

# ***Tuta absoluta***

## ***Pheromone based management strategies***

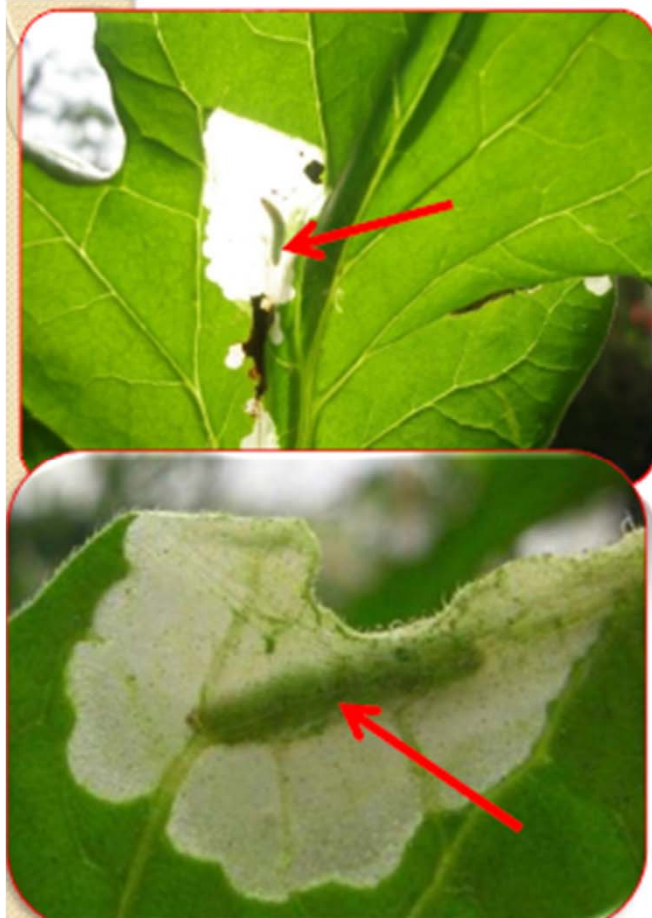


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**Russell IPM Ltd**

# *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 mesophyll tissue of the leaf.

Tomato



Potato



Aubergine

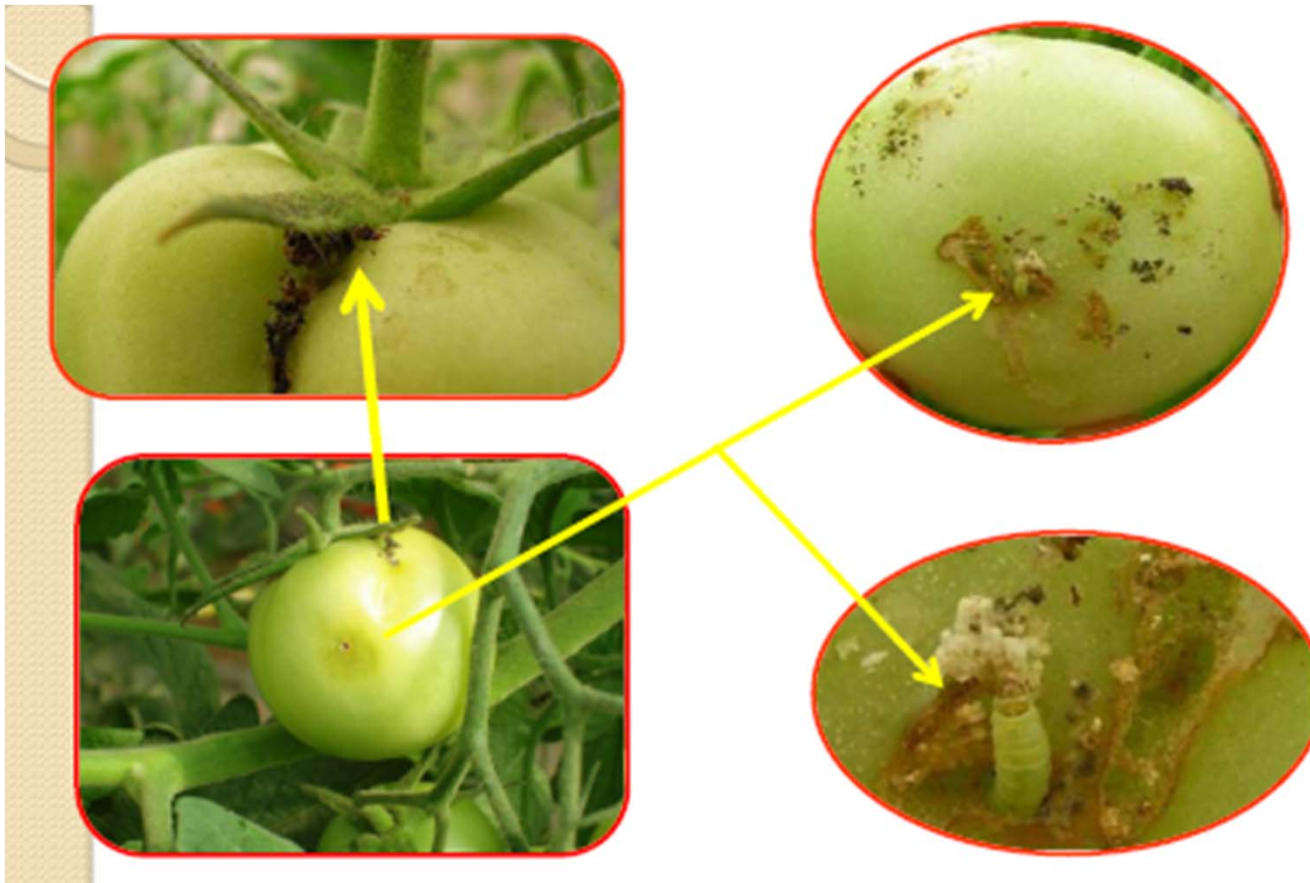


# *Tuta absoluta* larvae on stem

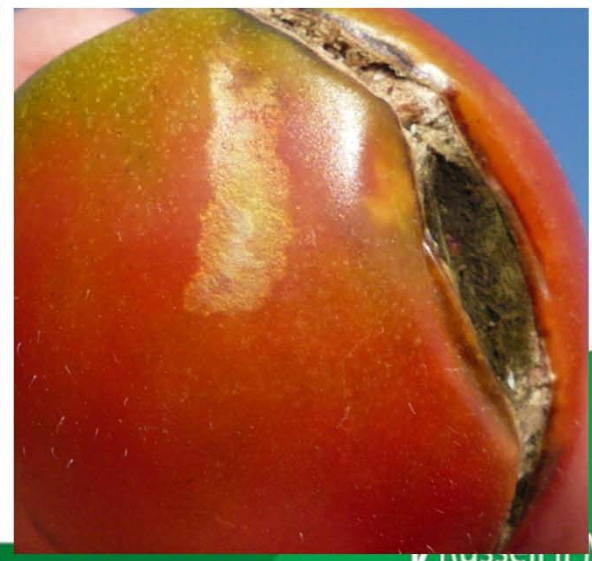


