Insecticide Resistance Action Committee

TUTA TASK TEAM UPDATE

International IRAC Mtg
Philadelphia, PA USA
March 2017
Abundant, Good-Quality
Technical Info Available
Early years: Focus on Spain and Italy

2006-2008
The development of a robust bioassay is essential for determination of baseline toxicity of insecticides and the design of resistance monitoring surveys.

Determine the product baseline susceptibility of 23 field collected populations from Spain, Italy and Greece.
Tuta presence and pest status globally.

In 10 years from 3% to 60% of tomato crops
2.8 million hectares
First report of *Tuta absoluta* resistance to diamide insecticides

Emmanouil Roditakis · Emmanouil Vasakis · Maria Grispou · Marianna Stavrakaki · Ralf Nauen · Magali Gravouil · Andrea Bassi

Chlorantraniliprole (season long appl.)

Untreated Check
Grower Practices Determine Pest Susceptibility

- growers trained on similar IRM recommends and training materials

<table>
<thead>
<tr>
<th>SPAIN</th>
<th>SICILY-ITALY</th>
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<tbody>
<tr>
<td>Dedicated technicians who scout and advise</td>
<td>Few advisors</td>
</tr>
<tr>
<td>Mandated release of bio control agents</td>
<td>Uncommon Practice</td>
</tr>
<tr>
<td>Extensive use of physical/cultural control measures: adult traps, solarization, sanitation</td>
<td>Mostly ignored</td>
</tr>
<tr>
<td>Attention to renovating GH’s to exclude Tuta</td>
<td>Apathetic - Passive</td>
</tr>
<tr>
<td>Depend on multiple Modes of Action</td>
<td>Highly dependent on diamides</td>
</tr>
<tr>
<td>More effective different MoA products available</td>
<td>Fewer product available (lost to “R”)</td>
</tr>
</tbody>
</table>
# 2016 Lepidoptera Working Group Company Team Members

## 10 Crop Protection Company Members Represented: 4 Companies Volunteered – Core Team

<table>
<thead>
<tr>
<th>NAMES</th>
<th>COMPANY</th>
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</thead>
<tbody>
<tr>
<td>Adeline Bertrand, Sebastian Coggiol</td>
<td>ADAMA</td>
</tr>
<tr>
<td>Werner Heck, Lixin</td>
<td>BASF</td>
</tr>
<tr>
<td>Nigel Godley, Ralf Nauen</td>
<td>Bayer</td>
</tr>
<tr>
<td>Jim Dripps, Maria Torne</td>
<td>Dow</td>
</tr>
<tr>
<td>Luis Teixeira, John Andaloro, Andrea Bassi</td>
<td>DuPont</td>
</tr>
<tr>
<td>Eric Andersen</td>
<td>FMC</td>
</tr>
<tr>
<td>Nobuyuki Nonaka</td>
<td>Nihon Nohyaku</td>
</tr>
<tr>
<td>Brian Duggan</td>
<td>Nufarm</td>
</tr>
<tr>
<td>Robert Senn, Jan Elias</td>
<td>Syngenta</td>
</tr>
<tr>
<td>Daniel Zommick</td>
<td>Sumitomo</td>
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</tbody>
</table>
Overall Objective of the Tuta Task Team Project:

*Provide cross-industry advice for best practice Tuta insect control in selected Europe, Middle East, and African countries by designing a regional Tuta pest control program that will be adapted, communicated and implemented locally to influencers, growers, and the industry supply chain.*

- Tuta Pest Management Practices
- Tuta IRM Recommends
# Best Management Practices to Control Tuta and Manage Insect Resistance

