



European Grapevine Moth *Lobesia botrana*



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Objectives:

- Locating the geographical origin of California's population
- 2011 Napa County Management Program
- UC treatment recommendations for 1st generation of 2012



Locating the Geographical Origin of *Lobesia botrana* (Lepidoptera: Tortricidae): a Recent Invasive Pest to the Americas

Thesis Advisors

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Exit seminar by Matthew Craig Middleton
in partial fulfillment of the requirements for the degree of
Master of Science in Biology
in the College of Science and Mathematics
California State University, Fresno
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Sample Collections

Sample countries in the Americas:

Chile
United States

Sample collection in Europe

(11 countries; multiple locations within each):

Bulgaria
France
Germany
Greece
Hungary
Israel
Italy
Portugal
Spain
Switzerland
Turkey

Samples (male moths) were collected from pheromone traps left at field locations for no more than three days and the moths placed in 70-100% ethanol.

Samples were shipped to the University of California Kearney Agricultural Research and Extension Center and preserved at -80°C for subsequent DNA analysis.

Sequencing Results

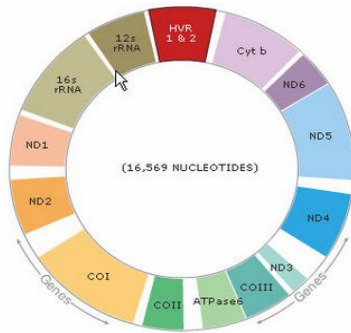
- CO₁
 - 116 individuals successfully sequenced and aligned for phylogenetic analysis
 - 9 haplotypes
 - 686 bp
- ITS₂
 - 102 individuals successfully sequenced and aligned for phylogenetic analysis
 - 12 haplotypes
 - 369 bp

Conclusions

- Low genetic variability in the CO₁, ITS₂ and ITS₂+CO₁ data sets, could not determine the source population or populations for EGVM in California.
- The genetic evidence from this study presents the case that EGVM populations, collected on cultivated grapes from broad geographic distributions, were genetically quite similar and not composed of distinct genetic strains that may have arisen in isolation.

Solutions

- Sequence complete section of the genome using novel sequencing approaches.



Summary of Pesticide Use Report for Napa County, 2011 (500 m areas)



1 st generation	2 nd generation	Acres	% of total	Sites	% of total
Conventional	Conventional	10,786.9	46.2	587	48.2
Conventional	Organic	41.37	0.18	4	0.33
Organic	Organic	2,072.9	8.9	113	9.3
Insecticide	None	5,250.7	22.5	193	15.8
None	Insecticide	1,783.2	7.6	73	6
None	None	3,399.08	14.6	249	20.4
Totals		23,334.1		1219	

2011 Pesticide Use Report Summary, Napa County
500 m treatment areas

1 st generation	2 nd generation	Acres	Sites
Altacor (chlorantraniliprole)	Intrepid (methoxyfenozide)	333.5	21
Altacor	Altacor	26.2	7
Altacor	None	150	16
Intrepid	Altacor	9689.3	494
Intrepid	Intrepid	727.3	64
Intrepid	Dipel (Bt) and/or Entrust (spinosad)	41.4	4
Intrepid	None	4188.8	136
Agri-Mek (abamectin)	Altacor	10.6	1
Agri-Mek	None	16.3	3
None	Altacor	1056.5	43
None	Intrepid	600.3	21
None	Dipel and/or Entrust	126.4	9
None	None	3399.1	249

1 st generation	2 nd generation	Acres	Sites
Dipel (Bt) and/or Entrust (spinosad)	Dipel (Bt) and/or Entrust (spinosad)	373.8	30
Dipel (Bt) and/or Entrust (spinosad)	None	895.7	38
Dipel (1)	Dipel (1)	319.8	19
Dipel (2)	Dipel (1)	98.1	9
Dipel (2)	Dipel (2)	492.3	22
Dipel (3)	Dipel (1)	273.6	3
Dipel (3)	Dipel (2)	210.3	10
Dipel (4)	Dipel (2)	222.7	7
None	Dipel and/or Entrust	126.4	9

Treatment	Acres	% of total	Sites	% of total
Isomate, Insecticide	13,047.5	56.2	585	48
Isomate, No Insecticide	294.5	1.3	26	2.1
No Isomate, Insecticide	6,827.5	29.4	386	31.7
No Isomate, No Insecticide	3,067.3	13.2	222	18.2
Totals	23,236.8		1219	