*Tuta absoluta* larvae bore into the Tomato stem.

# 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

Temp.	Egg	Larvae	Pupae	Adult	Total life cycle (days)
30°C	4	11	5	9	29
15°C	10	36	20	23	89

## 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.

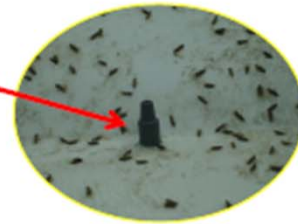
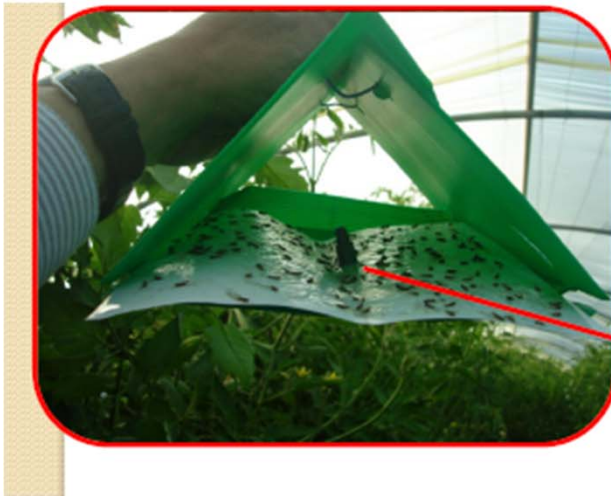
# Pheromone Components

