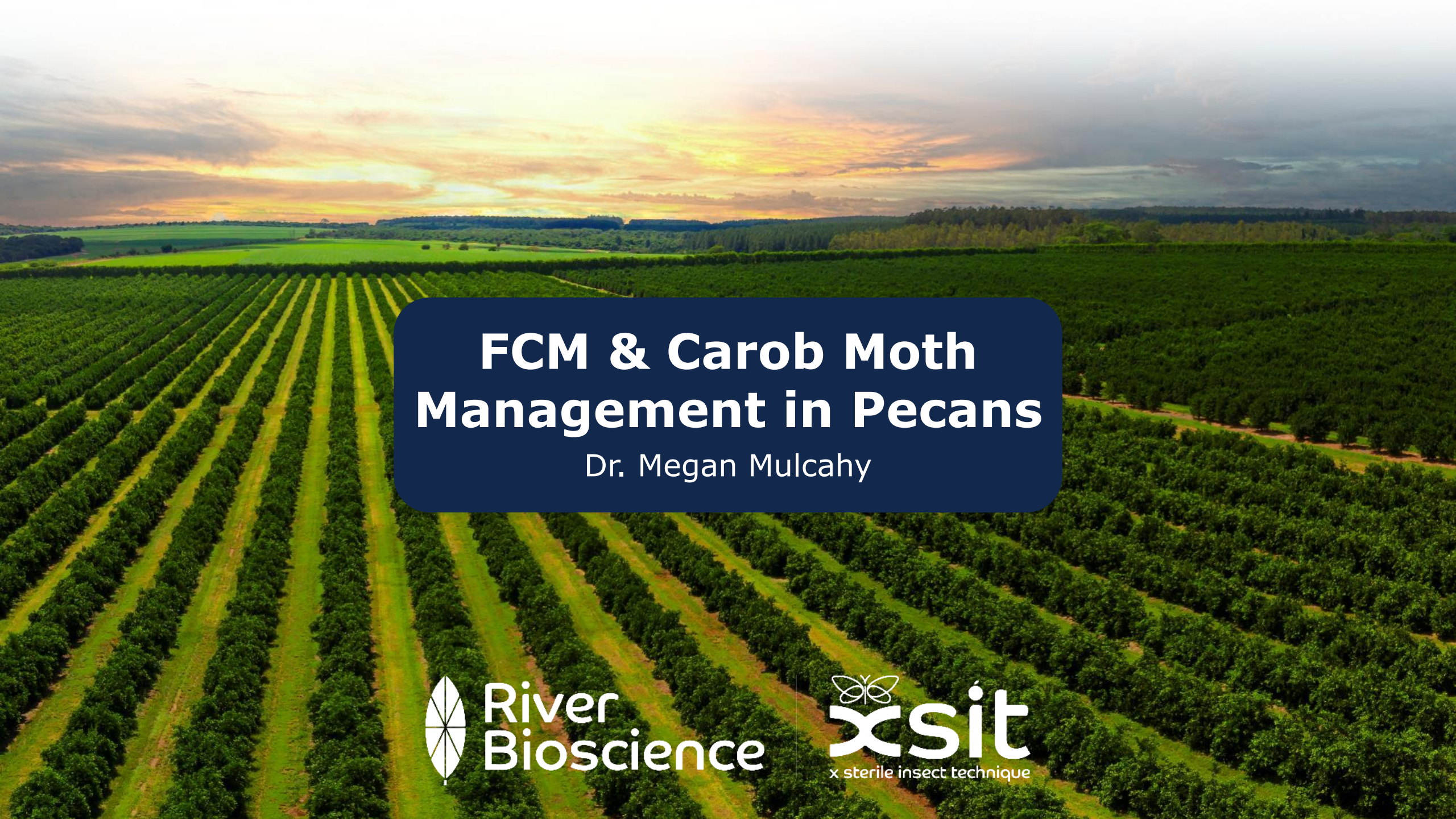




FCM & Carob Moth Management in Pecans

Dr. Megan Mulcahy



River
Bioscience



xsit
x sterile insect technique

OUR EXPERIENCE

AREA WIDE MANAGEMENT

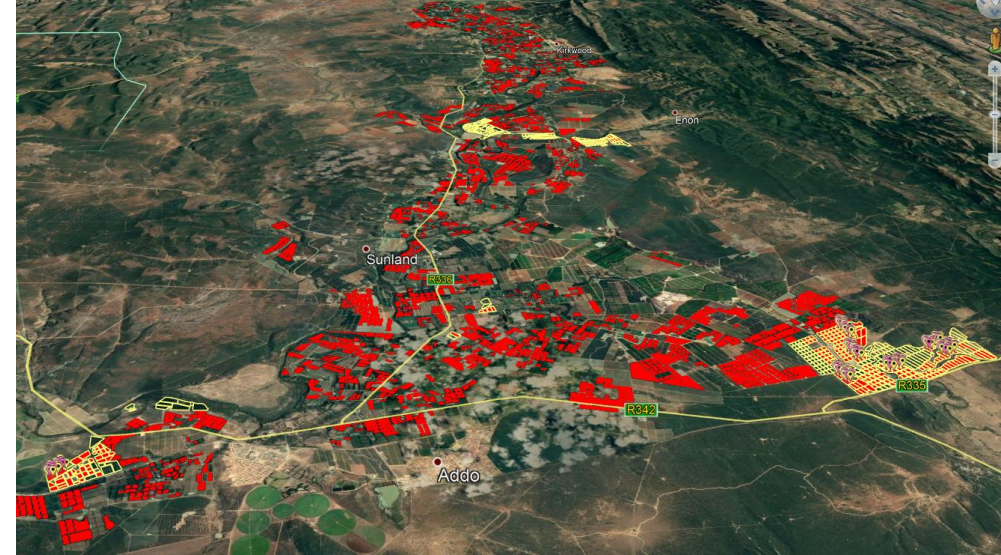
- 10 years of FCM SIT (> 120 000ha)
- 6 years of MD (> 40 000ha)

FOLIAR APPLICATIONS

- 20 years of FCM control (> 310 000ha)

FCM MONITORING

- 10 years of FCM on farm monitoring
- 5 years of FMS monitoring service



Wild FCM Catches

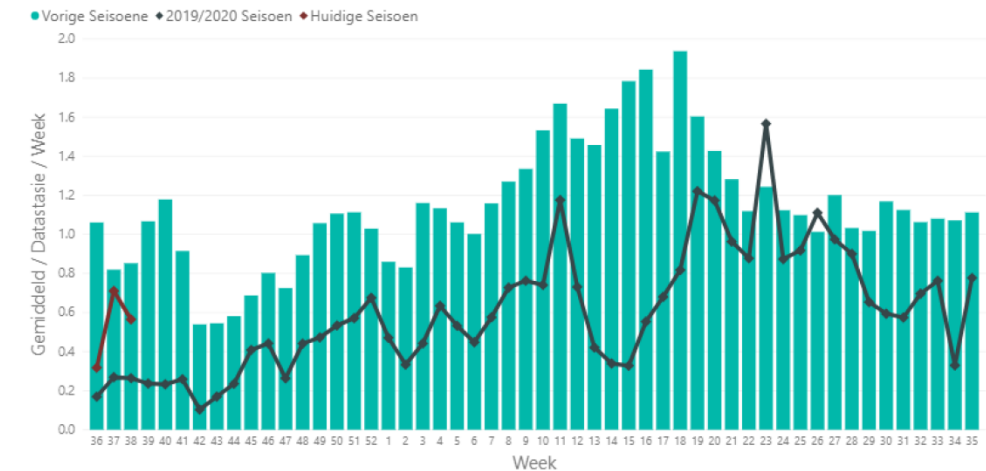


Figure 1: Average wild FCM / week from week 36 up to week 38 (2020/21) versus long term average (2011-2020).

20 YEARS OF INVESTMENT

IPM – FCM AS A CASE STUDY

Area-wide

SPLAT FCM



SIT Programme



Foliar apps



Cryptogran
& CryptoMax

Macrobinals

Nemapom & Cryptonem



Trichogramma



Monitoring

Delta Traps & Pheromone Lures
(in and outside orchard)



Insurance

RB Subscription
Programme

- **To meet market requirements of:**
 - Food safety
 - World-class quality
 - Retailer restrictions
 - Phytosanitary restrictions
- **Effective IPM toolbox required!**
- **RBX market leading toolbox for FCM**



FCM vs CM:

Moth ID, Life Cycle
Information & Damage





***Thaumatotibia leucotreta* - False Codling Moth (FCM)**

***Ectomyelois ceratoniae* – Carob Moth (CM)**



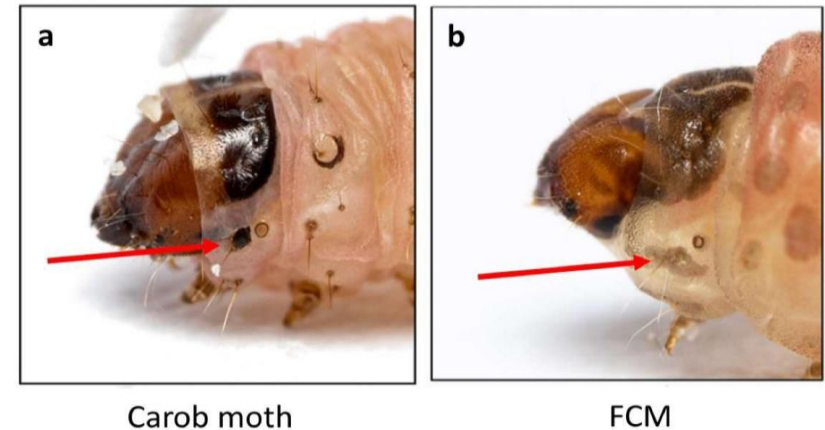
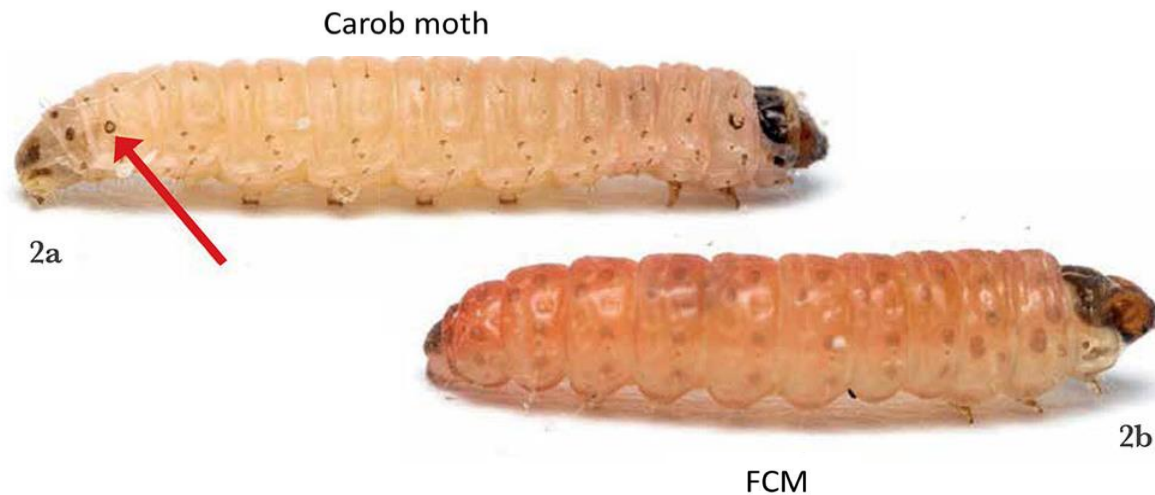
FCM or Carob Moth?

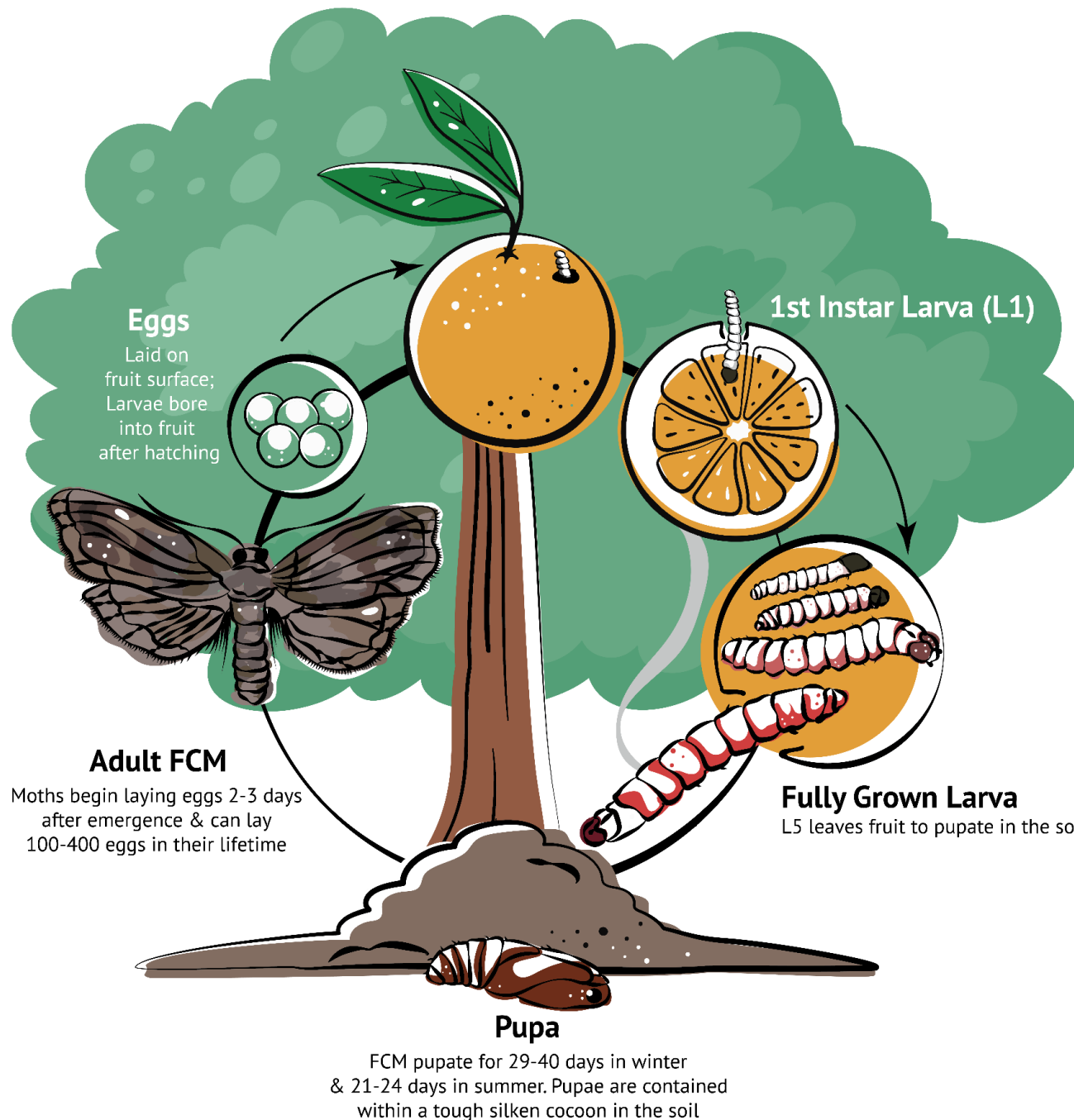
Taken from Moore, Addison & Marsberg (2024)