## 2016 Core and Extended Tuta Task Team

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>CORE MEMBERS</th>
<th>EXTENDED MEMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASF</td>
<td>Cesar Blanco Ruiz</td>
<td></td>
</tr>
<tr>
<td>Dow</td>
<td>Maria Torne</td>
<td>Aris Chloridis</td>
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<td></td>
<td></td>
<td>Enzo Tescari</td>
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<tr>
<td>DuPont</td>
<td>Luis Teixeira</td>
<td>Jean-Luc Rison</td>
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<td></td>
<td>John Andaloro</td>
<td>Ümit Ersöz</td>
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<td></td>
<td>Stefano Pasquini</td>
<td>David de Scals</td>
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<tr>
<td></td>
<td></td>
<td>Christos Theocharis</td>
</tr>
<tr>
<td>Syngenta</td>
<td>Robert Senn</td>
<td>Desiree van Heerden</td>
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<tr>
<td></td>
<td>Stefano Ramella</td>
<td>Pedro Vega</td>
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<tr>
<td></td>
<td></td>
<td>Radwan Ftayeh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sinisa Jelovcan</td>
</tr>
<tr>
<td>Experts -</td>
<td>Antonio Monserrat</td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>Pablo Bielza</td>
<td></td>
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</tbody>
</table>
Existing Country IRAC and Resistance Action Groups (former Diamide teams) in Focus Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Team</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spain</td>
<td>IRAC/CRAG</td>
</tr>
<tr>
<td>Italy</td>
<td>CRAG</td>
</tr>
<tr>
<td>Turkey</td>
<td>CRAG</td>
</tr>
<tr>
<td>Israel</td>
<td>CRAG</td>
</tr>
<tr>
<td>Morocco</td>
<td>CRAG</td>
</tr>
<tr>
<td>Rep S. A.</td>
<td>IRAC/CRAG</td>
</tr>
</tbody>
</table>
PROCCESS

✓ Numerous teleconferences throughout 2016
✓ Collected, collated, and wrote Tuta pest management, IPM, and IRM recommendations
✓ Identified and involved team leaders for focus countries.
✓ Two day organizing mtg in Malaga Spain
  - visited Spain greenhouses for clarity
  - developed a plan for local implementation in 2017/18
  - finalized educational/technical documents – Jan 2017
✓ Now developing a country interaction and audit plan
Best Management Practices to Control *Tuta absoluta* and Recommendations to Manage Insect Resistance

IRAC *Tuta* IRM Task Team

2017 Version 6
Best Management Practices to Control Tuta and Manage Insect Resistance

TABLE OF CONTENTS (140 page slide set)

1. Update Tuta presence and pest status globally
2. Recognize Tuta life stages, life cycle, damage, and plant symptoms
3. Tuta control products, resistance publications, and method to evaluate efficacy
4. Monitor Tuta populations
5. Integrate key Tuta control strategies
6. Understand Action Thresholds for chemical and microbiological control
7. Maximize pest control using adjuvants and app tech equipment
8. Understand Insecticide Resistance Management Principles
9. Implement Insecticide Resistance Management Strategies
10. Grower adoption of Tuta IRM: Factors that influence Growers
11. Examples of country MoA alternation programs
12. Country IRM execution guidelines
1. Update Tuta presence and pest status globally.

Possible areas under risk of pest spread

Main world tomato production areas at risk

- Confirmation of presence in India and Middle east makes Afganistan, Pakistan, India, Nepal and China as risk areas (Nepal: “Sensitizing workshop on Tuta absoluta: An impending threat to tomato production” 2015 Sponsored by IAPPS)
- Actions at OIRSA (International Regional Organization for Agricultural Health) Including: El Salvador, Costa Rica Honduras, Guatemala, Mexico, Bélice, Nicaragua and Panamá
- Presence in Kenia and Tanzania makes that Mozambique, Malawi, Zimbabwe, Zambia, Botswana as well as South Africa are at risk
**Tuta absoluta Life Cycle**

- **Egg**
  - 3 - 8 d

- **Larva**
  - 9 - 30 d

- **Pupa**
  - 6 - 20 d

- **Adult**
  - 6 - 15 d  
  - 10 - 25 d ♀

- **Egg to adult**: 25 - 80 days
- **Thermal threshold for juvenile development**
  - lower: $10 > x < 13 \, ^\circ C$
  - upper: $30 > x < 35 \, ^\circ C$

  (Various authors; Cuthbertson et al. 2013)

- **Up to 13 generations per year**

- **Good cold resistance**
  - supercooling points: larvae (-18.2°C), pupae (-16.7 °C), adults (-17.8°C)
  - the lower lethal temps for adults at 0°C (17.9 d), 5°C (27.2 d)

  (Van Damme et al. 2015)
Tuta absoluta: Typical Damage

Leaf damage up to 100%)
Decrease photosynthesis and yields

Tuta absoluta

Tuta absoluta Fruit Damage

Liriomyza spp.