- *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



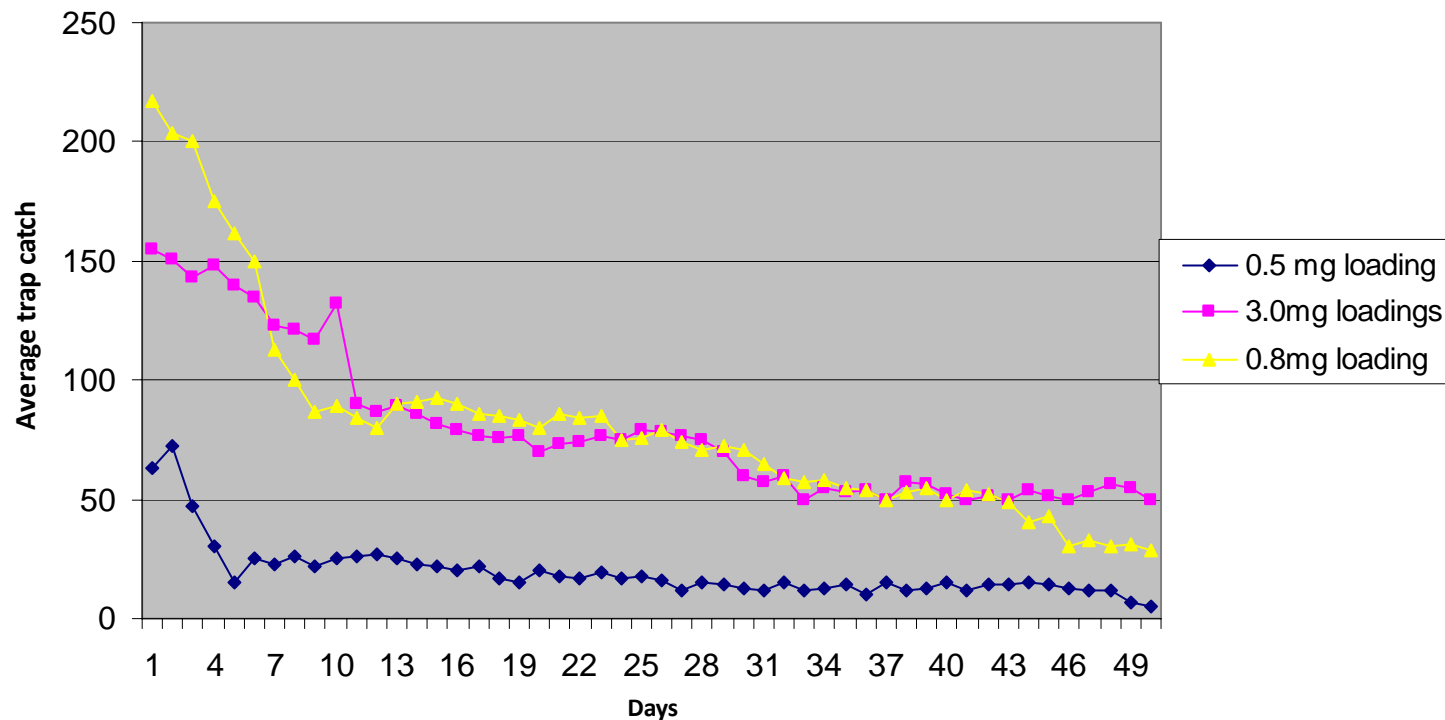


## Loadings of *Tuta absoluta* pheromone

- 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 field – longevity 4-6 weeks.
- TUA 100 N - 3 mg / polyethylene vial for long lasting lures – longevity – 100 nights

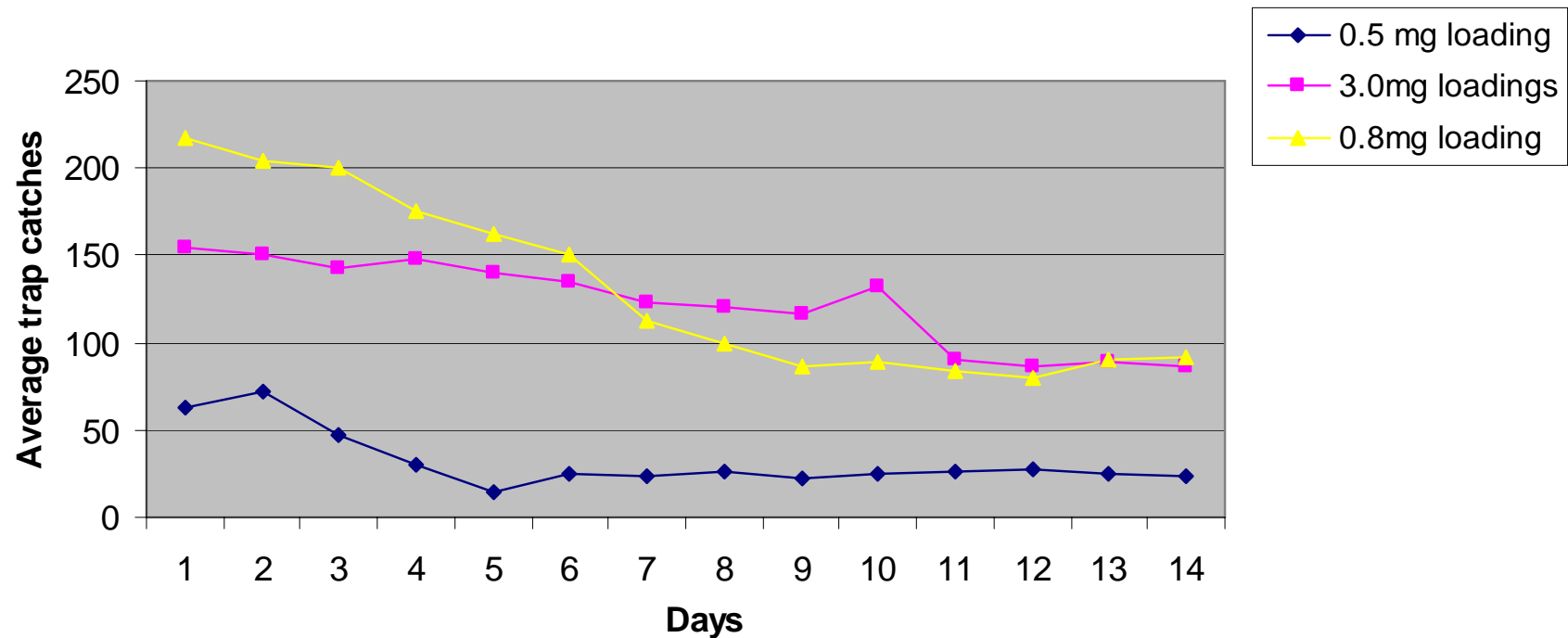
# Comparison of various pheromone loadings

