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

P. Senanayake, P. Kannan, SD. Kulatunga, R. Perera, BS. Vitana

Entomology & Nematology Division

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

![Tea tortrix Caterpillar](image1)

![Tea tortrix moths](image2)

### Life cycle of Tea tortrix

1. **Moth** ♀
   - 8-10 days

2. **Egg Mass**
   - 7-10 days

3. **1st instar larvae**
   - 35 days

4. **Pupae**
   - 8-10 days

5. **Larva**
   - 35 days
Biology & behavior of Tea tortrix

1\textsuperscript{st} instar larvae start feeding on young leaves

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

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 \textit{M. homonae}
  - Hyperparasitism (35\%-52%)
Pathogens active in wet weather

- Viruses (entomopox virus)
- Bacteria

- Entomopathogenic fungi

- Out breaks are rare in wet weather

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

Great Tit  Scimitar babbler  White eye  Red vented bulbul
### Biological control

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

![Image of *M. homonae* adults and parasitized larvae]

- Cocoons (*M. homonae*)
- Parasitized larvae
- Macrocentrus grubs emerging from tea tortrix larva

#### Chemical control

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

**Chemical control is not recommended**  
**Chemical control is recommended**

- **Spot spraying is recommended**
- Cultural methods are recommended

*Tea Research Institute of Sri Lanka*
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

Results: Laboratory bioassay

- 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

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

Anti-Log 0.26 g/L
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, Kaipoogala 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
Results: Experiment I

- **21 DAT**: Significant reduction of larval density was observed at three concentrations compare to control and similar to Atabron up to 21 days
- **28 DAT**: Significant reduction of larval density was observed at two concentrations 0.35 g/L and 0.3 g/L was and similar to Atabron

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

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 4 hrs. after exposing
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

<table>
<thead>
<tr>
<th>Quantity required for a hectare (0.280 g/L) in 900 L water</th>
<th>252 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available pack size in market</td>
<td>6 g</td>
</tr>
<tr>
<td>Price of 6 g in LKR</td>
<td>290.00</td>
</tr>
<tr>
<td>Price of 252 g in LKR</td>
<td>12,180.00</td>
</tr>
</tbody>
</table>

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

- Manager, staff of Fernlands Estate
- Manager, staff of Somerset Estate
- Manager, staff of Waltrim Estate

Thank You
Forecasting outbreaks of tea tortrix using Pheromone

High moth catch
Within 3-5 days
Freshly laid egg mass
7-10 days
Between 2-3 weeks
Early symptoms of feeding caterpillars