

A new Insecticide for Integrated Management of Tea Tortrix (*Homona coffearia*)

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Introduction : Tea tortrix (*Homona coffearia*)

- Indigenous pest
- First recorded in coffee and later on tea plantation
- Declared as a pest in 1920
- It was brought to localized and seasonal pest in high/mid elevations after introduction of *Macrocentrus homonae* (1935-1936)




Biology & behavior of Tea tortrix

- Greenish color with black head
- Feed on foliage while forming nests
- Live inside nest




Tea tortrix Caterpillar

- Adult is a typical moth
- Brown in color and bell shaped
at rest




♀ ♂
Tea tortrix moths

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Life cycle of Tea tortrix

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    graph TD
      Moth["Moth ♀"] -- "7-10 days" --> Egg["Egg Mass"]
      Egg -- "7-10 days" --> Larvae["1st instar larvae"]
      Larvae -- "35 days" --> Larva["Larva"]
      Larva -- "35 days" --> Pupae["Pupae"]
      Pupae -- "8-10 days" --> Moth
  
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Biology & behavior of Tea tortrix

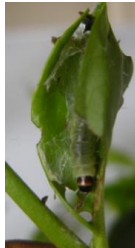



1st instar larvae

1st instar larvae start feeding on young leaves





- Move down to the maintenance foliage by feeding while forming nests
- They pass five instars before pupation





Pupae

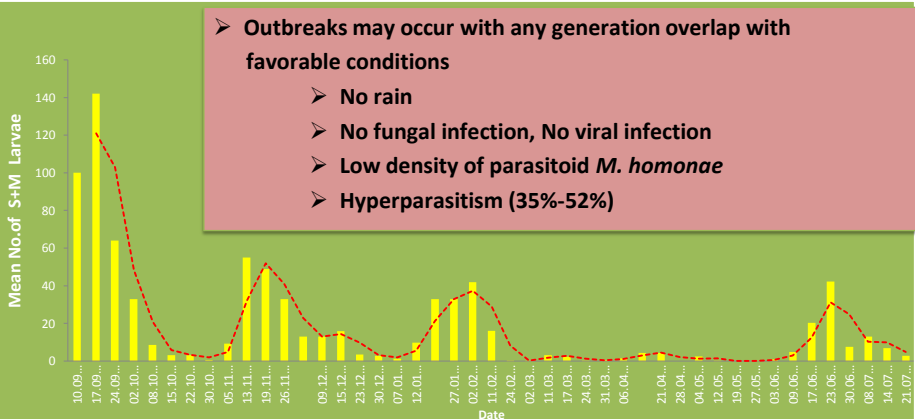


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5

Abundance of Tea tortrix

- Dry weather pest
- Outbreaks : South West quarter (Up country) : December- March
North East quarter (Uva) : June – September
- 6 generations per year



- Outbreaks may occur with any generation overlap with favorable conditions
 - No rain
 - No fungal infection, No viral infection
 - Low density of parasitoid *M. homonae*
 - Hyperparasitism (35%-52%)

6

Pathogens active in wet weather

➤ Viruses (entomopox virus)

➤ Bacteria



➤ Entomopathogenic fungi

➤ Out breaks are rare in wet weather



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7

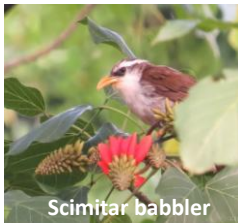
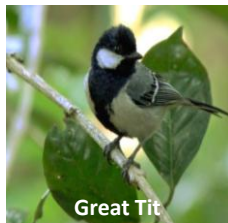
Integrated Management of Tea tortrix

Cultural control →

- Collection of egg masses
- Closer plucking rounds (7 days) to remove caterpillars
- Hard plucking to remove caterpillars
- Proper shade management (High, Low) - Resting places for birds



Birds are good Predators on tea tortrix



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8

Biological control

- Releasing of biological control agent *Macrocentrus homonae*, larval parasitoid of Tea tortrix