Effect of differnt loading of *Tuta absoluta* pherommone



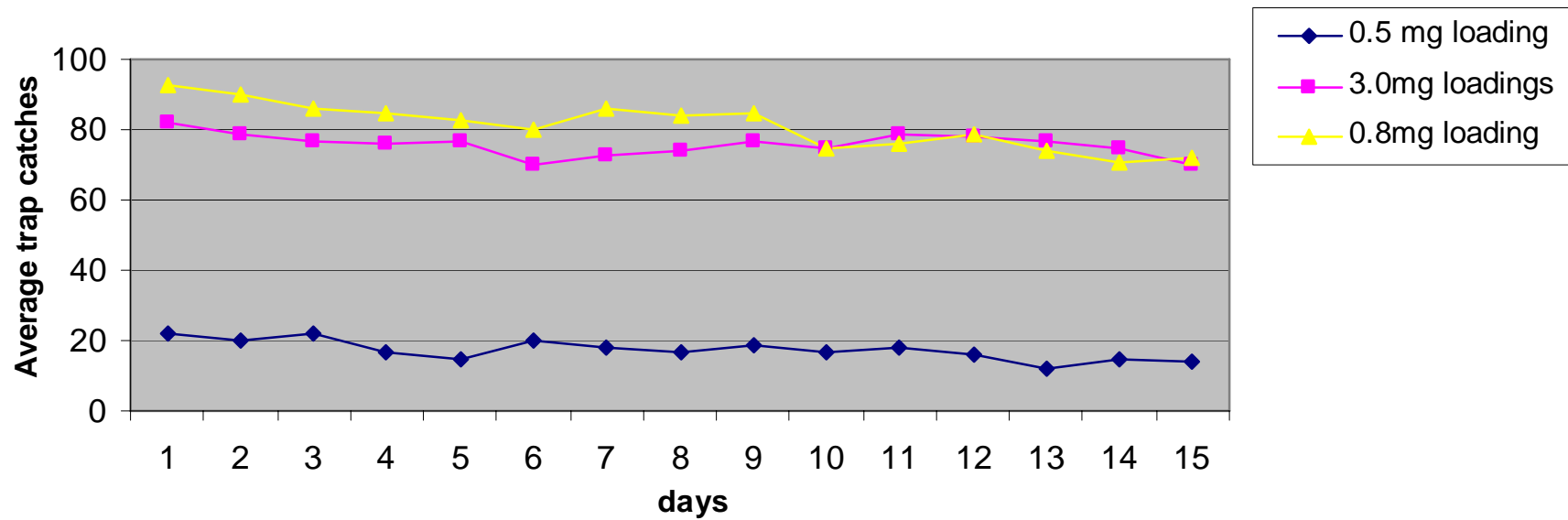
# Comparison of various loading from week 1-2

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



# Comparison of various loading from week 3-4

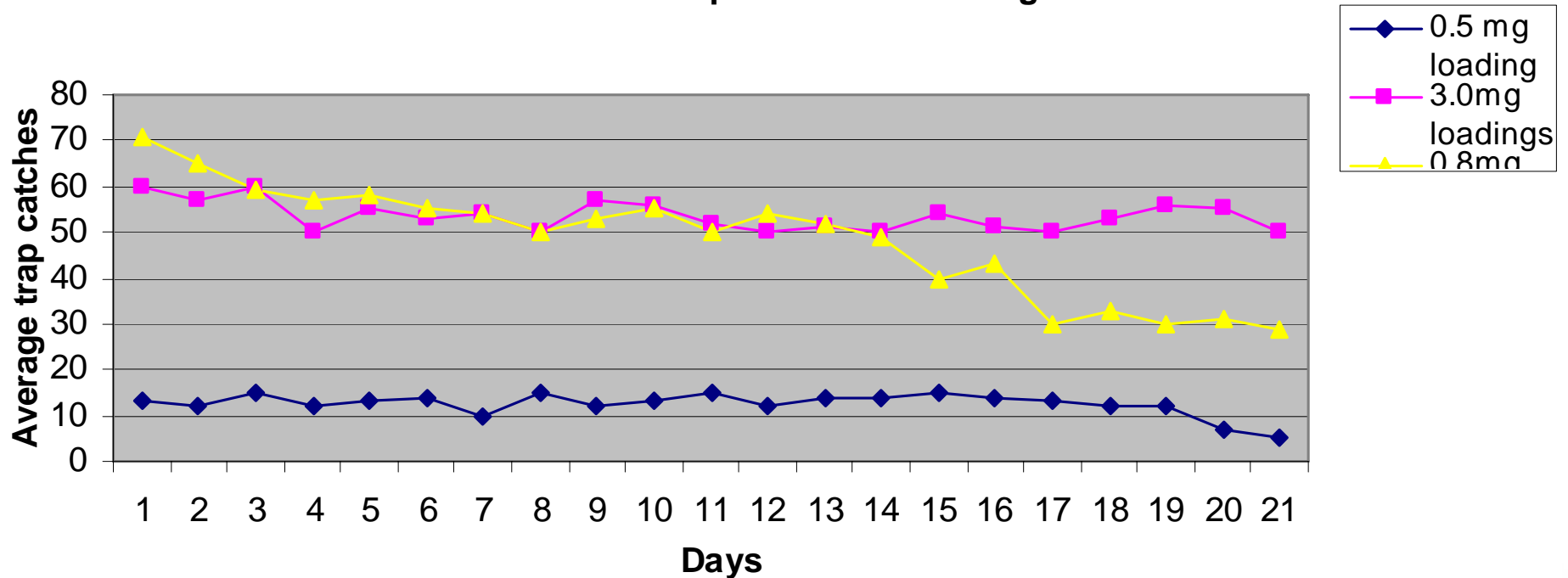
Effect of *Tuta absoluta* pheromone loading Week 3-4