← **Pyralidae**

← **Tortricidae**



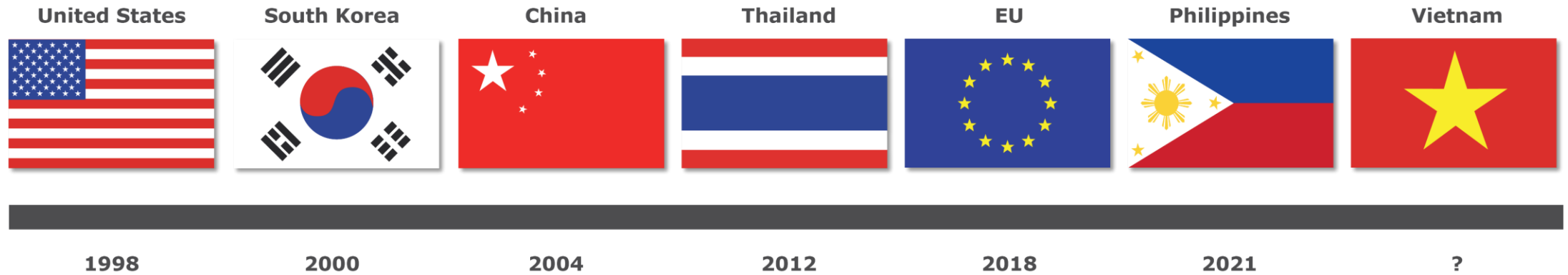


Why is FCM so difficult to manage:

- Native pest
- Multiple hosts
- No diapause
- Overlapping generations
- Strict chemical regulations
- Phytosanitary status

WHAT ABOUT CAROB MOTH (CM)?

FCM AND MARKET ACCESS



LARVAL DAMAGE IN PECANS

Karabos, 2024



Karabos, 2024



← FCM

Van Rooyen, 2017



Hatting, 2024



← CM



Integrated Pest Management (IPM)

Building a successful programme for lepidopteran pests in pecans

AW-IPM: An Introduction



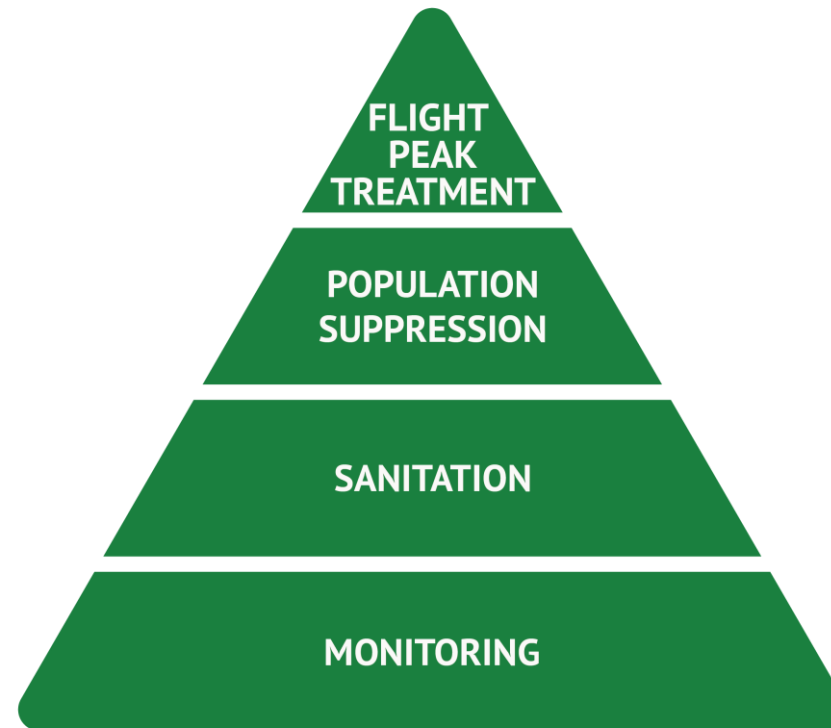
Area Wide – Integrated Pest Management:

Multiple tactics employed over wide geographic areas to achieve population suppression and reduce phytosanitary risks.

-  Understand the risk on farm – Know your pest & know your farm!
-  Establish a foundation programme – Take a holistic approach!
-  Establish “site thresholds”- Monitoring networks!
-  Allocate resources wisely – select products carefully & adhere to labels!
-  Realistic expectations – There are no silver bullets!

