Foothill Grape Day
June 14, 2007

Vine Mealybug Biology & Control Strategies

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Grape


Longtailed


Obscure

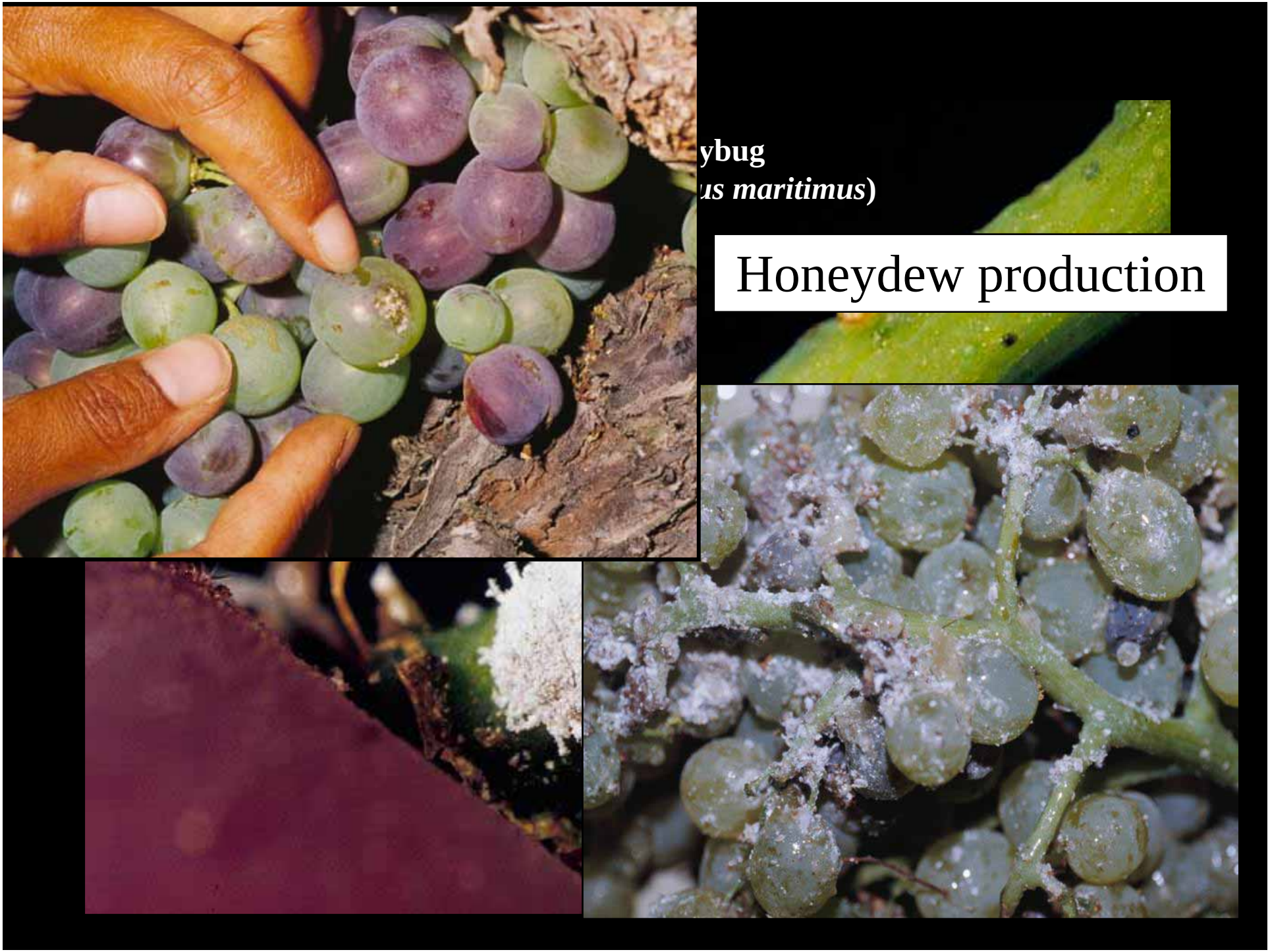

Vine

Vine Mealybug is Different from Grape Mealybug

Grape mealybug
(*Pseudococcus maritimus*)

Morphology

Vine mealybug
(*Planococcus ficus*)


ybug
us maritimus)
Honeydew production

Vine Mealybug is Different from Grape Mealybug

Grape mealybug
(*Pseudococcus maritimus*)

Synchronized generations

Ease of sampling

Timing of insecticide applications

Vine mealybug
(*Planococcus ficus*)

Overlapping generations

1-2 generations per season

Grape mealybug
(*Pseudococcus maritimus*)

Table 1. VMB degree days (DD) for grape-growing regions.

