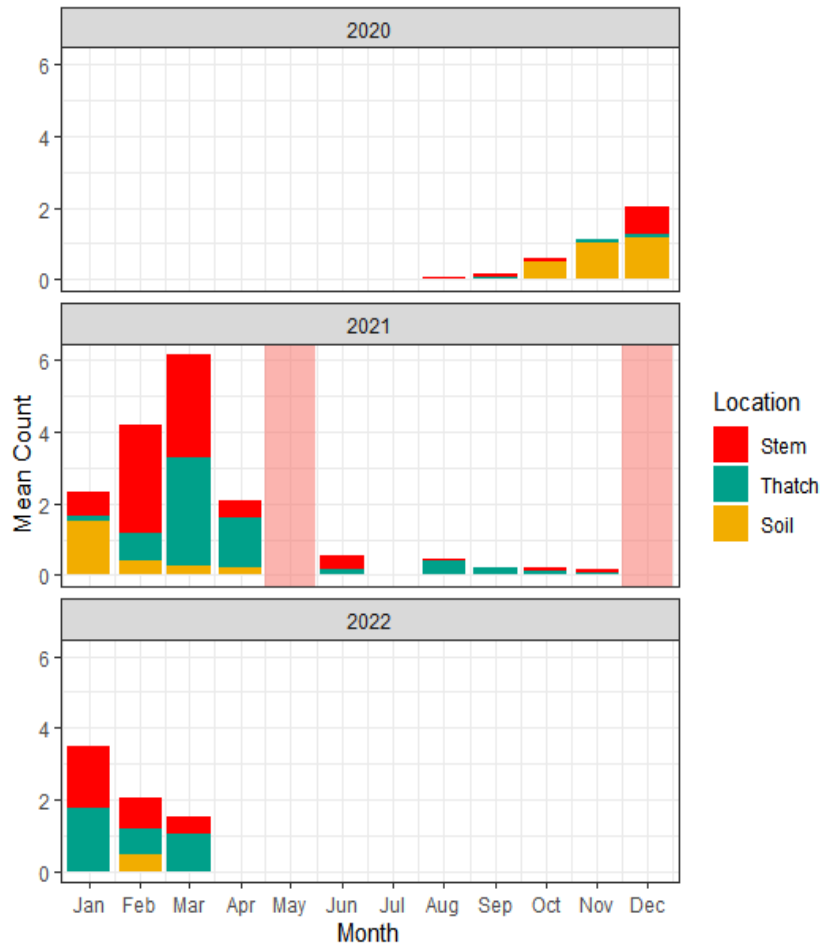
Photo: R. Morgan, C. Hauxwell (QUT)



H. summervillei "egg mass" and female in soil.
C.Hauxwell, QUT

- Adult males: winged, spring/early summer, **do not feed.**
- Mated females are pink, **do not feed: disperse,** overwinter in soil, thatch, under cowpats and logs
- Reproduce in thatch, on leaves, and in soil
- **Early instars feed and cause damage** (both sexes)

Seasonal biology: the key to management



September - December

- Females hide in upper soil/thatch and reproduce!
- Emerge onto leaf with rain and warmth

December to April:

- Large breeding population in thatch
- **Lots of small instars on leaf** – this is what does the damage
- Summer rain : pasture death

April – September:

- Mature females disperse into refugia: soil, logs, cowpats, dense thatch.

Emergency control only:



Australian Government
Australian Pesticides and
Veterinary Medicines Authority

PERMIT TO ALLOW EMERGENCY USE OF A REGISTERED AGVET CHEMICAL
PRODUCT FOR THE CONTROL OF PASTURE MEALYBUG IN MIXED PASTURE

PERMIT NUMBER - 88482

This permit is issued to the Permit Holder in response to an application granted by the APVMA under section 112 of the Agvet Codes of the jurisdictions set out below. This permit allows a person, as stipulated below, to use the product in the manner specified in this permit in the designated jurisdictions. This permit also allows any person to claim that the product can be used in the manner specified in this permit.

THIS PERMIT IS IN FORCE FROM 16 SEPTEMBER 2019 TO 30 SEPTEMBER 2022.

Permit Holder:
MEAT AND LIVESTOCK AUSTRALIA LTD
C/O AgAware Consulting Pty Ltd
21 Rosella Avenue
STRATHFIELDSAYE VIC 3551.

Persons who can use the product under this permit:
Persons generally.

Systemic insecticides: Movento
(Spirotetramat), Imidacloprid

Best use:

Spring & summer populations

Early instars feeding on leaf

Small areas

Not: adult females, dry grass, soil
(winter, drought)

Only for incursion management

Not viable for large areas



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CRICOS No. 00213J

This is a pest – we can beat it!

Monitor

- Know the early symptoms
- Learn to find mealybugs
- Be proactive and seasonal

Manage

- Graze / slash: reduce thatch
- Spray emerging patches?
- Improve with legumes & brassicas
- Choose tolerant grasses
- Try break and forage crops
- Improve soil nutrition: phosphate



“When you have eliminated all which is impossible, then whatever remains, however improbable, must be the truth.”