A SYSTEMS APPROACH

The **success of the system** is dependent on every single step in the process

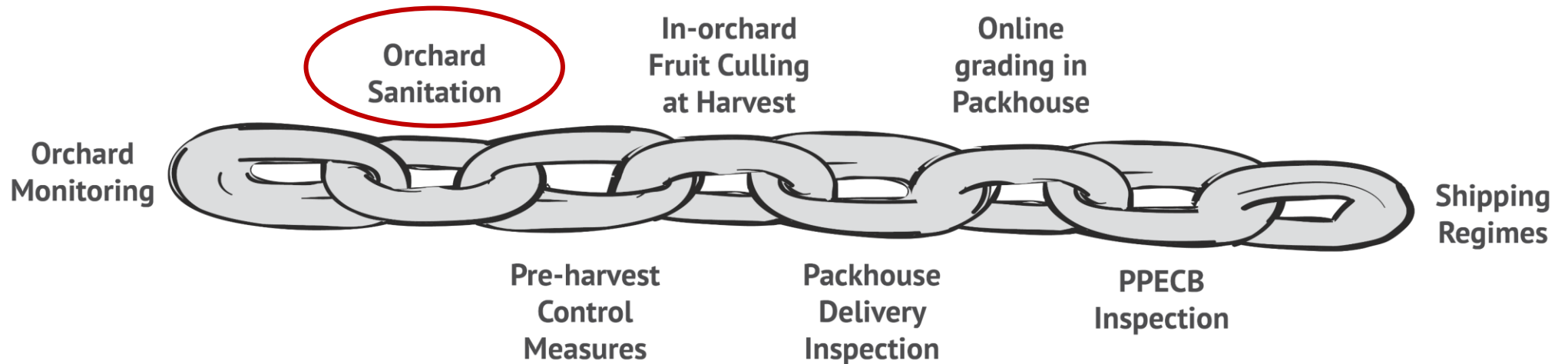


IPM FOUNDATION PROGRAMME

A SYSTEMS APPROACH

The **success of the system** is dependent on every single step in the process

There is a statistically significant relationship between FCM infestation during the **full season** and the **last 4 weeks before harvest**. Infestation in the last 4 weeks before harvest significantly influences **delivery to the packhouse**



Trap Placement & Monitoring

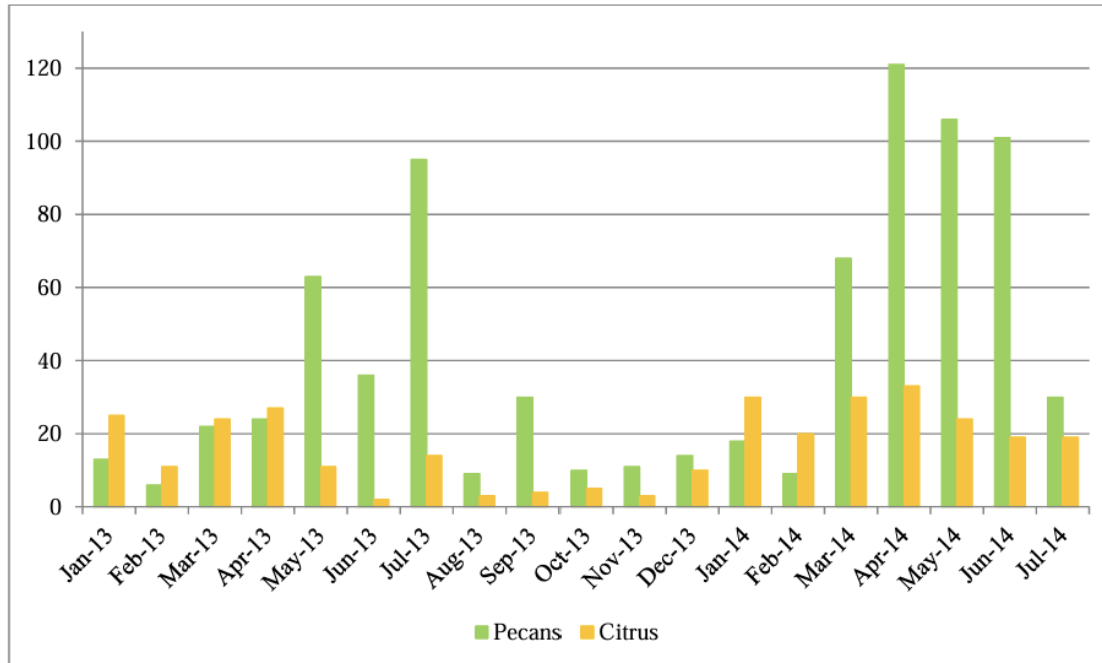


- FCM Lure = Z-8, E-8, E-7 – Dodecenyl acetate
- Carob Moth = (7Z,9E)-7,9,11- Dodecatrienyl formate
- Lures should be placed in yellow delta traps with a sticky pad.
- Hang delta traps at least 1.8 m above ground.
- Consider wind direction and sunlight exposure when placing traps.
- Minimum of 1 trap every 4 ha (at least 150 m apart).
- Monitoring weekly is recommended.
- Replace sticky pads when dirty.
- Replaced lures every 10-12 weeks (FCM) & every 6 weeks (Carob Moth).