Region	Location	Cumulative DD	Generations per season
Monterey Coast	Monterey	498	1.80
North Coast	Napa	1092	3.95
	Sonoma	1286	4.65
Russian River	Cloverdale	1333	4.82
Central Coast	San Luis Obispo	1039	3.76
	Paso Robles	1407	5.09
Northern SJV	Lodi	1448	5.24
Sierra foothills	Sonora	1468	5.31
Central SJV	Madera	1752	6.34
	Fresno	1903	6.88
	Bakersfield	2192	7.93
Coachella Valley	Coachella	3423	12.38

Amador & El Dorado County

4.2 to 5.25 generations per season

Vine mealybug
(*Planococcus ficus*)

Sampling

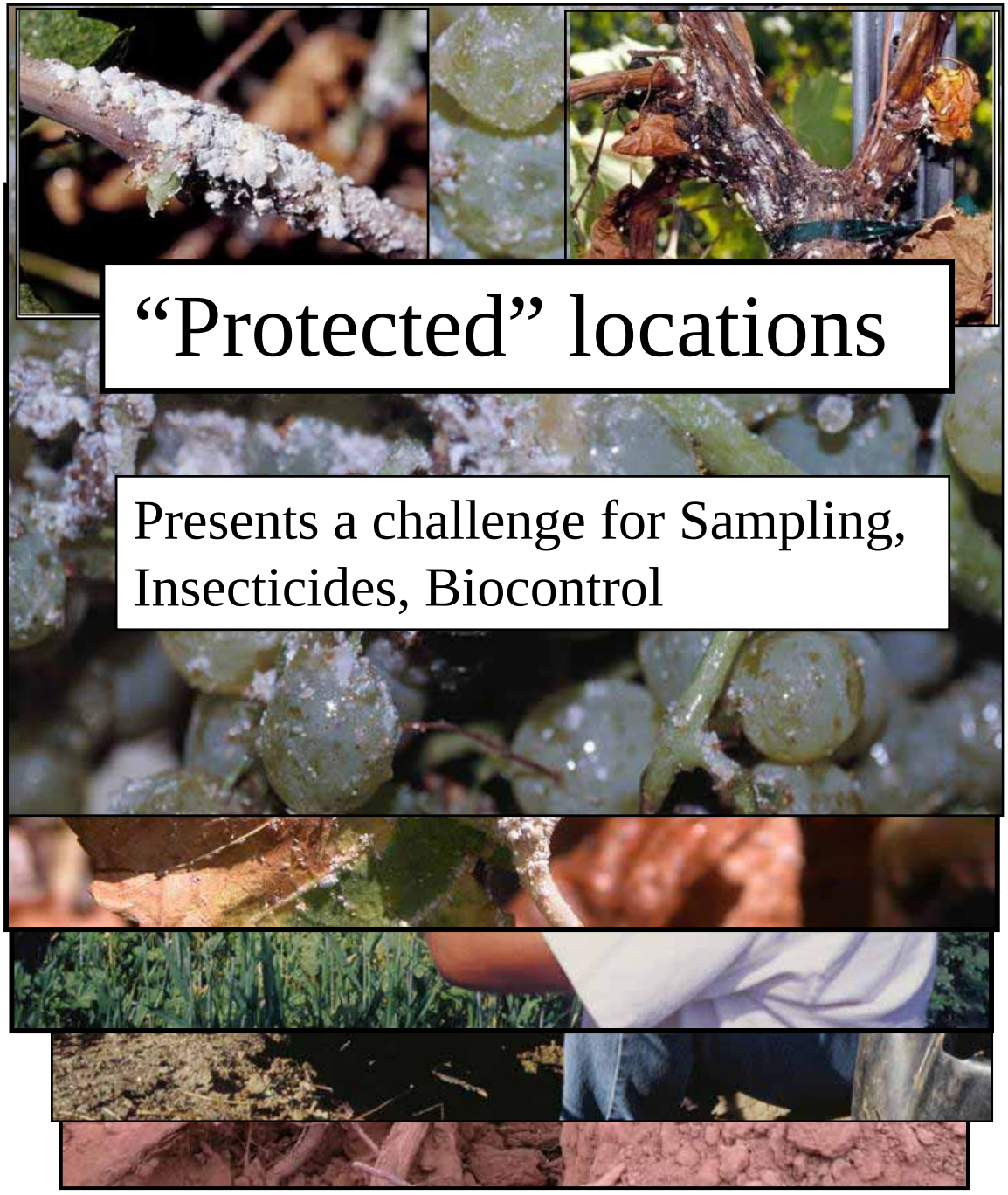
Harvest:
Upper trunk, canes, leaves, bunches

