Tuta absoluta

Pheromone based management strategies

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**Tuta absoluta**

- The most serious pest of Tomato.
- Crop losses have been reported 50-100%.
- Main host is tomato, potato, Aubergine
- Alternative host solanaceous weed.
- Showed resistance to most conventional insecticides.
- Due to mining habit it is difficult to kill this insect with direct control.
Leaf Damaged due to *Tuta absoluta* larvae

The larvae mine and eat the mesophylic tissue of the leaf.
**Tuta absoluta** larvae on stem

*Tuta absoluta* larvae bore into the Tomato stem.
Damage on fruits by *Tuta absoluta* larvae
Damage in tomatoes
Partial to complete damaged green house tomato production by *Tuta absoluta*
Open field Tomato damaged

Complete crop loss of open field tomato production
Mature tomato destruction in Libya

Growers left tomato without harvest due to excessive infestations.
Distribution of *Tuta absoluta*

- 2006/7 first identified in Spain from South America.
- 2008 detected in France, Italy.
- 2009 Morocco, Algeria, Tunisia, Malta, Libya, United Kingdom, Greece, Portugal.
- To date it reaches in Turkey, Switzerland, Czech Republic, Egypt, Palestine, Israel, Syria, Jordan and Saudi Arabia.
Tuta absoluta distribution in Mediterranean Basin
### Tuta absoluta Life cycle

<table>
<thead>
<tr>
<th>Temp.</th>
<th>Egg</th>
<th>Larvae</th>
<th>Pupae</th>
<th>Adult</th>
<th>Total life cycle (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30ºC</td>
<td>4</td>
<td>11</td>
<td>5</td>
<td>9</td>
<td>29</td>
</tr>
<tr>
<td>15ºC</td>
<td>10</td>
<td>36</td>
<td>20</td>
<td>23</td>
<td>89</td>
</tr>
</tbody>
</table>
Potential risk

- 15 Millions tonnes industrial tomato is at risk.
- Export restrictions has been applied against countries with *Tuta absoluta* outbreak.
- Serious losses will encourage farmers to switch to other crops leading to output reduction.
- Risk of over use of insecticide application leads to increase in health risk to consumer.
Elements of Management Strategy

- Pheromone Monitoring Systems.
- Pheromones as a control system.
- Biological agents including natural enemies.
- Selected chemical control agents.
- Integrated approach using all above elements.
Pheromone Components

- *Tuta absoluta* pheromone has been identified as (3E;8Z;11Z)-3, 8,11-tetradecatrienyl acetate as major and (3E,8Z)-tetradecadien-1-yl acetate minor component (Attygalle, *et al.*, 1995, 1996).

- Filho *et al.*, 1999, reported addition of the minor pheromone does not significantly increase the trap catches of *Tuta absoluta*.

- Later on Ferrara *et al.*, 2001 reported that the addition of a secondary component to 3E,8Z,11Z–14: Ac is unnecessary for catching males in the field.
Application of pheromone for monitoring and detection

Standardisation of the:

- Pheromone lure
- Traps
- Adhesive board
Loadings of *Tuta absoluta* pheromone

- Different loading of *Tuta absoluta* pheromone has been used for monitoring and mass trapping.
- TUA-500 - 0.5 mg / rubber septa dispenser green house – longevity 4-6 weeks
- TUA-Optima - 0.8 mg / rubber septa dispenser for open filed – longevity 4-6 weeks.
- TUA 100 N - 3 mg / polyethylene vial for long lasting lures – longevity – 100 nights
Comparison of various pheromone loadings

Effect of different loading of *Tuta absoluta* pheromone

![Graph showing the effect of different pheromone loadings on average trap catch over days.](image-url)
Comparison of various loading from week 1-2

Effect of different *Tuta absoluta* pheromone loadings from week 1-2

- 0.5 mg loading
- 3.0 mg loadings
- 0.8 mg loading
Comparison of various loading from week 3-4

Effect of *Tuta absoluta* pheromone loading Week 3-4

![Graph showing the effect of different loading levels on average trap catches over 15 days. The graph compares 0.5 mg, 3.0 mg, and 0.8 mg loadings, with the 0.5 mg loading showing the lowest average trap catches throughout the period.]
Comparison of various loading from week 4-7