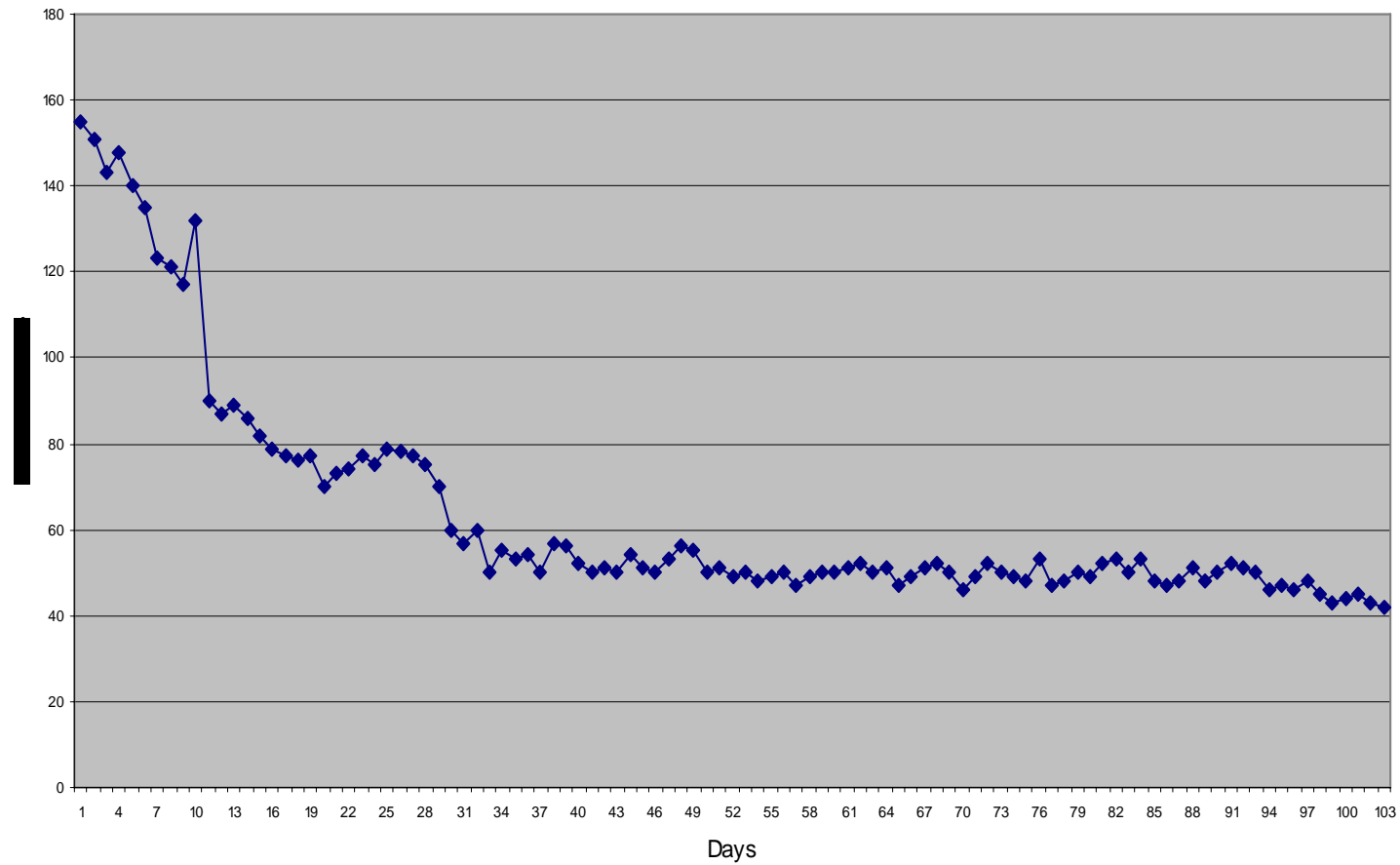
# Comparison of various loading from week 4-7