Summer:
Upper trunk, canes, spurs, leaves

Late spring:
Upper trunk, canes, spurs, basal leaves

Early spring:
Lower to mid-trunk

Winter: Roots and lower trunk



“Protected” locations

Presents a challenge for Sampling, Insecticides, Biocontrol

Harvest:
Upper trunk, leaves, bunches

Summer:
Upper trunk, canes/spurs leaves

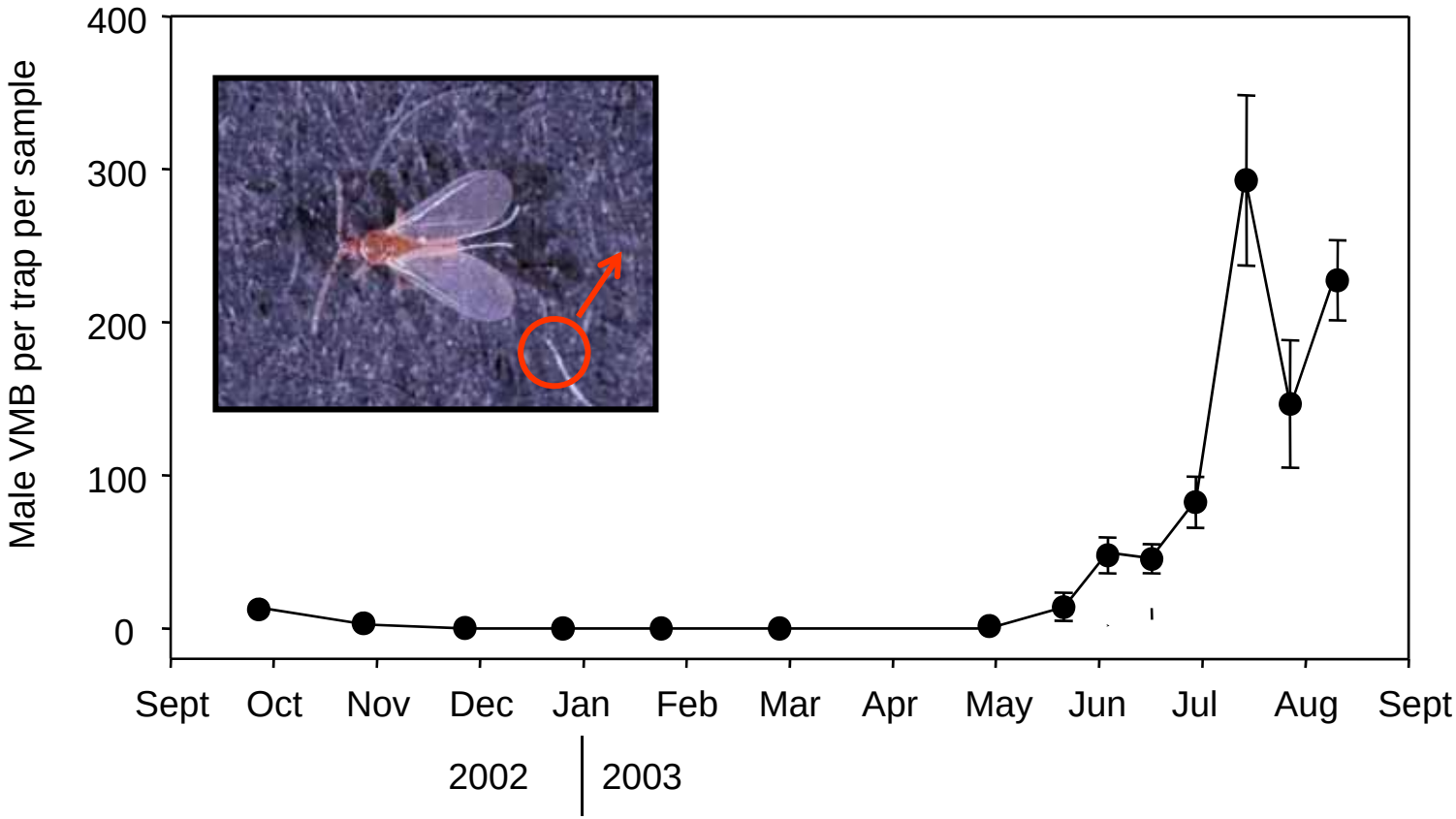
Late spring:
Upper trunk, canes/spurs, basal leaves