2011 Pesticide Use Report Summary, Napa County
500 m treatment areas

90 %

Intrepid							
	Apr 16		Apr 21 - May 14		May 15 - Jun 24		Totals
Acres, % total	3	0.02%	13085.5	89.3%	1558.2	10.6%	14646.7
Sites, % total	2	0.3%	643	92%	53	7.6%	698
Dipel and/or Entrust							
	Apr 5		Apr 18 - May 14		May 18- Jun 10		Totals
Acres, % total	0.3		2752.3	93.4%	195.2	6.6%	2947.8
Sites, % total	1		131	86.2%	20	13.2%	152
Altacor							
			Apr 21 - May 14		May 15- Jun 30		Totals
Acres, % total			444.3	87.2%	65.3	12.8%	509.7
Sites, % total			33	75%	11	25%	44
Agri-Mek							
			Apr 26 - May 13		Jun 23		Totals
Acres, % total			18.8	70.2%	8.0	29.8%	26.8
Sites, % total			3	75%	1	25%	4

89 %

Altacor							
	May 7- Jun 30		Jul 1- Jul 28		Jul 29 - Aug 16		Totals
Acres, % total	1109.2	10.3%	9639.3	89.1%	67.7	0.6%	10816.2
Sites, % total	57	10.4%	479	87.7%	10	2%	546
Dipel and/or Entrust							
	Jun 3 - Jul 5		Jul 6 - Jul 26		Aug 2		Totals
Acres, % total	225.4	10.1%	1967.5	88.3%	35.2	1.6%	2228.1
Sites, % total	19	15.1%	106	84.1%	1	0.8%	126
Intrepid							
	Jun 6 - Jun 30		Jul 1 - Jul 28		Aug 6		Totals
Acres, % total	164.7	10.3%	1432.1	89.3%	7	0.4%	1603.8
Sites, % total	20	18.9%	84	79.2%	2	1.9%	106

Summary of Pesticide Use Report for Napa County, 2011 (outside 500 m areas)



1 st generation	2 nd generation	Acres	% of total	Sites	% of total
Conventional	Conventional	2,283.7	43.5	112	41.5
Conventional	Organic	10.5	.0001	2	.01
Organic	Organic	504.8	9.6	32	11.9
Insecticide	None	1609.9	30.6	77	28.5
None	Insecticide	844.4	16.1	46	17
Totals		5,253.9		270	

2011 Pesticide Use Report Summary, Napa County
outside 500 m treatment areas

Treatment	Acres	% of total	Sites	% of total
Isomate	2,237.4	38.6	121	41.3
No Isomate	3,554.9	61.4	172	58.7
Isomate, Insecticide	1,745	78	99	81.8
Isomate, No Insecticide	492.5	22	22	18.2

2011 Pesticide Use Report Summary, Napa County
outside 500 m treatment areas

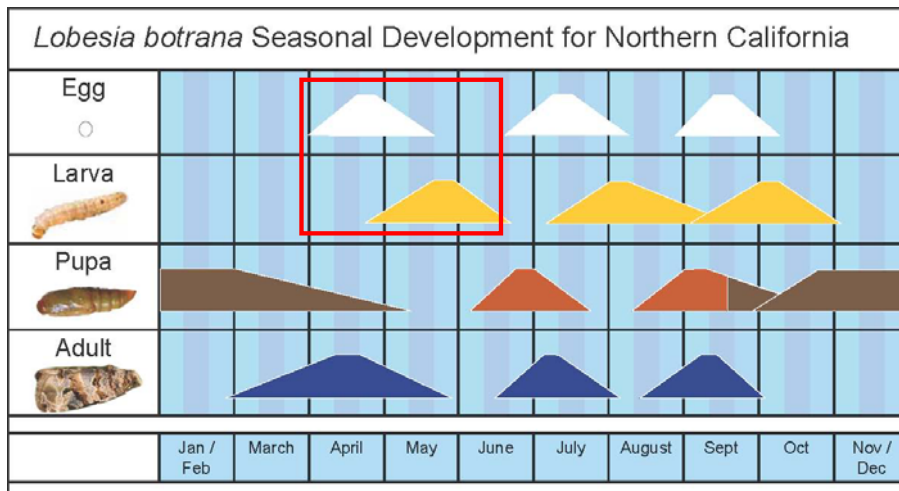
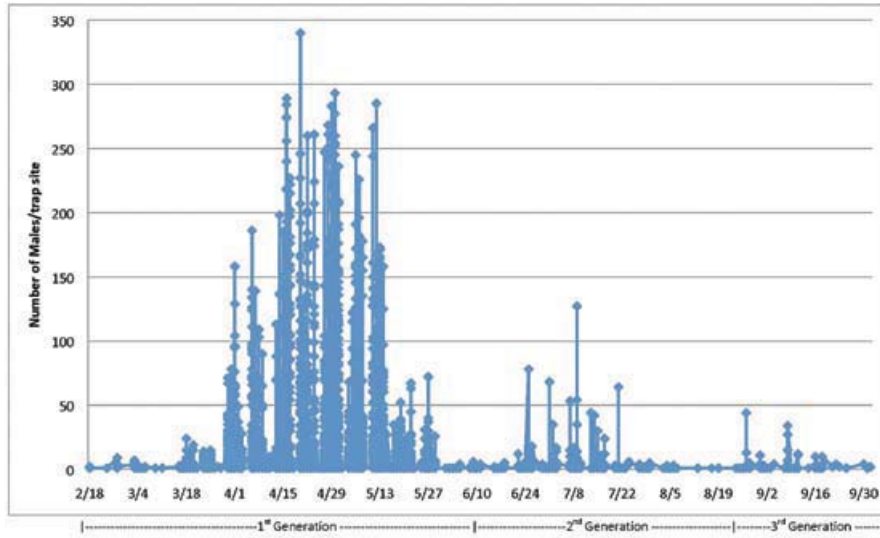
Insecticide Application Timing for 2012 1st generation



