Kiwifruit Biosecurity Grower Update 2020

ASB Arena, Mount Maunganui

4th November 2020

Plant & Food™ Research
Rangahau Ahumāra Kai

Biocontrol preparedness for brown marmorated stink bug – a research update

Dr Gonzalo Avila
Science Team Leader – Biological Control
Applied Entomology Group, Bioprotection

THE SCIENCE OF PREMIUM™

Know your enemy – *Halyomorpha halys*

Brown marmorated stink bug (BMSB)


Highly polyphagous


Native to Asia


Highly mobile


Multiple generations


Feeds on everything


Overwintering stage

Pre-emptive classical biocontrol for BMSB

- A novel approach
  - ✓ Usually wait for pest to arrive first
  - ✓ BCAs selected, screened & pre-approved before pest arrival
- BMSB pre-emptive research started in late 2015
- In close collaboration with industry (cross-sector)
- Effective biocontrol preparedness for a potential invasion

Pre-emptive classical biocontrol for BMSB

Most promising BCA: *Trissolcus japonicus* – Samurai wasp


Egg parasitoid


Not really host-specific

High parasitism rates


More females than males


Short developmental time


More generations than host

Approval to release Samurai wasp

- **March 2018** – Research results included in application to EPA for approval to release Samurai wasp, if an incursion of BMSB is discovered in NZ
- **August 2018** – EPA granted approval for conditional release of Samurai wasp
- **A huge milestone** for pre-emptive classical biocontrol in NZ, **and a world first!**

BioControl
https://doi.org/10.1007/s10526-019-09949-x

Check for updates

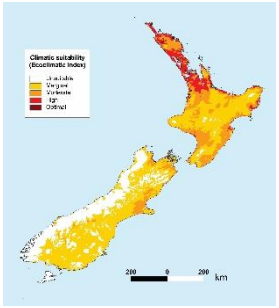
Experimental assessment of the biosafety of *Trissolcus japonicus* in New Zealand, prior to the anticipated arrival of the invasive pest *Halyomorpha halys*

J. G. Charles · G. A. Avila · Kim A. Hoelmer · Sophie Hunt · Robin Gardner-Gee · Frances MacDonald · Vicky Davis

BioControl (2018) 63:505–518
https://doi.org/10.1007/s10526-018-9866-8

Modelling the potential geographic distribution of *Trissolcus japonicus*: a biological control agent of the brown marmorated stink bug, *Halyomorpha halys*

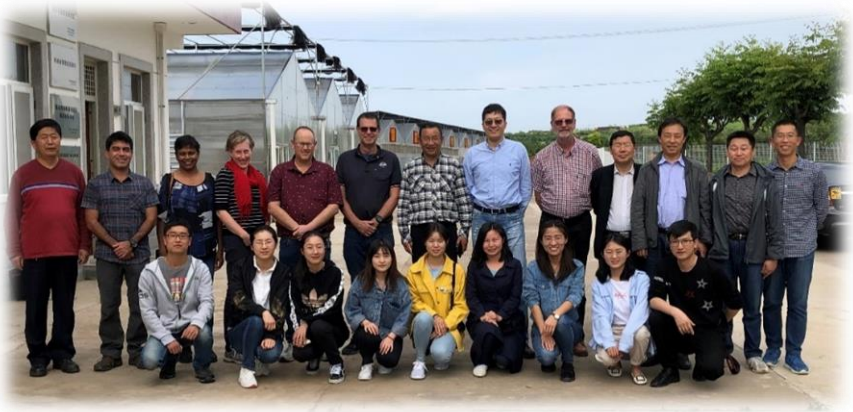
G. A. Avila · J. G. Charles



Current pre-emptive biocontrol research:
Optimising biocontrol for BMSB in kiwifruit

Experimental kiwifruit station - NWAFU

Shaanxi province, Mei County



Zespri/KVH funded project

Optimising biocontrol for BMSB in kiwifruit

- Understanding parasitoids abundance and diversity in kiwifruit (2018 – 2021)
- Investigate optimum release numbers of Samurai wasp, timing and frequency in kiwifruit (2019 – 2022)
- Green (‘Hayward’) kiwifruit orchards (Organic & Conventional)
- Key research for future BMSB biocontrol in kiwifruit

Optimising biocontrol for BMSB in kiwifruit

Understanding parasitoids abundance and diversity in kiwifruit (2018-2019)

- Field collection of wild BMSB egg masses
- Exposure of laboratory-reared BMSB egg masses (‘sentinel egg masses’) to natural parasitism
- Trials conducted from May to September (mid-spring to late summer)

Optimising biocontrol for BMSB in kiwifruit

Understanding parasitoids abundance and diversity in kiwifruit

Summary of combined result **2018-2019**:

- Parasitism found from May to August
- Average parasitism observed – **29%**
  - ✓ Conventional – 27%
  - ✓ Organic – 31%
- 5 parasitoid species found to date
- Two dominant parasitoids
  - ✓ *T. japonicus* (48%)
  - ✓ *T. cultratus* (45%)