Early spring:
Lower to mid-trunk

Winter: Roots and lower trunk

Pheromone Monitoring – Can be Faster, Easier, More Effective

Pheromone traps only work when males are present



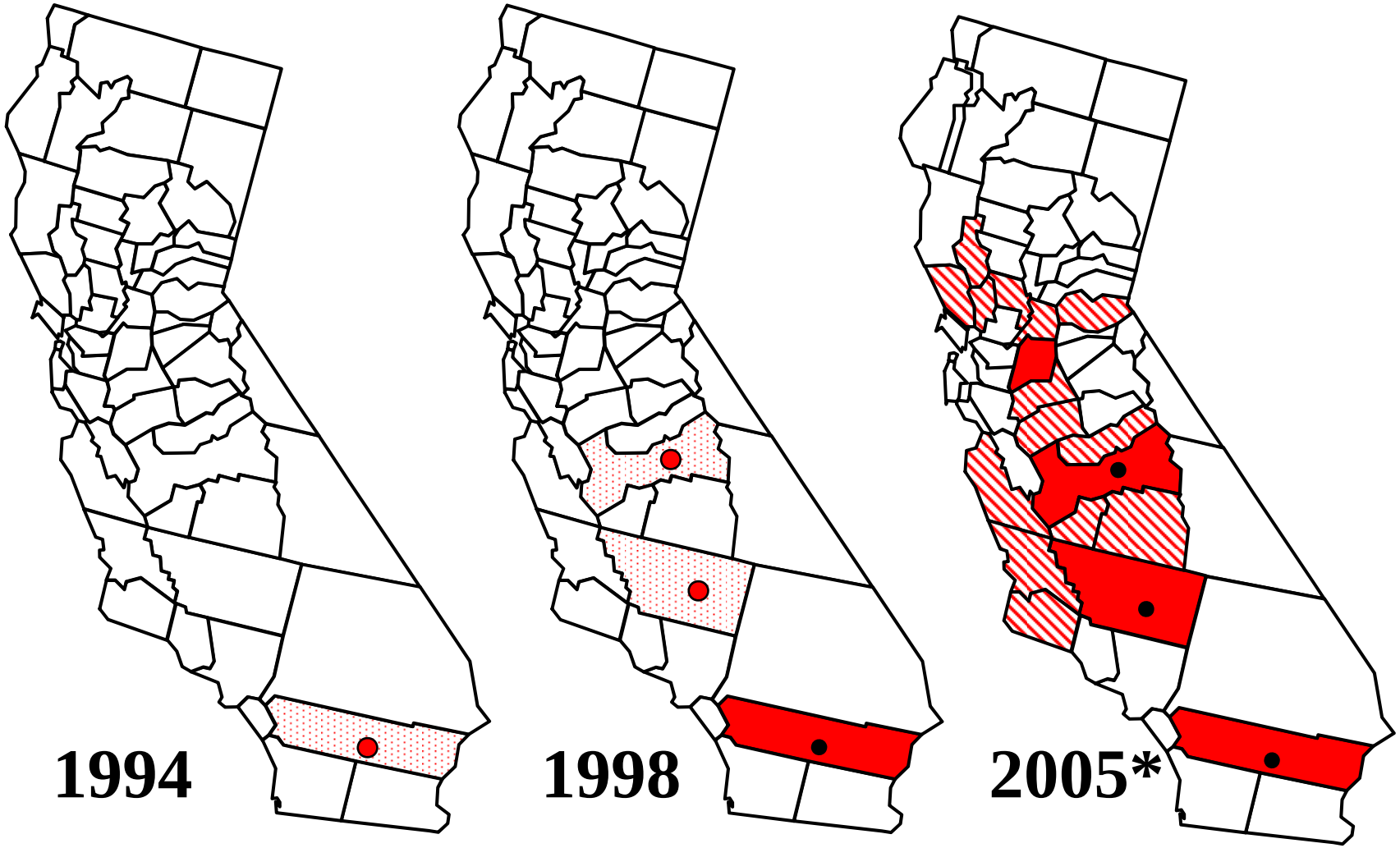
Insecticides may remove males more easily than females; may result in changes in sex ratio – leading to fewer or more males.