M. homonae (Adults)

Cocoons (*M. homonae*)

Parasitized larvae

Hyperparasite

Macrocentrus grubs emerging from tea tortrix larva

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9

Chemical control

- Pest population monitoring is necessary for chemical control
 - I. Visual signs
 - II. Sex pheromone

Population monitoring through Visual signs

chemical control is recommended


Chemical control is not recommended

- Spot spraying is recommended
- Cultural methods are recommended

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10

Population monitoring through pheromone trap

- Pheromone traps are placed on Tortrix prone fields
- Moth counts should be recorded daily
- Egg masses could be seen in the field within 3-5 days after observing high moth catches(100<)
- 1st instar larvae could be seen in the field between 2-3 weeks after observing high moth catches 
- Accordingly chemical control can be adopted



Chemical control

- Application of TRI recommended insecticide for tea tortrix
- Ensure to apply correct dosage at correct time
- Ensure to allow recommended pre harvesting interval (PHI)
- Bulking of sprayed leaves with unsprayed leaves (1:10)

-Dilute the residues in made tea



Screening of an insecticide as an alternative to Atabron (Chlorfluazuron)



Emamectin benzoate (Proclaim 05 SG)

- Derivative of Avermectin
- Secondary metabolite isolated from soil bacterium
Streptomyces avermitilis
- Toxicity Class III
- MRL EU : 0.02 ppm
Japan Tea Association: 0.5 ppm
- Available in the market



Bioefficacy of Emamectin benzoate (Proclaim 5 SG) against Tea tortrix

➤ Bioefficacy was evaluated in the laboratory to select the effective concentration

- Design CRD with 4 replicates
- 20 larvae were introduced to each replicate
- Mortality was monitored for 7 days

Treatments

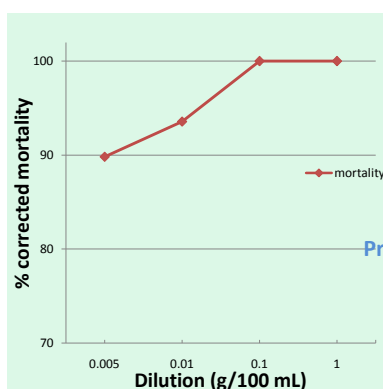
- T1- 1% (1 g of product in 100 mL)
- T2- 0.1%
- T3- 0.01%
- T4- 0.005%
- T5- Untreated control



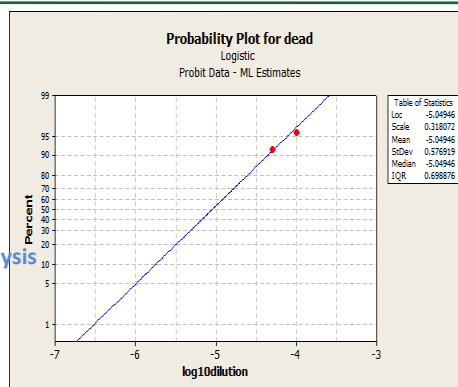
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15

Results :Laboratory bioassay



➔ Probit analysis



99% mortality was given at Log_{10} -3.57199

➔ Anti-Log

0.26 g/L

- The highest mortality (99%) was observed in the 0.26 g/L (lowest concentration)
- 0.26 g/L was selected as the minimum concentration for field trials

16

Methodology : Evaluation of field efficacy of Proclaim 05 SG

- Experiment I : Fernlands Estate
- Experiment ii: Somerset Estate
- Experiment iii: Waltrim Estate
- Design RCBD with 3 replicates
 - 50 bushes / plot
- Sampling procedure : 5 infested bushes were sampled before and after spraying

Larval population was recorded at weekly intervals
for 30 days



Experiment I : Evaluation of field efficacy of Proclaim 05 SG

Experimental site: Field No 08, Kaipogala Division, Fenlands Estate
Design: RCBD with 3 replicates, 50 bushes /plot

