Hunting and Estimating MALB Populations

Wishful Thinking ?

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- KCMS Applied Research and Consulting staff

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1. When do MALB appear in vineyards?
2. Are they attracted to something specific?
3. Why are aromatic cultivars affected more than others – or are they?
4. Is there cultivar preference?
5. How do I know if I need to control MALB?
6. Why does MALB appear in vineyards close to harvest?
7. What role does fruit maturity play in MALB presence?
8. How can a processor estimate MALB levels in machine harvested grapes ?
9. Are MALB found uniformly in a block?
10. How can I prevent MALB from infesting my grapes?

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Research Projects

1. Use of Volatile Attractants - 2004
2. Vineyard Population Estimation- 2004
3. Bin Sampling- 2004
4. Region wide monitoring – 2005/2007
5. Olfactometer work – 2006/2007

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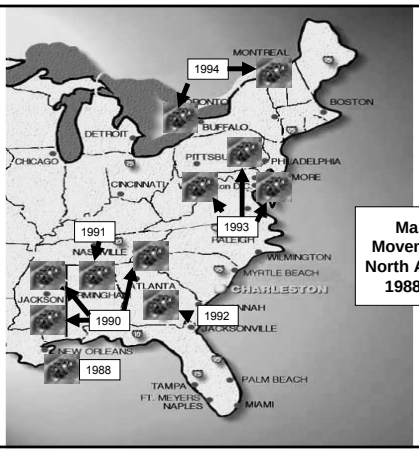

Map of Movement in North America 1988-1994

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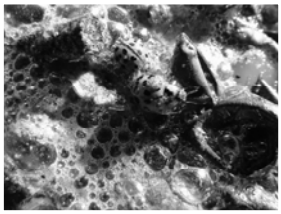
What Attracts MALB to Grapes?



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Volatiles ?

- Observations in 2001 and 2003 indicated that MALB was more prevalent in aromatic white cultivars Riesling, Gewürztraminer etc
- The key volatiles in these cultivars are the terpenes
- Literature suggested that some of the terpenes may be chemicals that are part of aggregation response

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Volatiles used

- α-terpineol,
- Linalool,
- Nerol,
- Citral,
- Geraniol.

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Volatiles Traps




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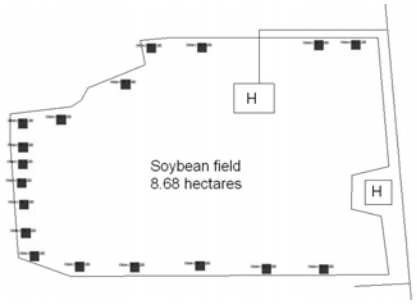
Soybean Field

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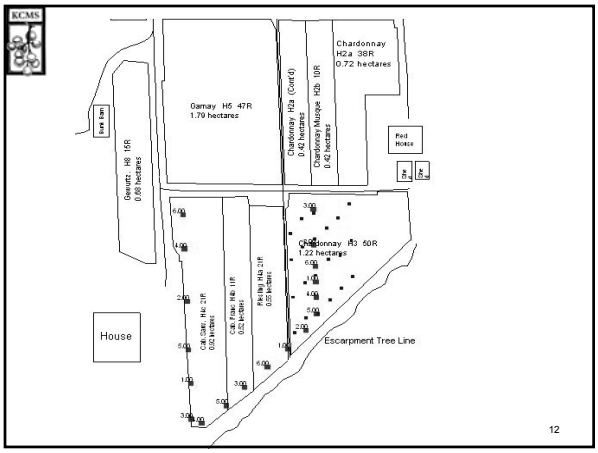

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West Grimsby – Base of Escarpment

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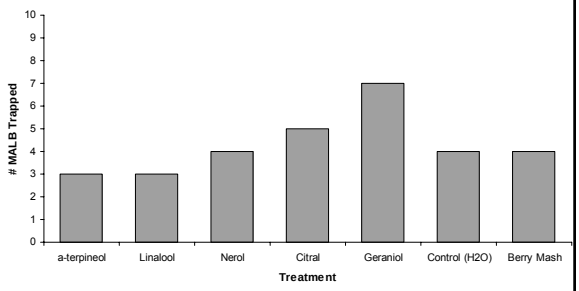
Results



Total MALB captures in volatile baited traps for all trial locations.

