Assessment of mating disruption efficacy by using new prototypes of overloaded sex pheromone traps.

Claudio Ioriatti, Mario Baldessari,
Fondazione Edmund Mach – 38010 San Michele all’Adige – Trento (Italy)
Andrea Lucchi,
Dept of Agriculture, Food & Environment, University of Pisa, 56124 Pisa Italy
David R. Lance, Victor Mastro
USDA-APHIS-PPQ-CPHST - Otis Lab, 1398 West Truck Rd. Buzzards Bay, MA 02542
MD in vineyards

EGVM 1,120 ha
EGVM 10,750 ha
EGVM 1,000 ha

2013: 178,000 ha MD treated hectares

Infos from: M. Cooper, O. Tortosa, L. Sazo, V. Veronelli
Efficacy assessment

• Visual inspection (eggs and larvae assessment)
  – Labor intensive, time consuming

• Traps shut down
  – (std ph-lure – 1 mg E7,Z9-12:Ac)
  – necessary but not sufficient
Questions

1. How is it possible to assess MD efficacy saving time and cost?

2. Are there any effective tool for early alert of MD failure?
Improve the trap efficiency

$H_0$: a trap baited with more attractive ph-lure will be less inhibited by the presence of MD

1. Multicomponent pheromone lure (El-Sayed et al. 1999)

<table>
<thead>
<tr>
<th>Component</th>
<th>5 comp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E, 7, Z, 9-12 : AC</td>
<td>1 mg</td>
</tr>
<tr>
<td>E, 7, Z, 9-12 : OH</td>
<td>0.05 mg</td>
</tr>
<tr>
<td>Z, 9-12 : AC</td>
<td>0.01 mg</td>
</tr>
<tr>
<td>E, 9-12 : AC</td>
<td>0.01 mg</td>
</tr>
<tr>
<td>$\Delta$ 11-12 : AC</td>
<td>0.1 mg</td>
</tr>
</tbody>
</table>

2. Overloaded sex pheromone traps (Charmillot 1990; Branco et al., 2006)

3. Overloaded multicomponent pheromone lure
Set-up of multicomponent pheromone lure
(Lugana 2013 – 6 reps/lure/treatment, 4 ha each)

ANOVA and Tukey test
Set-up of overloaded ph-lure
Franciacorta 2012 – 2013
4 reps/lure/treatment, 4 ha each
4 traps/lure were installed in each MD treatment
Overloaded pheromone lure

CONTROL

500 m

4 traps/lure were installed in each MD treatment
Overloaded pheromone lure control

4 traps/lure were installed in each MD treatment.
EGVM catches in 2012
(control, Franciacorta)

![Graph showing moth catches in 2012 and 2013. The x-axis represents dates from 23 April to 1 October, and the y-axis represents moth catches per trap. The graph compares the moth catch between 2012 and 2013.]
Set-up of overloaded ph-lure
Franciacorta 2012 – 2013

Overloaded lure (5 and 10 mg) caught significantly more moths than standard lure in MD treated plots, but not in the control.

Overloaded lure (10 mg std and 10 mg 5-cmp) caught significantly more moths than standard respective 1 mg in MD treated plot, but not in the control.

ANOVA – Tukey test
Set-up of overloaded ph-lure  
Franciacorta 2012

**Graphs:**
- **Capture inhibition in relation to pheromone release rate of MD technologies**
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**Line graph:**
- **Total catches/trap**
- **Pheromone release rate/day (mg/ha)**
- **R² = 0.9571**
- **R² = 0.8571**

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**Graphs:**
- **Capture inhibition in relation to pheromone release rate of MD technologies**
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**Graphs:**
- **Capture inhibition in relation to pheromone release rate of MD technologies**
- 

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**Graphs:**
- **Capture inhibition in relation to pheromone release rate of MD technologies**
- 

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**Text:**

Trap inhibition increases by increasing the daily pheromone release rate (mg/ha) (Grieshop et al., 2010).

1 mg std lure is more rapidly inhibited by the presence of PMD compared to 10 mg std lure

(data of 2013 are still preliminary)
Set-up of overloaded ph-lure
Franciacorta 2012 – 2013

10 mg std lure > 1 mg std lure (p≤ 0.01).

Testing by treatment:
Control, Puffer Lb (not significant at p≤ 0.05 )
RAK 2 Max, Hercon, NoMate (p≤ 0.05); Isonet L+, Isca Splat (p≤ 0.01)
(Wilcoxon Signed-Ranks Test, for pair of traps on the same row)
Set-up of overloaded ph-lure
Franciacorta 2012 – 2013

1 mg std > 1 mg 5 comp lure (p ≤ 0.05).