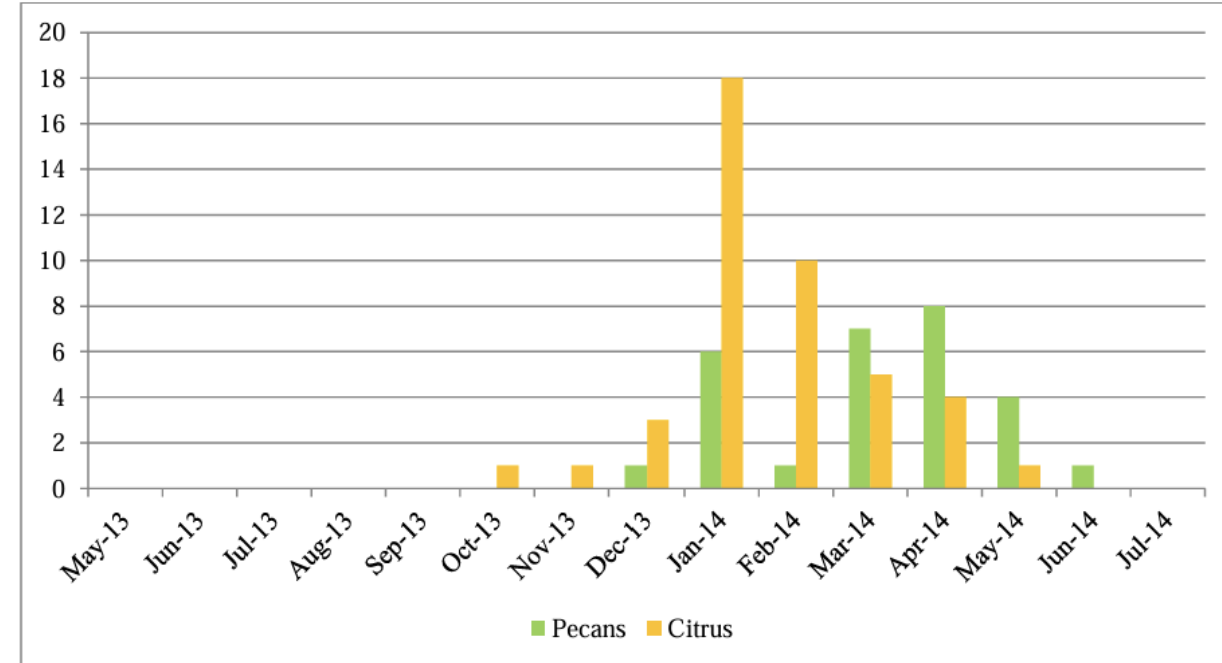


FCM & CM Moth Trap Catches in Pecans & Citrus

Taken from Van Rooyen (2017)



False Codling Moth Data



Carob Moth Data

POPULATION MONITORING

- Monitoring is extremely important to achieve good control.
- Ensure traps are correctly placed and monitored.
- **Historic Data:**
 - Major FCM moth flight peaks in June/July & August/September.
 - CM flight peaks December-May
- Moth activity can be used to make more informed pest management decisions.