Antonio BIONDI, Lucia Zappalà, Giovanna Tropea Garzia, Gaetano Siscaro University of Catania, ITALY; antonio.biondi@unict.it
3. Tuta control products, resistance publications, and method to evaluate efficacy.

<table>
<thead>
<tr>
<th>Method:</th>
<th>No: IRAC No. 022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status:</td>
<td>Approved</td>
</tr>
<tr>
<td>Species:</td>
<td>Tuta absoluta</td>
</tr>
<tr>
<td>Species Stage</td>
<td>Larvae L2 (size: 4-5 mm)</td>
</tr>
<tr>
<td>Product Class:</td>
<td>Oxadiazins (IRAC MoA 22), anthranilic diamides (IRAC MoA 28), spinosyns (IRAC MoA 5)</td>
</tr>
</tbody>
</table>

**Comments:**
In order to obtain homogeneous *Tuta absoluta* larvae (same age, nutritional and general health condition), it is highly recommended that insects collected from the field (*F₀* generation) are brought to a laboratory and reared to the F1 generation for evaluation of insecticide susceptibility.
5. Integrate key Tuta control strategies

Integrated Pest Management – non chemical key tactics:

1. **GH cleaning and sanitation**
   - Prevent carry over of the pest from the previous crop; sanitation of the GH for a better start; use pest-free transplants; remove and destroy attacked part plants

2. **Physical control - Insect exclusion**
   - GH modern structures; insect netting; double doors; climate control

3. **Cultural control - Mass trapping**
   - Water/oil based and sticky traps pheromone-baited

4. **Biocontrol – Natural enemies**
   - Establish populations of effective biological control agents; select crop protection spray programs safe vs beneficials

5. **Mating disruption**
   - Mating disruption contribution when low density population of *T. absoluta*
8. Understand Insecticide Resistance Management PRINCIPLES

Implementing IPM Removes Resistant Individuals from the Population and Improves Level of Pest Control

Acquiring the highest level of pest control within a generation removes Resistant genes.

Reproductive Capacity Influences the Speed of Resistance

Implementing IPM with Different Modes of Action Reduces Selection Pressure for Resistance

Rotating insecticides with Different Modes of Action Reduces Selection Pressure for Resistance

Repeated exposure of pest populations to insecticides with the same Mode of Action will select for resistant insects.

Two successive insect generations shouldn’t be treated with insecticides that have the same Mode of Action number (examples 3, 1, 6). Products in Mode of Action subgroups (example 3A) should not be rotated among products within the same MoA group (example 3).

Insect Migration (exchange of resistant insects) Influences the Speed of Resistance.

Resistance levels in pest populations can be INCREASED through immigration of resistant insects. Therefore, the evolution of resistance in the pest population may accelerate.

IMMIGRATION OF RESISTANT INSECTS INTO A POPULATION OF SUSCEPTIBLE PEST INSECTS

Result: The percentage of resistant insects in the population is increased. The interbreeding between susceptible and resistant insects will likely increase the level of resistance in the next generation.

IRAC – A Tool to Help You Select Different Product Choice

Under-dosing Speeds the Rate of Resistance: Maximize Insect Kill With Every Spray

An under-dosed insecticide application may not remove moderately resistant insects from a pest population. This can accelerate the evolution of resistance.

Follow this rule to prevent resistance: alternate insecticides with different modes of action numbers.

There are currently 27 insecticides available with action numbers and not.

Mode of Action Classification: Phone/Tablet Application

Search for: IRAC moa

A list of insecticides with the summarized mode of action number is on the next page of this application.
9. Implement Insecticide Resistance Management Strategies