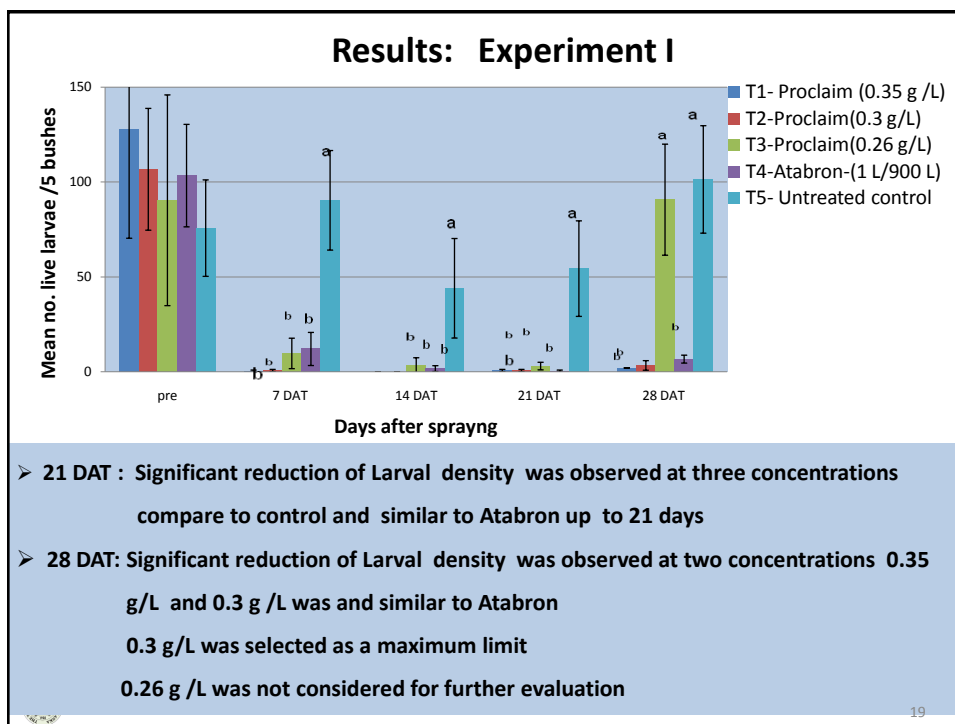
Treatments

- T1- Proclaim (Emamectin Benzoate) 0.26 g/L (minimum concentration)
- T2- Proclaim 0.3 g/L
- T3 –Proclaim 0.35 g/L
- T4- Atabron 1 L/900 L
- T5 -Untreated control

Assessments

- Post treatment assessments were obtained weekly intervals for 1 month
- 5 infested bushes were sampled
- Dead and live counts of larvae were recorded





Experiment II – Evaluation of field efficacy of Proclaim 05 SG

Experimental site: Field No.10NC, Langdale Division, Somerset Estate

Design: RCBD with 3 replicates, 50 bushes /plot

Treatments: T1 – Proclaim (Emamectin benzoate) 0.3 g/L

T2 – Proclaim 0.28 g/L

T3 –Atabron (Chlorfluazuron) 1 L/900 L (TRI Recommendation)

T4 – Untreated Control

Assessments

- Post treatment assessments were obtained weekly intervals for 1 month
- 5 infested bushes were sampled
- Dead and live counts of larvae were recorded



Experiment III: Evaluation of field efficacy of Proclaim 05 SG (confirmation trial)

Experimental site: Field No 2A, Maraya Division, Waltrim Estate
Design : RCBD with 3 replicates, 50 bushes /plot,