Control Strategies

Eradication program:

- Vine Removal
- delayed-dormant Lorsban (OP)
- bloom-time Admire or Venom (neonicotinoid)
- in-season with various contacts
  - Lannate/Sevin (blows up mites)
  - Dimethoate/Imidan (knock down)
  - Applaud (insect growth regulator)
- post-harvest Lorsban (OP)

VMB continues to spread: What new controls will be used?



* Distribution changes rapidly because of new/unreported finds

<u>Sustainable Management Tools</u>:

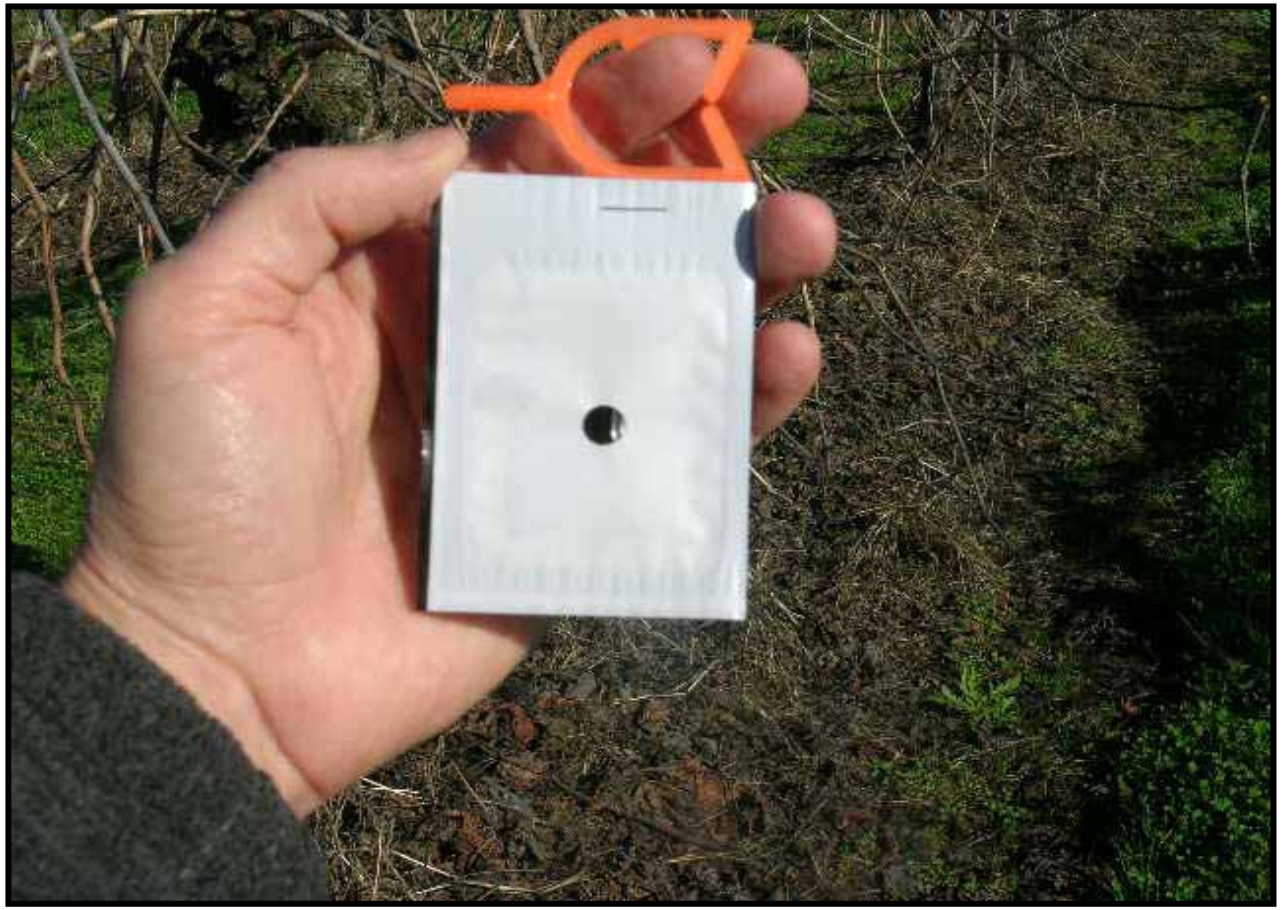
Mating Disruption

Biological Control

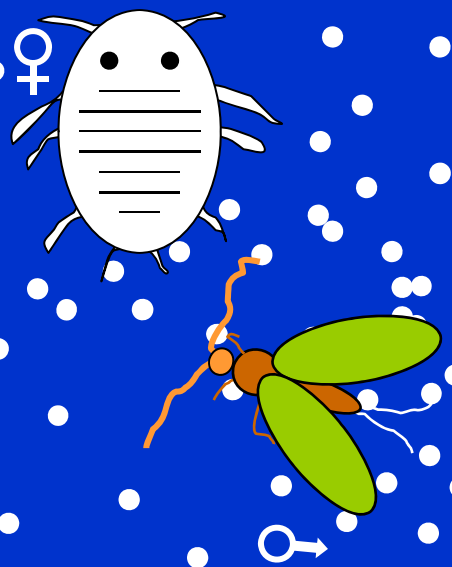
“Softer” Insecticides

Argentine Ant Management

Mating Disruption

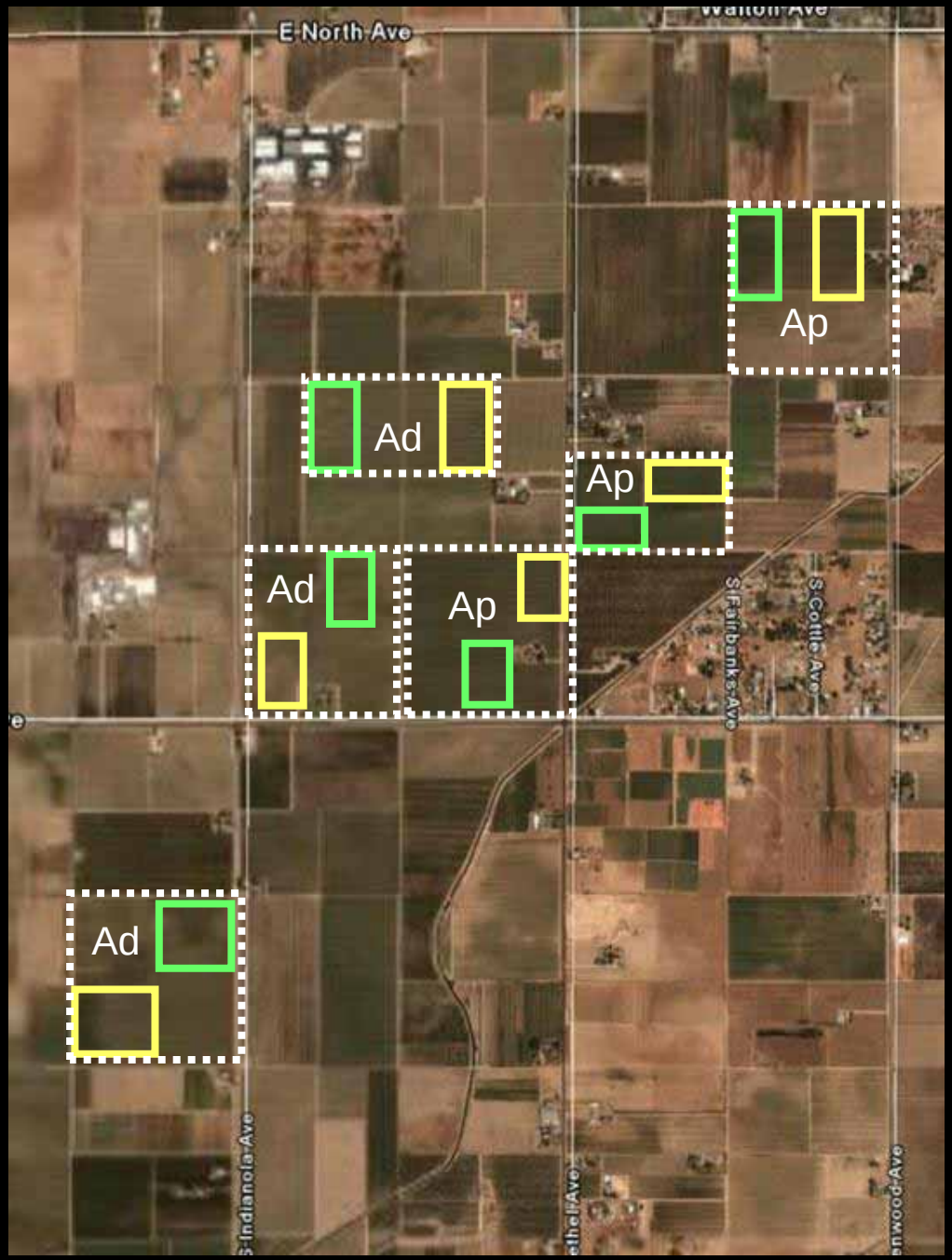