IRM Recommendations for Tuta absoluta on Tomato - 1

<table>
<thead>
<tr>
<th>Practice Integrated Pest Management</th>
</tr>
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<tbody>
<tr>
<td>Remove and destroy infested cull tomatoes and plant material</td>
</tr>
<tr>
<td>Remove all wild Solanaceous and other host plants near greenhouse</td>
</tr>
<tr>
<td>Rennovate greenhouse to exclude Tuta adults</td>
</tr>
<tr>
<td>Use pheromones and sticky traps to monitor and mass trap adults</td>
</tr>
<tr>
<td>Augment and conserve natural enemy populations</td>
</tr>
<tr>
<td>Apply entomopathic nematodes (<em>Steinernema feltiae</em>) in a foliar spray</td>
</tr>
<tr>
<td>Use optimal spray volume, maintain and calibrate spray equipment</td>
</tr>
<tr>
<td>Treat large areas to same MoA</td>
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<tr>
<td>CALIBRATE/ MAINTAIN sprayers. Clean/replace nozzles.</td>
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<table>
<thead>
<tr>
<th>Insecticide mixtures</th>
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</thead>
<tbody>
<tr>
<td>Tank mixing products:</td>
</tr>
<tr>
<td>Do not tank-mix insecticide products with the SAME MoA.</td>
</tr>
<tr>
<td>When tank-mixing insecticide products with DIFFERENT MoA’s, follow label rates for each insecticide.</td>
</tr>
<tr>
<td>Respect maximum number of applications, PHI and REI stated in the label of each product.</td>
</tr>
<tr>
<td>Product(s) applied on subsequent window/pest generation should have an MoA that is different from both tank-mix partners.</td>
</tr>
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<thead>
<tr>
<th>Apply insecticides at economic pest thresholds</th>
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<tbody>
<tr>
<td>Follow locally established economic pest thresholds for the application of foliar insecticides in order to optimize insecticide use.</td>
</tr>
<tr>
<td>Always use labeled rates and water volumes.</td>
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<thead>
<tr>
<th>Use windows of insecticide application</th>
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<tbody>
<tr>
<td>Use windows of application to minimize exposure of sequential generations of a insect pest species to the same insecticide modes of action.</td>
</tr>
<tr>
<td>Each window should be approximately 30 days.</td>
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<table>
<thead>
<tr>
<th>Rotate insecticides with different MoA.</th>
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<tbody>
<tr>
<td>If more than one insecticide application is required during an application window then it is recommended to use an insecticide with a different MoA.</td>
</tr>
<tr>
<td>Multiple applications of insecticides with the same mode of action within a single window are acceptable as long as combined effects (residual activity) of the applications do not exceed approximately the 30-day window.</td>
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</table>

<table>
<thead>
<tr>
<th>Maximum Number of MoA Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is preferred to use the same MOA products in only 2 windows per season</td>
</tr>
<tr>
<td>Aoid using the same Mode of Action products in more than 3 windows.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Avoid insecticides with Tuta resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consult with local experts to determine which insecticides are affected by resistance in your locality. A preference to insecticides which are not affected by resistance should be given.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preserve non-target &amp; beneficial organisms</th>
</tr>
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<tbody>
<tr>
<td>The use of selective insecticides with reduced impact on non-target and beneficial organisms is recommended whenever possible.</td>
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<thead>
<tr>
<th>Manage the removal of in-season infested stems and fruit</th>
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<tbody>
<tr>
<td>In addition to practicing clean sanitation pre and post season it is critical to remove and destroy plant stems pruned during the season and all cull/waste tomato after each harvest.</td>
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<table>
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<tr>
<th>Rotate crops and Incorporate a Host Free Period</th>
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<tr>
<td>Subsequent crop plantings should be of a different crop type, which is not a host to the insects which are pests of Tuta.</td>
</tr>
<tr>
<td>Institute an area-wide fallow period where only non-host crops to Tuta can be planted disrupting the life cycle of Tuta.</td>
</tr>
</tbody>
</table>
9. Implement Insecticide Resistance Management Strategies

IRM Recommendations for Tuta absoluta on Tomato - 2

- Rotating products with different Modes of Action delays resistance.
  Don’t apply the same Mode of Action continuously:
  o Rotate insecticides with different modes of action using the window approach to minimize exposure of sequential generations of a pest species to the same insecticide MoA.
  o Each “treatment window” should be approximately 30 days.
  o Multiple applications can be made in a window:
    o If more than one insecticide application is required then attempt to use an insecticide with a different mode of action.
    o Multiple applications of insecticides with the same mode of action within a single window are acceptable if their combined residual activity does not exceed approximately the 30-day window.
  o After a “treatment window” of approximately 30 days rotate to a window with different MoA products for approx 30 days. Allow at 30-60 days before applying the same mode of action again.