Registered Pest Management Tools

Product Registered for FCM Control

Chemical/Synthetic Sprays

1. Emamectin Benzoate:

- Proclaim
- Tarpinon
- Emperor

2. Chlorantriliniprole & Lambda-cyhalothrin

- Ampligo

3. Methoxyfenozide:

- Cohort
- Marksman
- Walker
- Bolt
- Chimera

4. Spinetoram (Semi synthetic)

- Delegate



Biological/Area-Wide

1. Cryptophlebia leucotreta granulovirus:

- Cryptogran
- GraTham
- Cryptex



2. Beauveria basiana:

- Broadband

3. Sterile Insect Technique:

- XSIT

4. Mating Disruption:

- SPLAT FCM
- X-Mate FCM
- CheckMate FCM



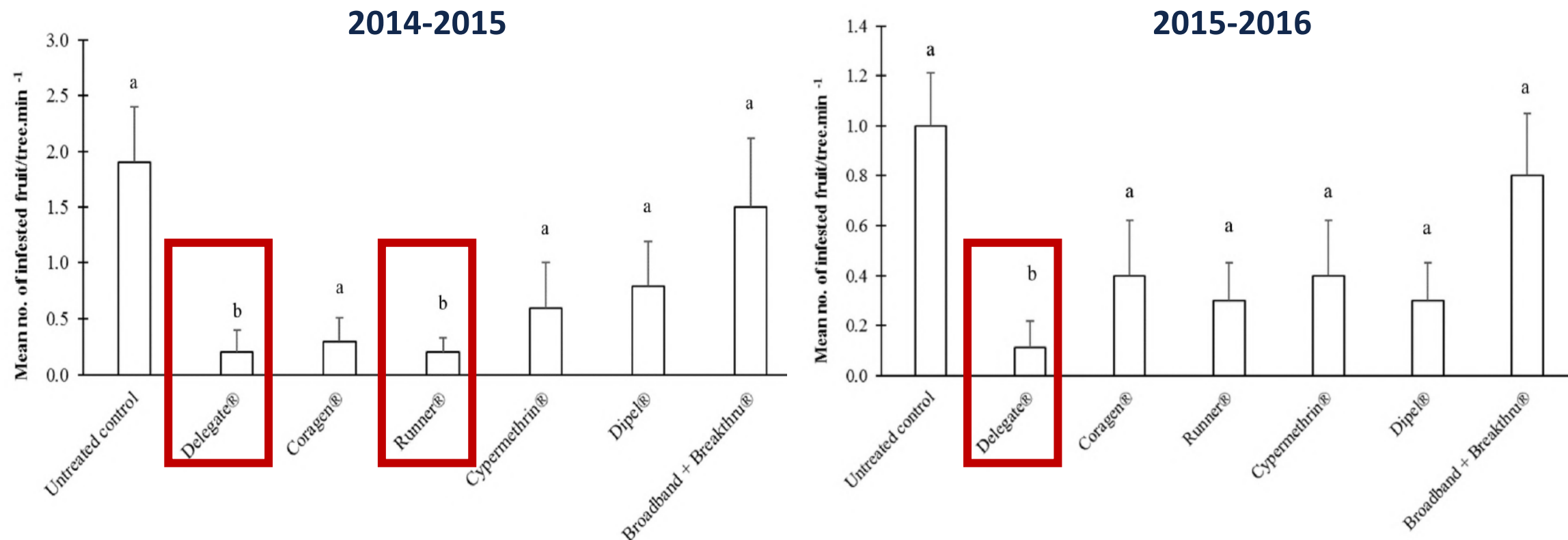
Product Assessment for Efficacy Against CM

Treatment	Active compound	Concentration per 100L	litres/tree	
			23/3/2015	14/12/2015
Delegate®	Spinetoram	20g	30.5	28
Coragen®	Chlorantraniliprole	17.5ml	28.5	29
Runner®	Methoxyfenozide	60ml	33	32
Cypermethrin®	Cypermethrin	25ml	33	32
Dipel®	<i>Bacillus thuringiensis</i>	12.5g	31	25
Broadband® + Breakthru ¹	<i>Beauveria bassiana</i>	50ml + 5ml	30	30
Untreated control	*	*	*	*

¹ Breakthru® (active ingredient: polyether-polymethylsiloxane-copolymer 1000 g/l) (Evonik Industries, Germany)

Taken from Thackeray (2017)

Spinetoram & Methoxyfenozide Significantly Reduced CM Infestations



Taken from Thackeray (2017)

Other Biocontrol Options:

Parasitoids & Beneficial Insects



Trichogrammatoidea Cryptophlebiae

Commercially available parasitoid:

An egg parasitoid of tortricid moths:

- Adult *T. cryptophlebiae* lay their eggs in the eggs of multiple tortricid moth species

The larval stages of the wasp feed on the eggs of their hosts:

- This kills the target pest and prevents crop infestation



False Codling Moth

Thaumatotibia leucotreta



Litchi Moth

Cryptophlebia peltastica

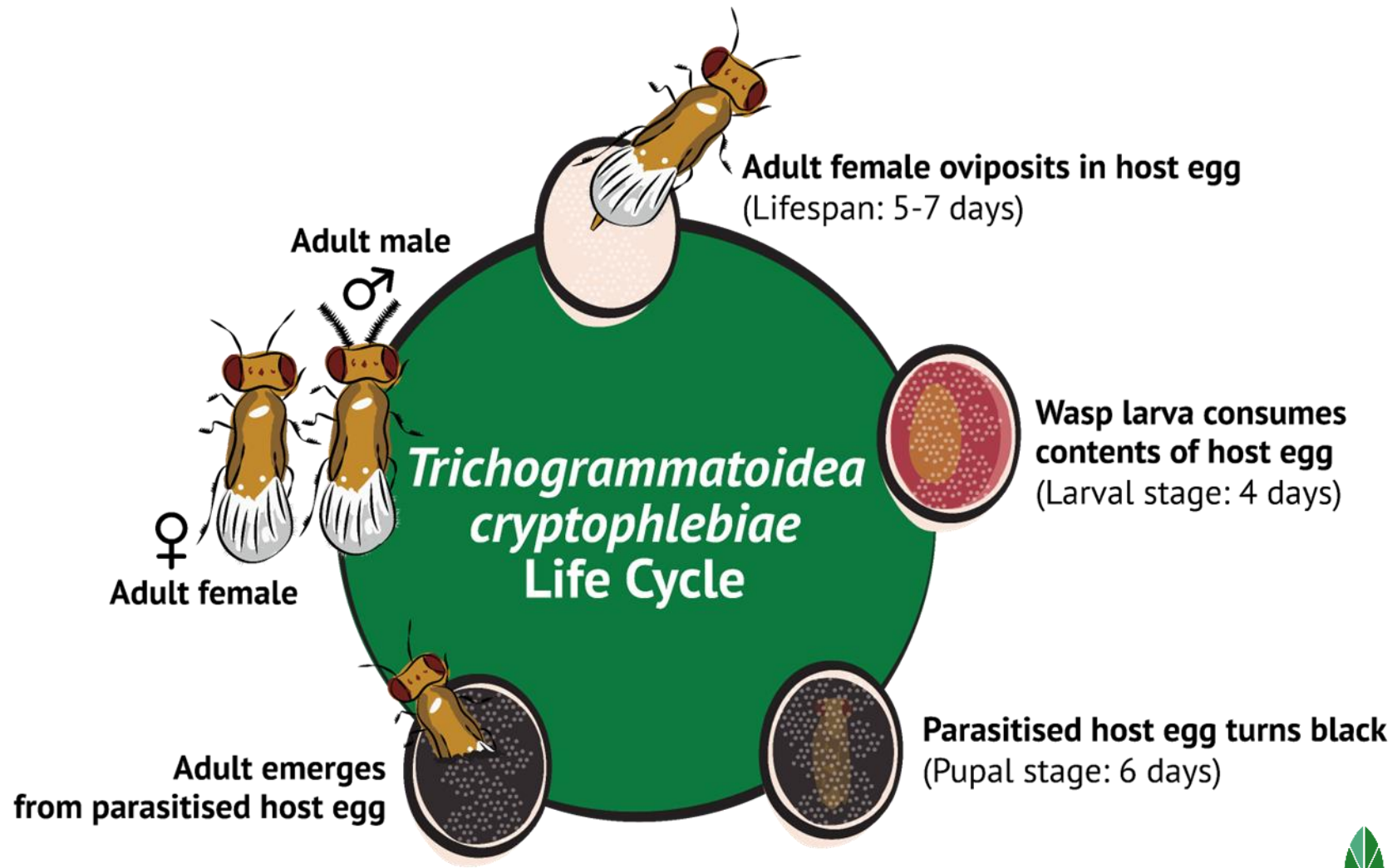


Mac Nut Borer

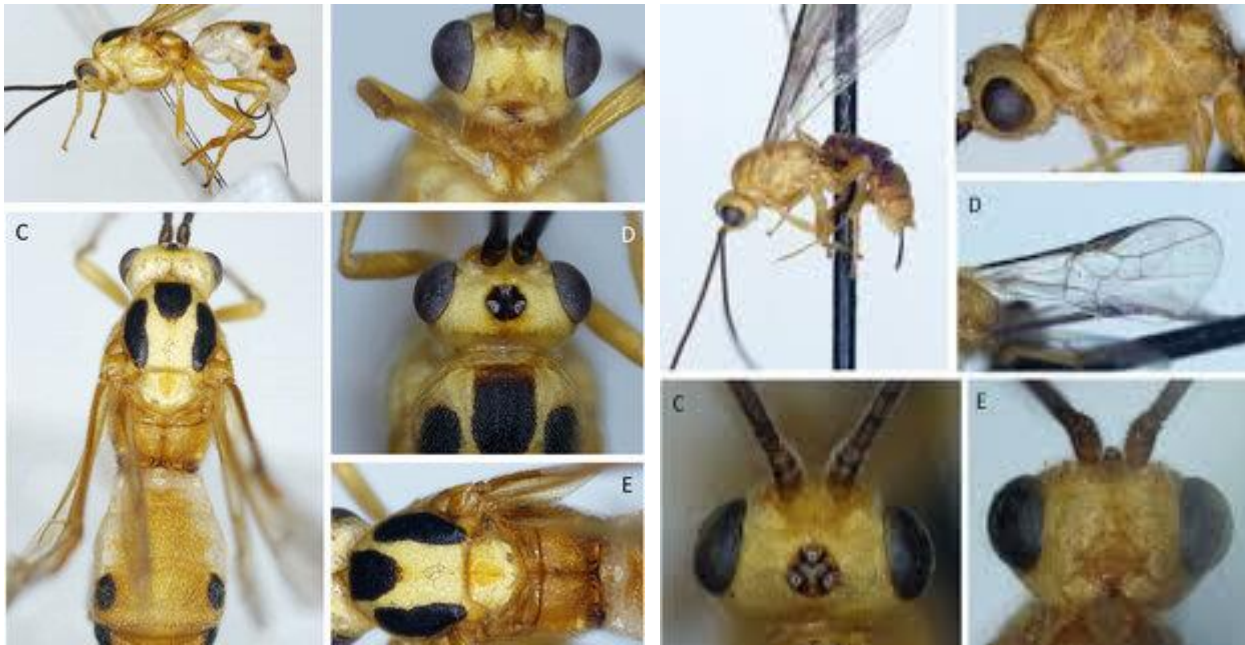
Thaumatotibia batrachopa

Codling Moth, Oriental Fruit Moth, *Lobesia vanillana

Trichogrammatoidea Life Cycle



Other Biological Control Agents



Agathis bishop (FCM)



Phanerotoma carobivora (CM)

Taken from Achterberg et al. (2017) and Zimba et al. 2016

Thank you

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