Treatments

T1- Proclaim (Emamectin Benzoate) 0.28 g /L

T2- Proclaim 0.3 g/L

T4 -Atabron 1L /900L

T5- Untreated control

Assessments

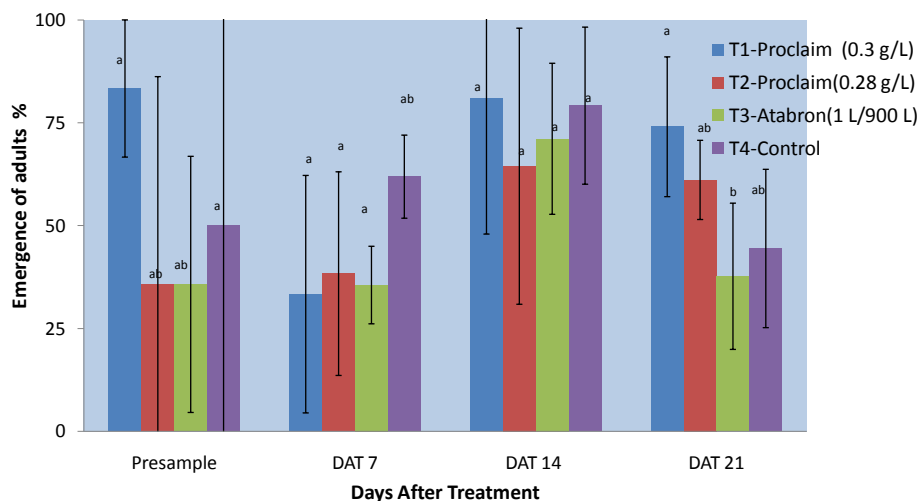
- Post treatment assessments were obtained weekly intervals for 1 month
- 5 infested bushes were sampled
- Dead and live counts were recorded



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21

Effects of Proclaim on *M. homonae*



- Effects of Proclaim 05 SG on *Macrocentrus* cocoons were not significant
- *Macrocentrus* adults are highly sensitive they died after e 4 hrs. after exposing

22

Conclusions

- **Effective concentration of the Proclaim 05 SG against Tea tortrix is 0.28 g/L**
- **Proclaim 05 SG has the potential to incorporate present IPM of Tea tortrix after conducting MRL studies**



Cost analysis

Quantity required for a hectare (0.280 g/L) in 900 L water	252 g
Available pack size in market	6 g
Price of 6 g in LKR	290.00
Price of 252 g in LKR	12,180.00

- **45% discount is offered for 100 g purchase**
- **Large pack size will reduce the price of chemical**

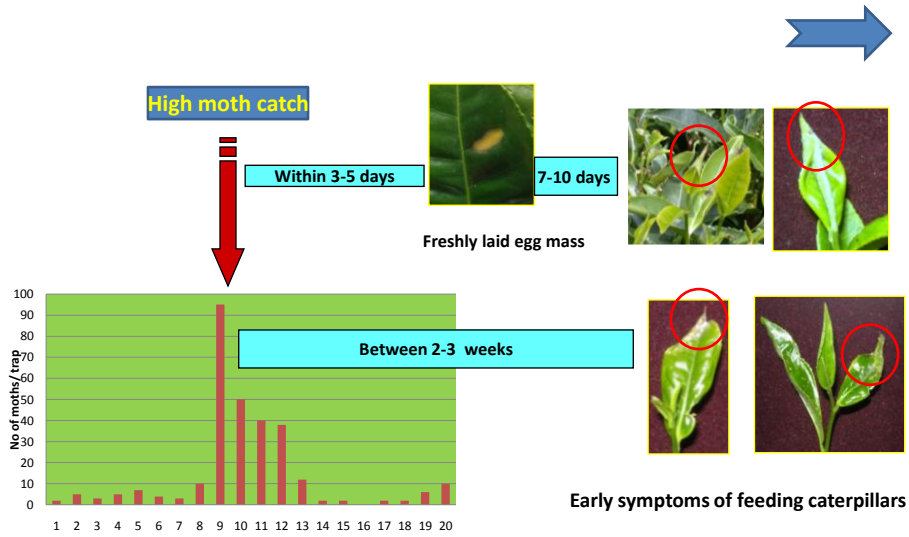


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Forecasting outbreaks of tea tortrix using Pheromone



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