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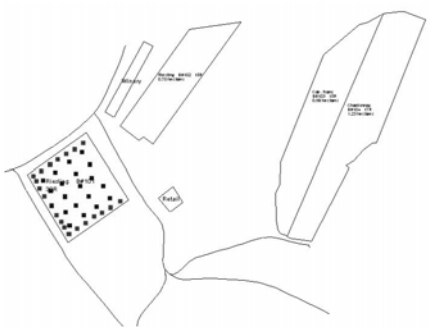
Vine Counts



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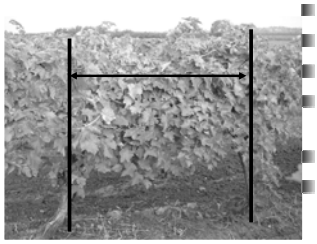
Vine examination



- 20 vines per block
- 4 vines per row
- 5 rows per block
- Wood, clusters, leaves
- 1 day per week
- Same vineyards as volatiles plus 2 other sites

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Vine Sampling Results 2004

- MALB not present until late in season
- #'s per vine less than 3 at any one sampling observation
- Greater number of MALB on vines nearer wooded areas
- More MALB in vineyards in West Niagara than in NOTL

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Processor Assessments Sampling Machine Harvested Bins

- How can a processor estimate the number of MALB per harvested bin?
- Processor threshold of 200 beetles per tonne (0.2 beetles/kg of fruit)
- Are the beetles evenly distributed in the bins?
- Will a surface inspection be good enough?
- Could a core sampler give an estimate of beetles below the surface?

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Seeding the Grapes





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Seeding the Grapes



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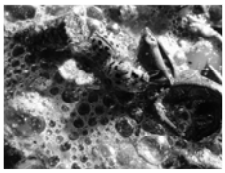

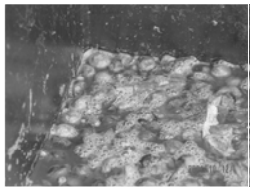


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Number of MALB adults found on the surface of seeded one tonne grape bins (200 MALB per 1 tonne of harvested grapes)

		Time (hours)				
		0	**2**	**4**	**6**	**8**
Bin #	**1**	0	38	35	25	15
	2	0	73	78	88	67
	3	0	10	12	12	8
	4	0	13	14	10	9
	5*	0	-	42	37	27

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Number of MALB recovered by core sampling
(9 cores Bins 1 to 4 – 1 tonne bins)
(18 Cores Bin 5 – 4 tonne bin)

		Time (hours)				
			2	**4**	**6**	**8**
Bin #	**1**		0	3	4	4
	2		1	5	1	7
	3		2	4	2	2
	4		3	7	3	5
	5*		14	11	8	8

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Bin Sampling Conclusions

- Surface counts do not provide reasonable estimate of total number of MALB in bin
- MALB migration to surface is highly variable
- Core sampling did not provide acceptable estimate of beetle numbers
- There was no difference in location of core sample for beetle detection
- Time to complete core sampling per bin unacceptable for commercial processing

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2005 - 2007
Region Wide MALB Monitoring

- Monitor specific vineyards across Niagara for MALB presence
- Commence prior to first MALB sighting
- Terminate at harvest
- Vineyard locations were strategically chosen to complement soybean data collected by Dr. Mark Sears, University of Guelph

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Region Wide MALB Monitoring

Methodology:

- 20 vines examined 2x/week at each location
- Early-season cultivars were examined first, moving to mid-season cultivars, then to late-season cultivars and finally to ice wine cultivars
- All sampling locations were GPS mapped, outlining sample blocks and vine locations

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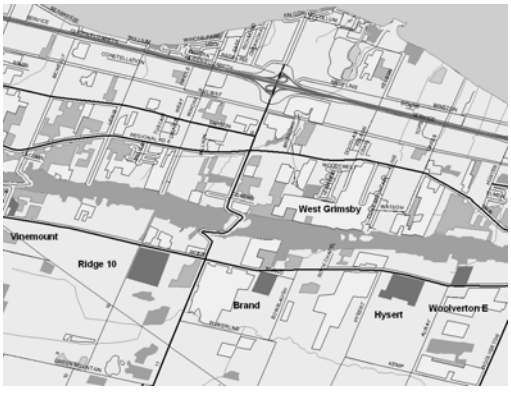

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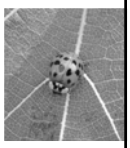
Region Wide MALB Monitoring



Results:

- All MALB found on selected vines were categorized into 4 groups depending on where the insect was observed;
- foliage - 35%
- clusters - 57%
- canes/trunks - 6%
- understory (vegetation under vines) – 2%



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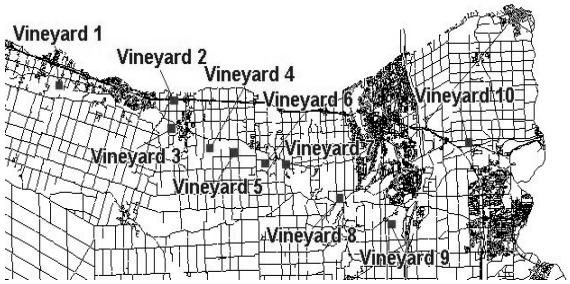
MALB Monitoring Locations



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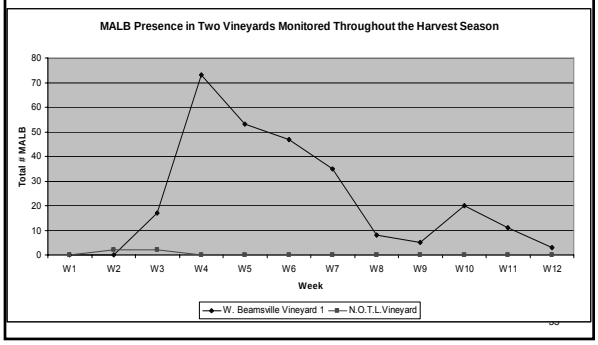
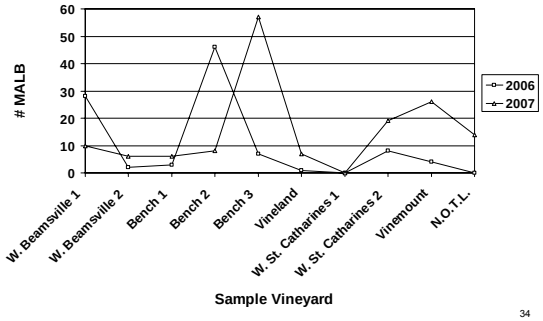
Region Wide MALB Monitoring



MALB Monitoring Results
(Sept/Oct)



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MALB Rapid Response

- To visit and document MALB presence and densities in vineyard blocks across the Niagara region after first detection
  - This required the cooperation of wineries and growers to call in at the first sign of MALB activity
- Assist growers in making critical management decisions
- Evaluate the control options accessible to growers in Niagara

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MALB Rapid Response

Results:

- 32 grape blocks examined
  - 2 blocks in NOTL
  - 13 blocks in W. St. Catharines / Jordan
  - 4 blocks in Vineland / Beamsville
  - 5 blocks on the Beamsville Bench
  - 8 blocks W. of Beamsville (including the Grimsby area)
- 11 cultivars examined
  - 6 Baco Noir, 4 Foch, 2 DeChaunac, 2 Cab. Franc, 2 Cab. Sauv. and 1 Merlot
  - 1 GM 311, 5 Chardonnay, 3 Riesling, 5 Vidal and 1 Rosette

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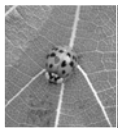
MALB Monitoring

- All MALB found were categorized into 4 groups depending on where the insect was observed; foliage, clusters, canes/trunks and/or understory




2005	**35%**	**57%**	**6%**	**2%**
2006	**27%**	**62%**	**8%**	**3%**

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Hidden Beetles



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MALB Rapid Response

- Dead MALB observed within clusters during the follow-up evaluation, post-spray.
  - These MALB were included in the follow-up count due to their potential for being harvested with the crop.
- Majority of MALB were observed on the perimeter vines (first panel or outside rows) and mainly on the upper wire growth (if applicable).

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MALB Rapid Response

- MALB activity is greatest on clusters (especially damaged and/or degrading clusters) during the mid-day hours.
- MALB activity is lowered immediately after a rain event.
- Growers that have historically observed MALB presence in their vineyards each year often chose to apply a pre-pick Malathion 500E treatment 72 hours (3 days) before harvest on all blocks.

