New tactics for control of grape berry moth

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Grape berry moth
Metamorphosis of grape berry moth management

- Early 1900’s
  - Reliance on cultural and biological tactics, arsenical insecticides

- Mid 1900’s
  - Broad-spectrum neurotoxins: DDT, parathion, methyl parathion, etc
Metamorphosis of grape berry moth management

- Late 1900’s
  - Identification of sex pheromone and first mating disruption products
  - Cornell’s Risk Assessment Protocol developed and implemented
  - Food Quality Protection Act, insecticide restrictions

- Early 2000’s
  - Further restrictions on broad-spectrum pesticides
  - More selective insecticides available to growers
  - Increasing interest in sustainable viticulture
Mating disruption

- Pest management technique that uses synthetic sex pheromones to disrupt the reproductive cycle of insects.
Mating disruption principle
Mating disruption principle
Mating disruption principle
Grape berry moth mating disruption

- Studies in NY and Ontario demonstrated efficacy of twist ties for mating disruption
- But, low adoption of twist ties for GBM control
  - Most effective with moderate to low pest pressure
  - Needed season-long release
  - Labor to apply
  - Cost/efficacy relative to insecticides
Grape berry moth mating disruption

- Wax matrix (SPLAT-GBM™) is a flexible formulation for application in vineyards
- Provided season-long control of Oriental fruit moth
- Additional work on Codling moth, other leps
SPLAT-GBM™

- SPLAT = Specialized Pheromone & Lure Application Technology
- Application is versatile (hand, mechanical)
- Can be ‘charged’ with one or more pheromones
2005-06 Large-plot mating disruption study

- 1 ml SPLAT-GBM™ per post (3% pheromone)
- Male GBM monitored weekly in traps baited with lures
- Sampled GBM infestation for 1st and 2nd generations
Male moth captures

Captures in SPLAT-treated plots significantly lower than untreated plots.

High disruption for 10-12 weeks.
Percent cluster infestation

Large-plot mating disruption study

Border

Interior

% clusters infested ± S.E.

2005                   2006

2005                   2006

Untreated
SPLAT

Untreated
SPLAT

Gen 1  Gen 2  Gen 1  Gen 2

2005  2006  2005  2006

Gen 1  Gen 2  Gen 1  Gen 2

2005  2006  2005  2006
Effect of droplet density on male moth captures

- Small plot experiment in 2006
- 0.2 ml drops at densities of 40, 160, 320, 640, or 1280 drops/acre
- Lure-baited trap in each plot, checked weekly May-August
Effect of droplet density on male moth captures

Moth captures

- Blue line: Interior
- Green line: Border

Trap Shutdown

Point sources per hectare vs. Trap shutdown (%) graph.
Mechanical application of SPLAT-GBM™

“SPLAT-o-Gator”
60 psi
0.8 g droplets
0.5 or 1 kg/acre
10 mph = 10 ac/h

Solenoid valves
Nitrogen propellant
SPLAT
Electronic controller
2008 Comparison of application rates

- Replicated 1-7 acre vineyards
- 4 Treatments
  - Insecticides only (no mating disruption)
  - Insecticides + SPLAT 0.5 Kg/ac (X 2)
  - Insecticides + SPLAT 1.0 Kg/ac (X 2)
  - Insecticides + SPLAT 1.0 Kg/ac (X 3)
2008 Comparison of application rates

- **Lower infestation at vineyard borders**
- **No effect of application rate**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Infested clusters (%)</th>
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<tbody>
<tr>
<td>No Pheromone</td>
<td>A</td>
</tr>
<tr>
<td>SPLAT-GBM 0.5 kg x2</td>
<td>a, B</td>
</tr>
<tr>
<td>SPLAT-GBM 1 kg x2</td>
<td>a, B</td>
</tr>
<tr>
<td>SPLAT-GBM 1 kg x3</td>
<td>a, AB</td>
</tr>
</tbody>
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Mating disruption summary

- Wax matrix formulation provides a flexible method for pheromone application to vineyards
- 0.5 or 1.0 Kg/ac rates reduced GBM infestation at vineyard borders
- Low labor and applicator costs provide economical method for vineyard treatment
- Working to improve droplet integrity and applicator design
Potential for new reduced-risk insecticides

- Intrepid - methoxyfenozide
- Confirm - tebufenozide
- Altacor – rynaxypyr
- Delegate – spinetoram
- Avaunt – indoxacarb
- Assail – acetamiprid
- Clutch - clothianidin
- Venom - dinotefuran

Program 1:
- Gen 1 Capture 3.2 oz
- Gen 2 Capture 3.2 oz
- Gen 3 Danitol

Program 2:
- Gen 1 Danitol
- Gen 2 Capture 6.4oz
- Gen 3 Sevin, Sevin
Caged moth experiment

1. Dip clusters in treatment solutions for one minute

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Rate/ac</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intrepid 2F</td>
<td>8.0 oz</td>
<td>IGR</td>
</tr>
<tr>
<td>Guthion 50 WP</td>
<td>1.5 lb</td>
<td>OP</td>
</tr>
<tr>
<td>Sevin 80S</td>
<td>2.5 lb</td>
<td>Carbamate</td>
</tr>
<tr>
<td>Danitol 2.4 EC</td>
<td>10.6 oz</td>
<td>Pyrethroid</td>
</tr>
</tbody>
</table>

2. 20 adult moths caged onto clusters on DAY 1, 7, or 14

3. Clusters recovered 7 DAT to quantify adult survival, egglaying and survival to pupa/adult
Residue age vs. GBM survival from egg to adult

Residue age during exposure

- 1-7 days
- 7-14 days
- 14-21 days

% survival (Water = 100%)

- Water
- Intrepid
- Danitol
- Guthion
- Sevin
GBM in NW Michigan

- Pest pressure?
- Trapping for GBM not the best indicator
  - MSU and Cornell are currently working on this
- Scouting is preferred method
GBM in NW Michigan, 2008

% clusters infested

- Old Mission 1
- Old Mission 2
- Leelanau 1
- Leelanau 2

- July 12
- Aug 3
- Sept 18
Improved GBM control through phenology-based application of selective insecticides

Comparison of new insecticides and timings

Phenology-based sprays
Intrepid at 8 or 12 oz/ac

Risk Assessment Protocol
Sevin – Late June
Imidan – Mid-July
Baythroid – Late August

% infested clusters

- Untreated
- Intrepid 12 oz/ac x2
- Intrepid 8 oz/acre x2
- Growers standard
Summary

- Wax pheromone formulation shows promise for non-chemical control of GBM
- Mechanical applicator allows rapid treatment with pheromone wax
- Selective insecticides and other new products have great potential for GBM control with minimal side effects
- Integrating these tools into IPM programs will benefit workers, the environment, and beneficial insects
Acknowledgements

Thanks to…

All our grower cooperators

Zsofia Szendrei, Elly Maxwell, and Chris Sebolt

Jim Miller, Lukasz Stelinski and Larry Gut

Funding support…

Pest Management Alternatives Program
Crops at Risk Program
Viticulture Consortium-East