Sex pheromone and mating disruption 250 dispensers/acre; 10 g AI/ac



Equivalent to pheromone released by

10 billion virgin female VMB per acre



Mating Disruption Trials

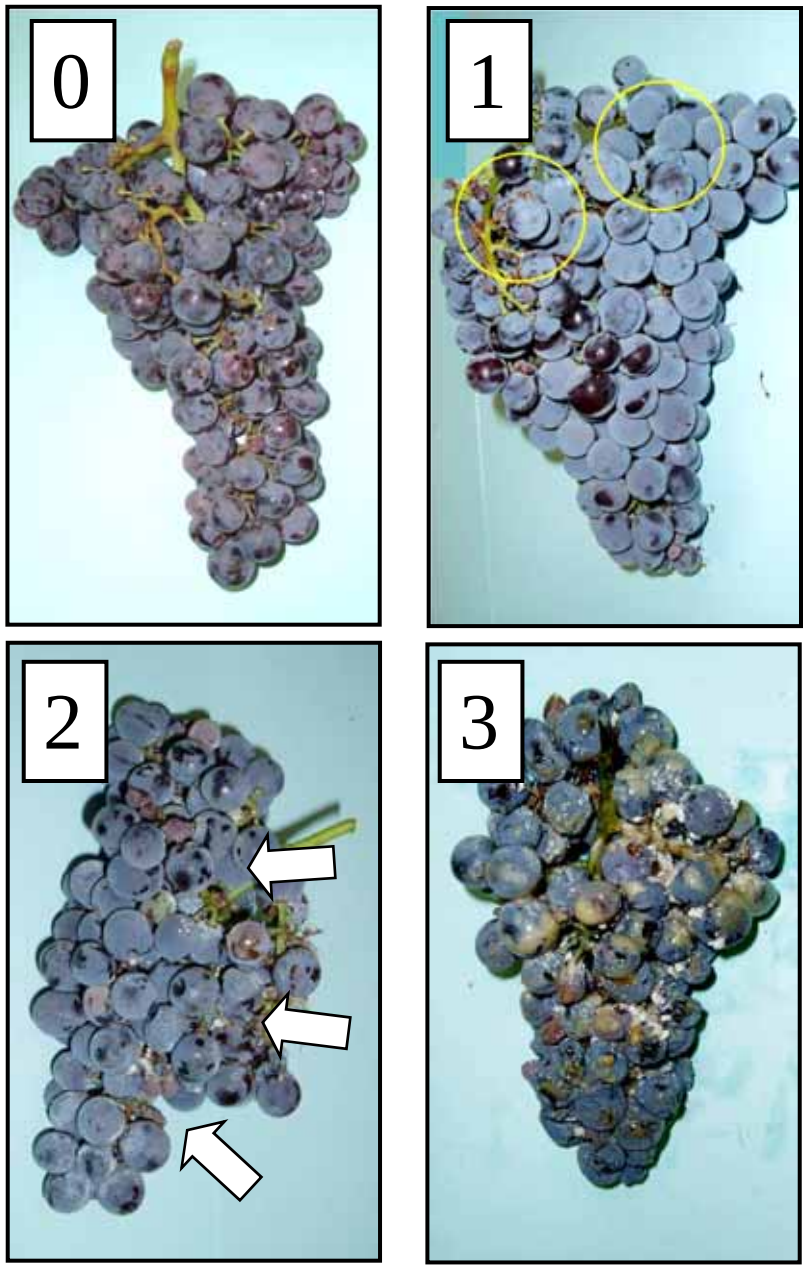
Del Rey, Fresno County

2006-08 replicated trial

- 20-40 acre blocks
- Applaud or Admire
- 10 acre treatments
  MD or **Control**
- 2-3 acre sample areas