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Control Products

Registered for use in Ontario

- Malathion 500 E (Malathion)
  - 3 day PHI
  - There appears to be a potential for MALB re-infestation after day 3 of Malathion 500E application
  - No repellent effect observed
  - Ex. One vineyard observed a 94% reduction of MALB at day 3 followed by a 400% increase of MALB at day 5 post Malathion application
- Ripcord 400 EC (Cypermethrin)
  - 7 day PHI
  - Research at AAFC Vineland shows a repellent effect observed for 2-3 weeks after application
  - Juice grapes destined for export to the US cannot be treated with cypermethrin

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MALB Rapid Response

Results:

- 87% MALB knockdown with Malathion 500E
- There appears to be high potential for MALB re-infestation after day 3 of Malathion 500E application.
  - One block exhibited a 400% increase of MALB at day 5 post Malathion application but had a 94% reduction of MALB at day 3.

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Multicoloured Asian vs. 7-Spotted Lady Beetle

Photo: M. Sears., University of Guelph

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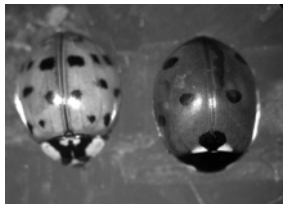

Grape loads rejected from wineries due to both species in 2007.

7-Spotted Lady Beetle has over 40x less IPMP compared to MALB

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Shaker Table

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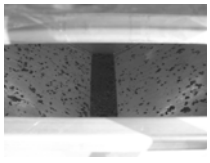
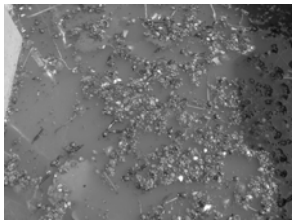
Shaker Table





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General Observations

- After spraying, dead MALB observed imbedded within clusters and on the vineyard floor
- Majority of MALB were observed on the perimeter vines and mainly on the upper wire growth
- MALB activity is greatest during the mid-day hours with direct sunlight
- MALB activity is lowered immediately after a rain event

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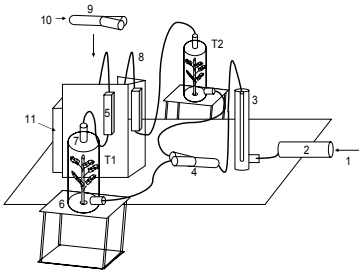
Olfactometer



1 – Clean pressurized air flow
2 – Activated charcoal filter
3 - Air stream humidifier
4 - Glass Y-tube
5 - Flow meter
6 - Bell jar support base
7 - Glass bell jar functioning as a volatile collection chamber
8 - Conduits made of Teflon® semi-flexible tubing
9 – Arena Y-tube
10 – Entry port for insect introduction into arena
11 - Mesh-covered frame

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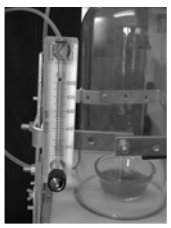
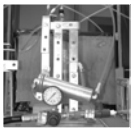
Olfactometer



Glass bell jar (containing volatile) and flow meter

Y-tube arena area

Glass bell jar and flow meter



Air regulator, activated charcoal filter and air stream humidifier (behind with red cap)

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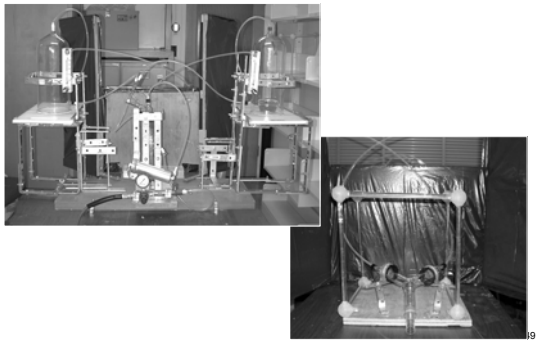
Olfactometer



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Volatiles of Interest

- Acetic Acid (high and low concentration)
- Acetaldehyde (high and low concentration)
- Ethanol (high and low %)
- Ethyl Acetate
- Methoxypyrazine

- Plus, various combinations of the above volatiles

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Conclusions

- Bin sampling is not reliable or time effective
- Vineyard population sampling must occur at first beetle detection (regional monitoring)
- Estimation of beetle population must occur prior to machine harvesting
- 7 day pre harvest estimation too long to be reliable
- Terpenes alone are not key attractants under low beetle populations
- Deteriorating fruit volatiles likely attractant

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KCMS
BEETLEJUICE
Courtesy of
Harmonia axyridis
Music by
Danny Elfman
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