- For crops longer than approx. 100 days, use the same MoA products in only 2 windows per season
- For crops less than approx 100 days then use same MoA products in only one window within the crop cycle.
  A short cycle crop (< 50 days) is a “treatment window”. Rotate products with different MoA in the next planting.
- Don’t treat the crop for more than approximately 50% of the cropping season or 50% of the total number of applications with same MoA
Select insecticides based on known local effectiveness and selectivity to beneficials.
- Know the attributes of your pest control products (adulticide, ovicide, larvicide, safety to beneficials, residual, spectrum)
- Use larvicides to treat young larvae
- Do not underdose. Follow label rates and intervals
- Use surfactants (wetting agents) to assure better coverage or methylated seed oil to acquire leaf cuticle penetration. Surfactants may be important to improve the activity of some insecticides.
- In high populations combine larvicide with adulticide or ovicidal product

Use sufficient spray volume.
- Maximize coverage to maximize pest kill

Whenever possible, use products and mixes that are selective and conserve natural enemies and pollinators
- Conserve natural enemies early season so they can assist in pest control season-long.
- Use B.t’s and non-chemical products against low Tuta populations.

Stop using products that are not providing good efficacy. Try that product again next season.
- Ideal to treat large areas with the same mode of action product and follow the same window rotation strategy
- Tank mix insecticides to control different life stages and manage pest populations.
- Rotate solanaceous crops with crops that are not a host to Tuta.
Example: Application Windows for Tuta absoluta on Tomato
Do not use the same insecticide MoA used in a previous window

9. Implement Insecticide Resistance Management Strategies

Rotation of different MoA Groups

Insecticides
A....A
or
A....B
or
A.....B.....C

Insecticide
D....D
or
D....E
or
D....E.....F

Insecticide
A....A
or
A....B
or
A....B.....C

Insecticide
D....D
or
D....E
or
A....B.....C

Insecticide
A....A
or
A....B
or
D....E.....F

Insecticides
D....D
or
D....E
or
D....E.....F

Rotation of different MoA Groups

Crop Stage

DAP

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180

11-19 51-59 61-69 71-79 81-83 84-86
9. Implement Insecticide Resistance Management Strategies

Pest Population Control and IPM Activities

Pre-Season
- Remove cull piles
- Kill weed hosts
- Renovate GH
- Moth-proof GH (fix screens)
- Monitor adults-Ph Traps
- Choose tolerant varieties
- Use pest free transplants

During-Season
- Manage the removal of in-season infested pruned stems and fruit
- Use pheromones and sticky traps to monitor and mass trap adults.
- Use pheromone dispensers for Mating Disruption
- Spray entomopathic nematodes and nonchemical products that will not select for insecticide resistance.
- Augment and conserve natural enemy populations
- Use optimal spray volume, maintain and calibrate spray equipment

Post-Season
- Remove cull piles
- Kill weed hosts
- Renovate GH
- Moth-proof GH
- Solarize soil
- Rotate to non-host crop & Incorporate a host free period:
  - subsequent crop plantings should be of a different crop type, which is not a host to the insects which are pests of Tuta.
  - Institute an area-wide fallow period where only non-host crops to Tuta can be planted disrupting the life cycle of Tuta.
11. Examples of country MoA alternation programs:

IRAC Spain

Pest control practices (**worse case scenario example**):
Example from Murcia: planting 3\textsuperscript{rd} Sep 14 and crop removal 10\textsuperscript{th} July 15
23 applications: 9 BT; 8 Diamides, 2 Spinosad, 1 Emamectine, 1 Indoxacarb and 2 Methomyl.
Up to 11 generations/crop cycle => shorter intervals with warm \( T \) and longer day light.