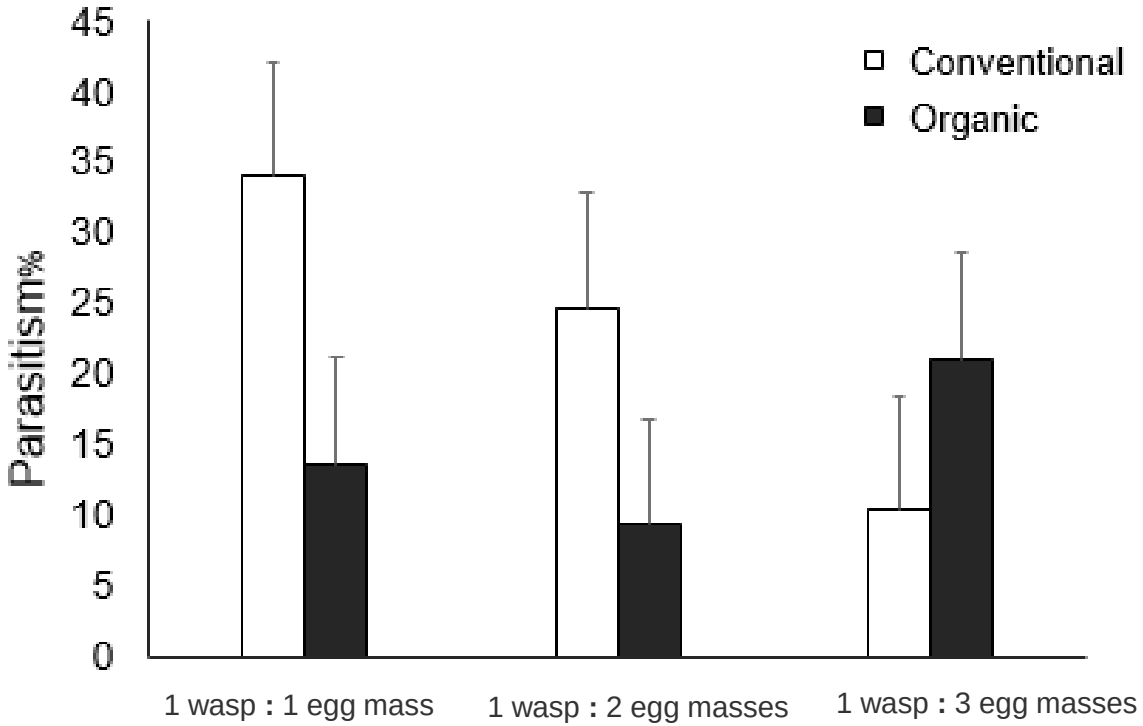

Trissolcus japonicus


Trissolcus cultratus

Optimising biocontrol for BMSB in kiwifruit

Optimum release numbers of Samurai wasp, timing and frequency in kiwifruit (started in 2019)

- **Parasitism by Samurai wasp at different host density (May to September)**



Current pre-emptive biocontrol research:
Dispersal behaviour of Samurai wasp

Dispersal behaviour of Samurai wasp after release – August 2019

(BMSB Council funded)

- Host location success rate
- Distance that Samurai wasp can disperse unaided
- Experimental work in collaboration with USDA – ARS (Newark, Delaware)

GIA Biosecurity through Partnership
Government Industry Agreement for Biosecurity Readiness and Response

Ministry for Primary Industries
Manatū Ahu Matua

Current pre-emptive biocontrol research:
Fecundity and mortality of Samurai wasp

Fecundity and natural mortality of Samurai wasp in the field (BMSB Council funded) – 2021-2022

In collaboration with CABI-China

- Life-time fecundity and egg laying frequency
- Natural mortality rate
- To be conducted in China

GIA Biosecurity through Partnership — Government Industry Agreement for Biosecurity Readiness and Response

Ministry for Primary Industries
Manatū Ahu Matua

Pre-emptive classical biocontrol for BMSB:
Complementary ongoing research

- Assessing how Samurai wasp can make use of host chemical cues to locate target and non-target hosts **(B3 funded),** Tom Saunders, PhD student

- Assessing the potential use of irradiated (sterile) parasitoids to be used as an eradication tool – Samurai wasp/BMSB **(B3 funded),** Kiran Horrocks, PhD student

Pre-emptive classical biocontrol for BMSB:
Future / New research opportunities

Additional pre-emptive biocontrol work with a second parasitoid species:
Trissolcus mitsukurii

Female *T. mitsukurii*
Photo: USDA - Steve Valley

Acknowledgments

Zespri™ KIWIFRUIT

KVH KIWIFRUITVINEHEALTH

GIA Biosecurity through Partnership

Government Industry Agreement for Biosecurity Readiness and Response

Ministry for Primary Industries
Manatū Ahu Matua

B3 Science Solutions for BETTER BORDER BIOSECURITY
www.b3nz.org

Plant & Food™ Research
Rangahau Ahumāra Kai

Thank you

plantandfood.co.nz

Gonzalo.Avila@plantandfood.co.nz

OUR SCIENCE IS GROWING FUTURES™