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





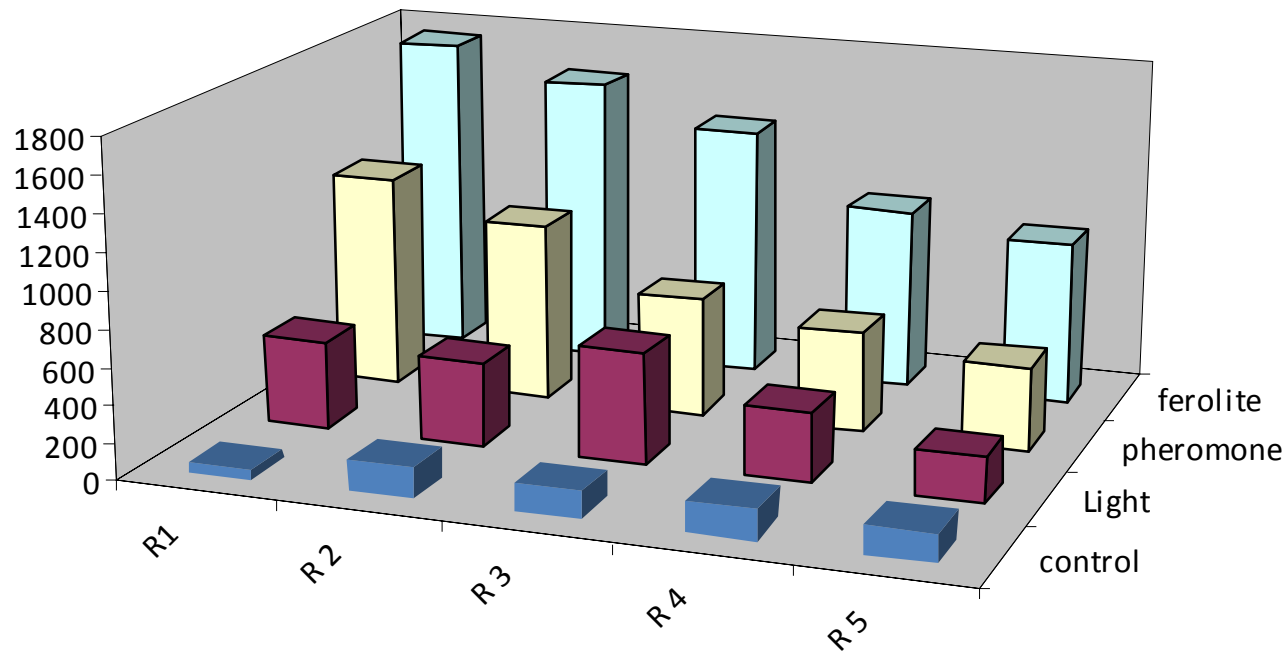
# Water traps



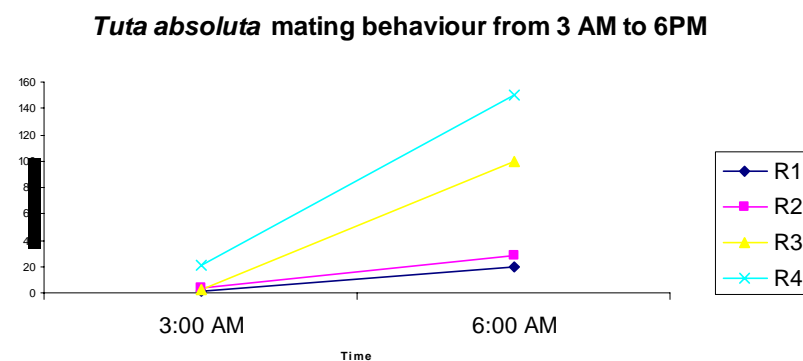
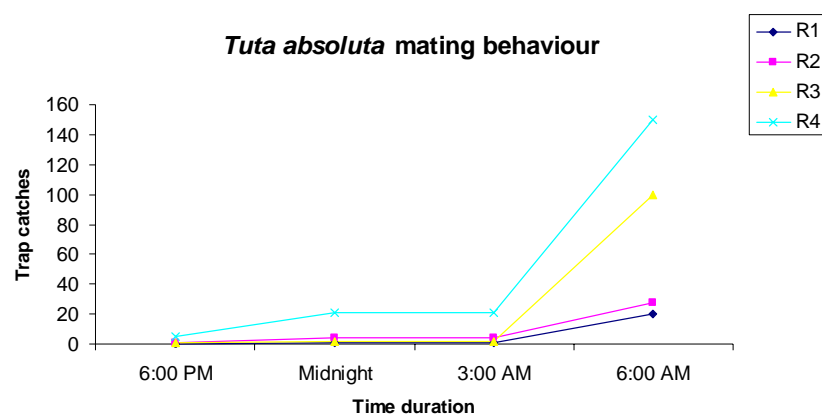
# Advantages of Ferolite trap

- 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* most active for mating 3-4 hours before sunrise**