Testing by treatment:

Control, not significant at p ≤ 0.05
MD treatments → 1 mg std > 1 mg 5 comp (p ≤ 0.01)

(Wilcoxon Signed-Ranks Test, for pair of traps on the same row)
Questions

1. How is it possible to assess MD efficacy saving time and cost?

2. Are there any effective tool for early alert of MD failure?
Effectiveness of early detection of moth flight

We checked the traps once a week and we scored 1 point any time an overloaded traps caught moths before the respective 1 mg (and vice versa)
This was done for each treatment and for each generation.
Effectiveness of early detection of moth flight

Franciacorta 2013

N° of positive traps before 1 mg std traps catch the first moth; 4 traps/treatment
How it works?

• Overloaded sex pheromone traps have a larger attraction range (Mason et al., 1990, Schylter 1992; Franklin and Gregoire, 2001; Branco et al., 2006,).
  – They are able to drain moths from out of the attraction range of the standard lure.
  – The consequence is a larger number of catches when the density of population around the trap is low,
  – ……but not when high density of moths are already around the trap as in the untreated control of these field trials (trap saturation)

• In MD plot, the range of attraction of the std lured traps is reduced because of the pheromone concentration in the vineyard atmosphere (Grieshop et al., 2010).
  – Increase of catches in the overloaded sex pheromone traps in MD plot is due to the enlarged attraction range that drains moths from larger distance.

• In this situation, number of catches is increasing as far as the pheromone concentration is not appropriate, MD does not work properly, and trap can compete efficiently with virgin female (Miller et al., 2006).
Conclusions

1. Moth catches significantly increase by increasing the ph-load from 1 to 10 mg in the MD treated plots but not in the untreated control (Franciacorta a 2012, 2013).

2. Overloaded sex pheromone traps catch moths earlier than the standard baited ones (Franciacorta a 2012, 2013)

3. 1 mg multicomponent lure does not increase significantly neither the moth catches nor the earliness compared to the standard (1 mg) single component. (Franciacorta 2012, 2013, Lugana 2013)

4. Overloaded multicomponent lure increases the number of moth catches compared with the standard dose (1 mg) of multicomponent lure,

5. ….but the increase in catches is not always significant compared with the standard single component lure (Lugana 2013, Franciacorta 2013).
Future perspective

• It is known that there is not a relationship between moth caught in the standard sex pheromone traps and the risk of damage. Trap shut down is necessary, but some time is not sufficient to assure the efficacy of MD.

• As overloaded sex pheromone trap is catching some moths even when MD is efficient, future experimental activities will address the objective to set a threshold for triggering control actions (inspection, treatments)
Thank you for your kind attention
EGVM Infestation during the third flight

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Isonet L plus</th>
<th>Puffer</th>
<th>Isca</th>
<th>RAK 2 max</th>
<th>No Mate</th>
</tr>
</thead>
<tbody>
<tr>
<td>egg/cluster</td>
<td>4.0</td>
<td>0.7</td>
<td>1.1</td>
<td>3.5</td>
<td>1.1</td>
<td>0.9</td>
</tr>
<tr>
<td>larvae/cluster</td>
<td>0.6</td>
<td>0.1</td>
<td>0.3</td>
<td>0.2</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>% infested cluster with larvae</td>
<td>37.5</td>
<td>5.0</td>
<td>27.5</td>
<td>13.8</td>
<td>11.3</td>
<td>11.3</td>
</tr>
<tr>
<td>% infested cluster with eggs</td>
<td>83.8</td>
<td>27.5</td>
<td>25.0</td>
<td>77.5</td>
<td>38.8</td>
<td>35.0</td>
</tr>
<tr>
<td>% infested clusters with eggs and larvae</td>
<td>91.3</td>
<td>28.8</td>
<td>45.0</td>
<td>82.5</td>
<td>46.3</td>
<td>42.5</td>
</tr>
<tr>
<td>average % of damaged cluster</td>
<td>40.4</td>
<td>2.2</td>
<td>18.0</td>
<td>11.1</td>
<td>9.6</td>
<td>11.3</td>
</tr>
</tbody>
</table>
EGVM Infestation
2° generation - Franciacorta 2012

EGVM damage: % of infested cluster of first summer generation larvae

Reference plot: 21.75%
Hercon: 5.00%
Isonet L plus: 2.75%
Rak 2 Max: 7.00%
Isca splat: 4.75%

Release rate /day
E7,Z9-12:Ac 610.8 804.3 775.5 311.8
E7-12:Ac 0.0 97.9 3.4 14.8
## Lugana 2012-13

<table>
<thead>
<tr>
<th>Treatment</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>catches</td>
<td>damage</td>
</tr>
<tr>
<td>Control</td>
<td>18,17</td>
<td>20,0%</td>
</tr>
<tr>
<td>Isonet L +</td>
<td>0,125</td>
<td>2,5%</td>
</tr>
</tbody>
</table>