**Product rotation in this case (by MoA):**
11. Examples of country MoA alternation programs:
Italy (Syngenta)

Flight example  SPRING-SUMMER CYCLE: example of sustainable program

- **0-30 giorni**
  - 2 applications of clorantraniliprole

- **30-60 giorni**
  - 2 applications of Indoxacarb

- **60-90 giorni**
  - 2 applications of emamectine

- **90-120 giorni**
  - 2 applications of **B. thuringensis**

- **120-150 giorni**
  - 2 applications of Indoxacarb

- **150-180 giorni**
  - 1 application of emamectine

- **In case of high Tuta pressure, and with applications made with short spray interval (7-10 days), integrate the spray calendar with B. thuringensis**

- **In case of persistant infestation, make also 1 application with Spinosad**

- **In case of control of other Lepidopteran species, consider insecticides with different Moz (e.g. Lufenuron – IGR)**

**DO NOT APPLY INSECTICIDES WITH SAME MoA WITHIN 60 DAY FROM THE LAST APPLICATION**
11. Examples of country MoA alternation programs:

**Italy**  DuPont™ Greenhouse fall cycle

<table>
<thead>
<tr>
<th>Descrizione stadio</th>
<th>Post-trapianto (prime foglie sviluppate)</th>
<th>Fase di preparazione palchi fiorali</th>
<th>Fase di fioritura</th>
<th>Continua fioritura e comparsa prime bacche</th>
<th>Colorazione bacche e inizio primi stacchi</th>
<th>Termine fioritura e proseguimento raccolta</th>
<th>Raccolta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Periodo indicativo per trapianti campagna autunnale</td>
<td>1 - 20 sett.</td>
<td>20 sett. - 10 ott.</td>
<td>10 - 31 ott.</td>
<td>1 - 30 nov.</td>
<td>1 dic. - 28 febb.</td>
<td>1 - 31 marzo</td>
<td>1 - 30 aprile</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Caratteristiche periodo</th>
<th>Pianta in attiva crescita, elevata pressione <em>Tuta</em></th>
<th>Pianta in attiva crescita, elevata pressione <em>Tuta</em></th>
<th>Immissione bombi nelle serre</th>
<th>Presenza bombi nelle serre e calo pressione <em>Tuta</em></th>
<th>Calo temperatura e quiescenza <em>Tuta</em></th>
<th>Ripresa pressione <em>Tuta</em></th>
<th>Ripresa pressione <em>Tuta</em></th>
</tr>
</thead>
</table>

| Stadio BBCH | 11 - 19 | 51 - 59 | 61 - 69 | 71 - 79 | 81 - 83 | 84 - 86 | 87 - 89 |

| Prodotti e dosi per ettolitro | 2 trattamenti con Steward® 12.5 g + bagnante (intervallo 10-12 gg fra primo e secondo tratt.) | 2 trattamenti con Spinosad 25 ml (intervallo 10 gg fra primo e secondo tratt.) | 2 trattamenti con Altracor® 12 g + Codacide® (intervallo 7-10 gg fra primo e secondo tratt.) | 2 trattamenti con emamectinbenzato 150 g (intervallo 7-10 gg fra primo e secondo tratt.) | Trattamenti con *Bacillus thuringensis* (intervallo 8-10 gg fra i tratt.) | 2 trattamenti con Steward® 12.5 g + bagnante (intervallo 10-12 gg fra primo e secondo tratt.) | Trattamenti con *Bacillus thuringensis* (intervallo 8-10 gg fra i tratt.) o con Spinosad in caso di infestazioni perduranti |

- **Group 22A Oxadiazine**
- **Group 5 Spynosins**
- **Group 28 Diamides**
- **Group 6 Avermectines**
- **Group 11 Bacillus**
- **Group 22A Oxadiazine**
- **Group 11 Bacillus**
11. Examples of country MoA alternation programs: IRAC Training Tuta Poster
12. Guidance for Locally Adapting and Implementing IRM Strategies

Checklist for country implementation teams to initiate and maintain IRM plan

Step I Organize-Meet-Align: A team of industry, university, local experts, and consultants

Step II Understand the common objectives and expectations of the team – Pick a Leader

Step III Review IRAC’s Code of Conduct & Antitrust Rules

Step IV Select target locations/growers/areas of common farming practices to focus effort

Step V Adapt regional Tuta IRM BMP guidelines to local area

Step VI Develop a plan to implement the IRM BMP strategies to focus areas

Step VII Develop plan to best communicate MOA to growers and Tuta industry

Step VIII Develop plan to educate growers & the ag community

Step IX Communicate advantages of IRM & grower’s responsibility to practice IRM

Step X Implement MoA communication, IRM strategies, grower/influencers education plans

Step XI Plan to take a leadership role once resistance occurs