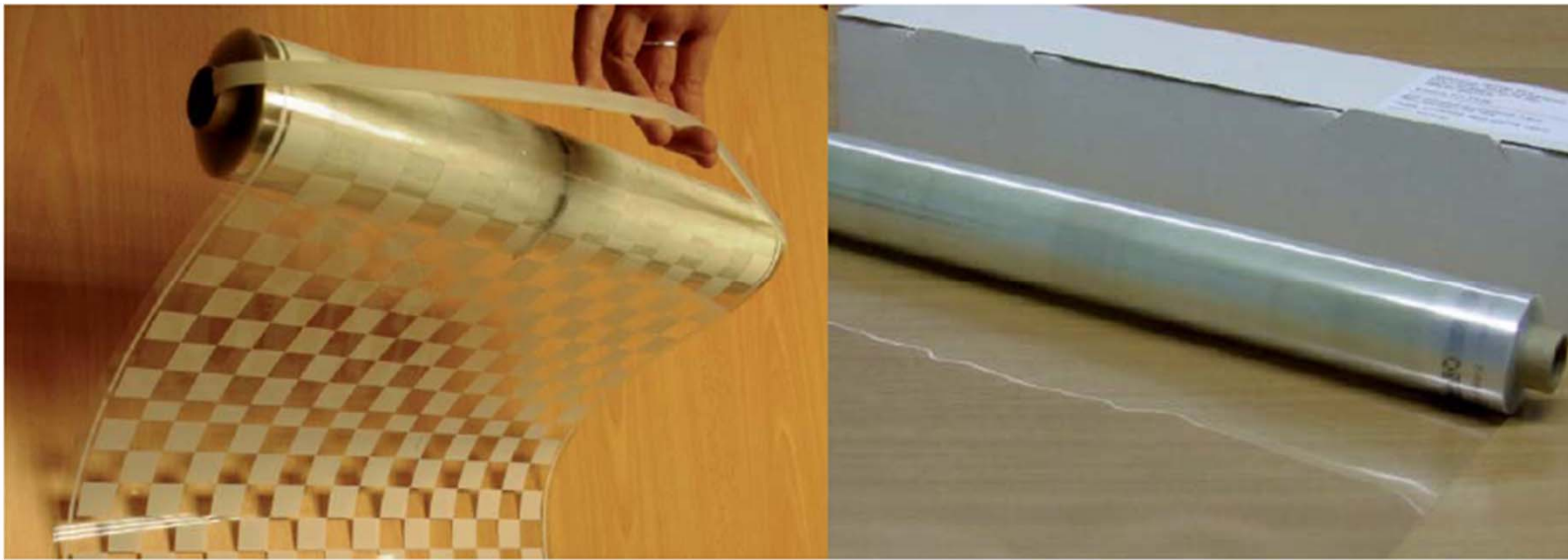


# Ferrolite in use



# 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 achaeae*.
- Ensures a steady release of attractant over a longer period of time.



# Tutaroll in use

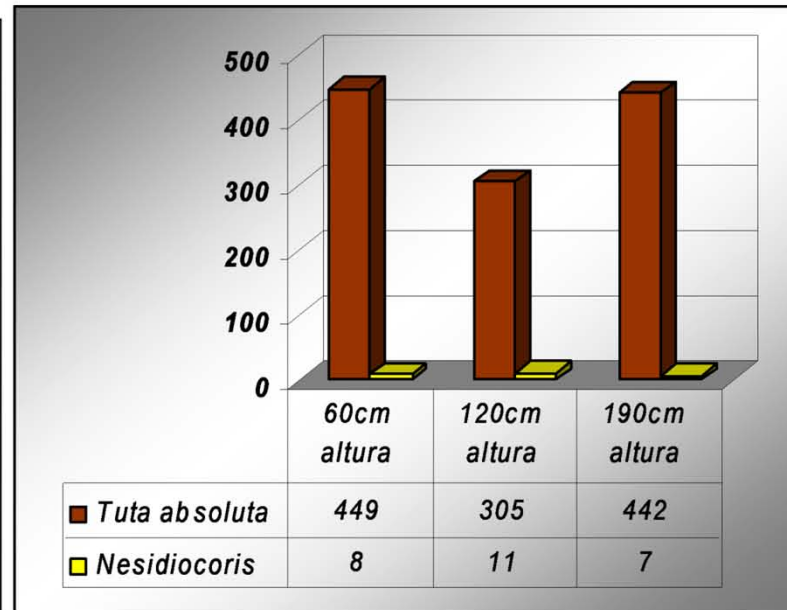
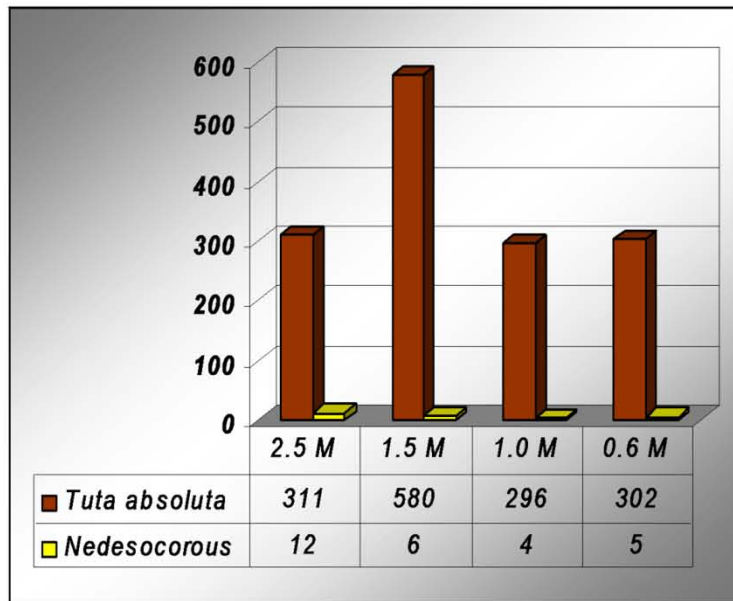


Tutaroll can be used horizontally  
In between two rows.