1st male flight: 6 to 8 weeks

Italy: Mar 26 to May 21

Portugal: Apr 16 to May 28



1st generation observations during 2010, 2011

Followed populations in multiple regions and varieties

Oakville/Rutherford CS: early, mid, late bud break

Initially, preparing to use degree-day development models



Development models require anchors



1st generation observations during 2010, 2011

Use shoot length to determine insecticide application timing?
varies across variety, site, vigor

Actually, what is important is cluster development



1st generation observations during 2010, 2011

Even when we were
finding adults, we
NEVER found eggs on
grapes before there
was at least 1 inch of
growth of flower
clusters



1st generation observations during 2010, 2011

Egg laying occurs during a period of ~5 weeks
At the same time, the cluster is elongating



1st generation observations during 2010, 2011

Eggs begin to hatch pre-bloom, when the cluster is fully expanded and individual flowers have separated



Eichhorn-Lorenz stage 17



Novartis Crop Protection, Canada

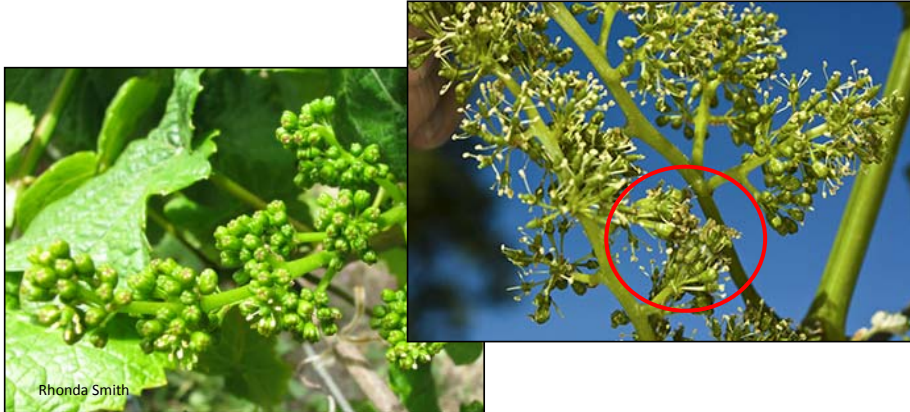
1st generation observations during 2010, 2011

1-5% bloom: mostly 1st, some 2nd to 3rd instar larvae

10% bloom: mostly 3rd instar larvae, also 1st and 2nd

Full bloom: 3rd to 5th instar larvae (no detectable eggs)

Fruit set: mature larvae and pupae



Insecticide applications for 1st generation, 2012

Optimal timing: Immediately before bloom (immediately before first caps are falling)

Cluster is fully elongated

Individual flowers are separating

Conventional
& Organic
insecticides



Eichhorn-Lorenz stage 17



Novartis Crop Protection, Canada

Just before bloom
Clusters fully elongated, individual flowers are separating



Just before bloom
Clusters fully elongated, individual flowers are separating



Bloom starting



Rhonda Smith

Bloom starting



Rhonda Smith

Insecticide applications for 1st generation, 2012

Too early: before flower separation;
more than 14 days before 1% bloom



Too late: if flowers are blooming
and you haven't treated



1st generation insecticide applications for 2012

Optimal: Just before bloom starts, when clusters are fully elongated and individual flowers are separating (Eichhorn-Lorenz stage 17)

Too early: More than 14 days before 1% bloom

Too late: Full bloom

Conventional
& Organic
insecticides

Newsletter:

<http://ucanr.org/NapaLobesia>

Website:

<http://ucanr.org/NapaEGVM>



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