Effect of *Tuta absoluta* pheromone loading week 4-7
Effect of long duration lure from day 1-100

Effect of 3.0mg loadings *Tuta absoluta* dispenser
Mass trapping

- Mass trapping with long lasting lure will reduce the *Tuta absoluta* male population substantially.
- Application of Ferolite with Optima lure can control *Tuta absoluta* in green house condition by controlling male and female moths.
- Use 10 traps / ha for low infestation
- Use 20-30 traps / ha for high infestation
- Use TUA-500 pheromone in moderate temp.
- Use TUA-100N high temperature period
Traps

Delta Trap – Monitoring

Water trap and Ferolite trap – Mass trapping
Water traps
Advantages of Ferolite trap

- 200-300% more effective than the standard pheromone traps.
- Specially designed for mass trapping of *Tuta absoluta*.
- Compatible with other biological control systems.
- Non harmful to the environment, beneficial arthropods or pollinators.
Efficiency of Ferolite trap –
Based on synergy of pheromone and light
**Tuta absoluta** mating behaviour while applying Ferolite trap

*Tuta absoluta* mating behaviour from 3 AM to 6PM

*Tuta absoluta* mating behaviour

*Tuta absoluta* most active for mating 3-4 hours before sunrise
Ferolite in use
TutaRoll- Sticky rolls

• The Tutaroll is an innovative product.
• It is a clear film coated with non drying glue and treated with slow release *Tuta absoluta* pheromone formulation.
• Our extensive field studies showed application of Tutaroll captures *Tuta absoluta* successfully without affecting the Beneficial’s *Nesidiocoris tenuis* or *Trichogramma achaearae*.

• Ensures a steady release of attractant over a longer period of time.
Tutaroll in use

Tutaroll can be used horizontally in between two rows. Tutaroll can be applied vertically from the top.
2 meters Tutaroll has been applied in various height and width from the tomato plant and found maximum catches in 1.5 height and 60 away form the plant.
•24 hr after application of Tutaroll catches 674 moths at 60 cm crop height.
•Similar result was repeated in 10 days after application and 4985 moths were captured in same height without trapping beneficial.
TutaPlus

- Optiroll Tuta+ is a yellow sticky roll where *Tuta absoluta* pheromone is incorporated with glue and releases from the adhesive layer.
- Tutaroll+ is specially designed for greenhouses where Beneficial’s are not in use as a biological control agent.
- This roll can be used for the mass trapping and control of *Tuta absoluta* in greenhouses.
Additional advantage of capturing white fly and aphids. Can be used for mass trapping as well as monitoring. Safe, simple and environmentally sound solution.
Lure and Kill

*Tuta absoluta*

TAC-37
TAC-37

Lure & Kill

• Pheromone and pesticide formulation.
• Targeted application, compatible with bio agents.
• Reduces the possibility of pesticide resistance.
• Reduces the possibility of pesticide over application.
• TAC-37 could be applied using hand dispensing gun.

• Application can be mechanized for large scale filed applications.
• Application of TAC-37 in open field tomato manage to keep the insect count under five insects per trap/day for over 50 days

• However, Application of conventional insecticide failed to keep the insect count under control.
Stage of infestation
Stage 1

• Traps catches insect but no visible damage
• Soft approach using mainly biopesticides
  • – Mass trapping - FEROLITE
  • – Mass trapping water trap.– Spot treatment with Adulticide (e.g. Deltamethrine)
• – If the trap catches remains high and does not drop
Stage 2

- Leaf damage only. No fruit damage
- Mass trapping – FEROLITE
- Mass trapping with long lasting lure
- Application of Tutaroll in hot spot both horizontally and vertically
- Application of Tuta roll in border areas and near the entrance of green houses.
- Application of Lure and Attract and Kill TAC-37
- Bt and Natural Azadiractin based bio-larvicide, Spinosad can be applied in addition to kill larvae.
Stage 3 – during fruit damage

- Clear damage to fruit and leaf
- Too late for the damaged fruit,
- Remove and destroy damaged fruit,
- Apply stage 2 programme.
Thanks for your Attention