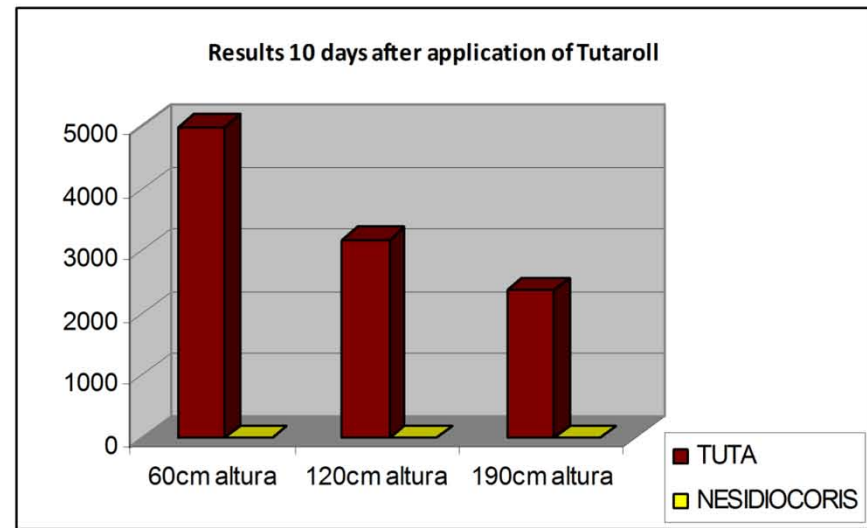
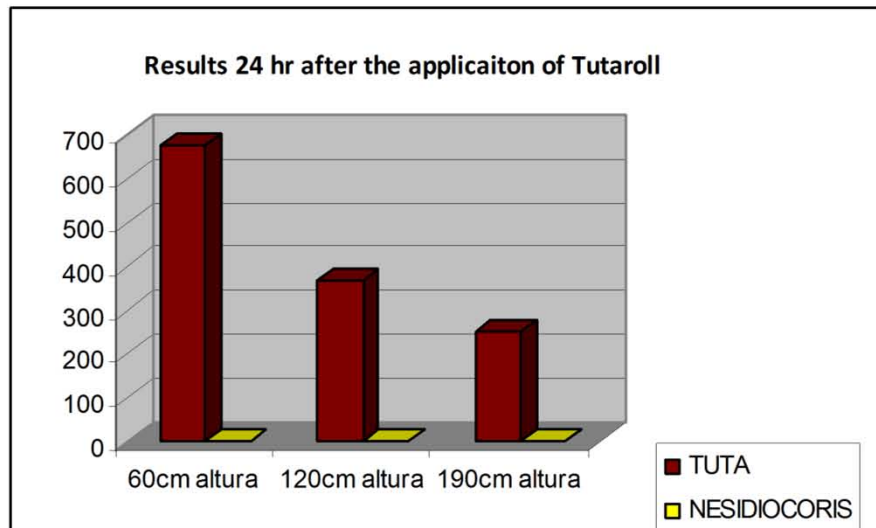


Tutaroll can be applied vertically from the  
top.





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 from the plant.



- 24 hr after application of Tutaroll catches 674 moths at 60 com 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 green houses.



Additional advantage of capturing white fly and aphids.  
Can be used for mass trapping as well as monitoring.  
Safe, simple and environmentally sound solution

**TAC-37**

Lure and Kill



***Tuta absoluta***



# 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.

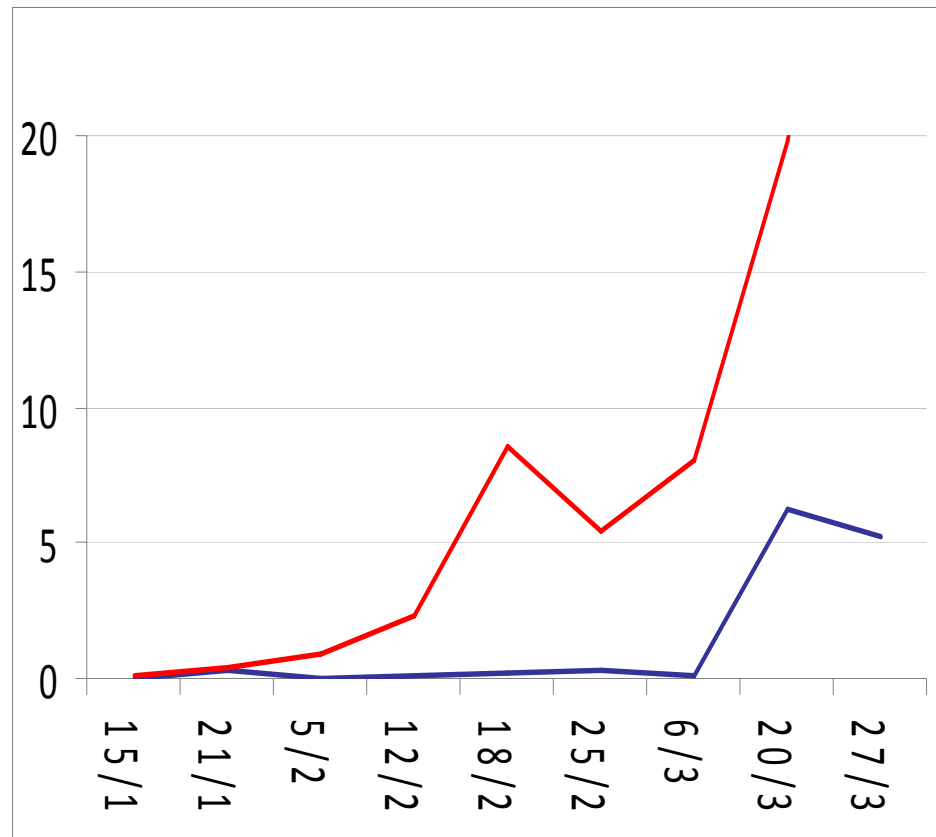
# Application

- TAC-37 could be applied using hand dispensing gun.
- Application can be mechanized for large scale field applications.



# Performance

- 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 Azadirachtin 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.

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**Thanks for your Attention**