"Extension" trials as part of sustainable VMB management program

Economic damage to clusters:



Methodology (0 – 3 scale)

0- no damage

1- honeydew and a few VMB

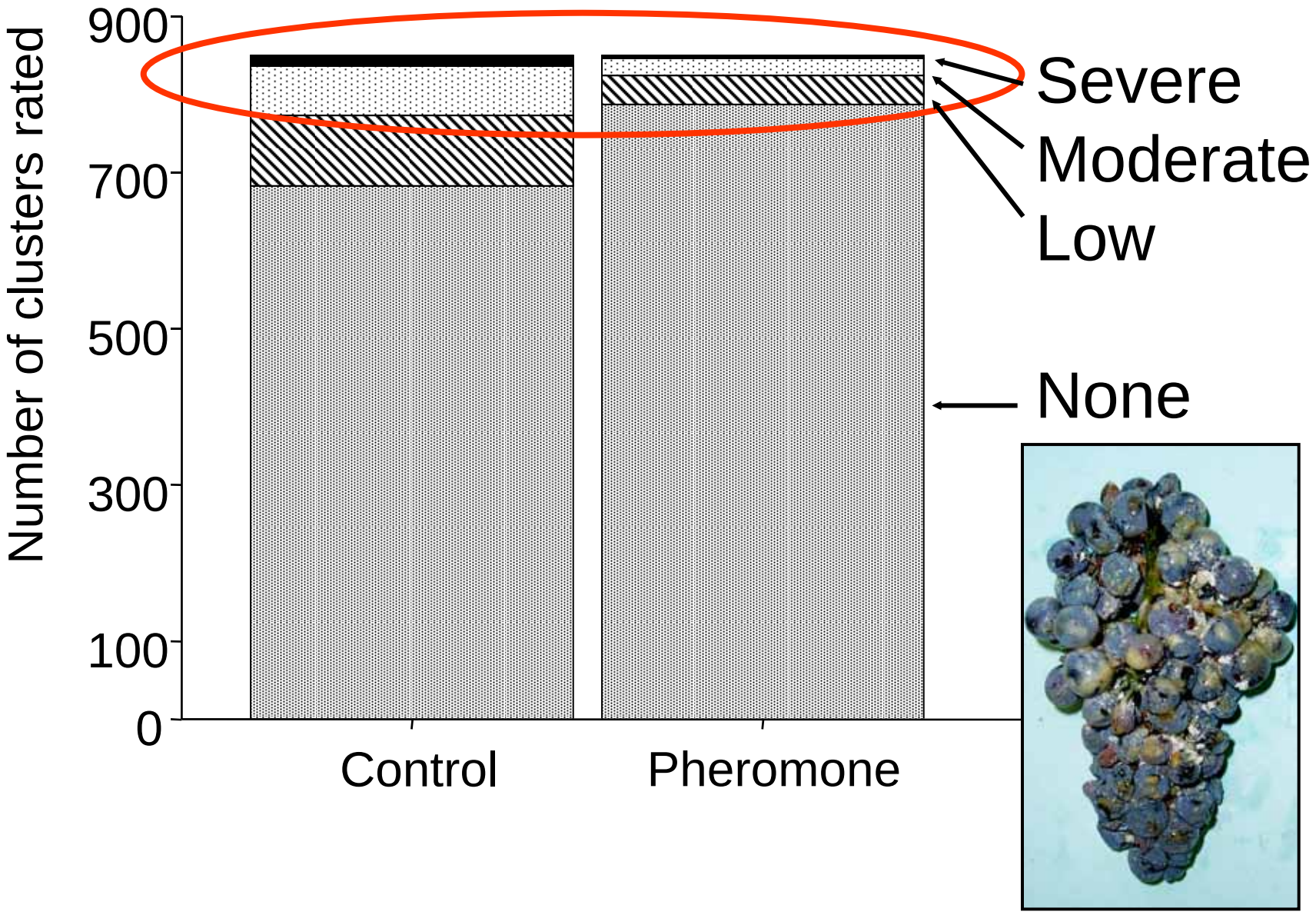
2- VMB but salvageable cluster

3- unmarketable cluster

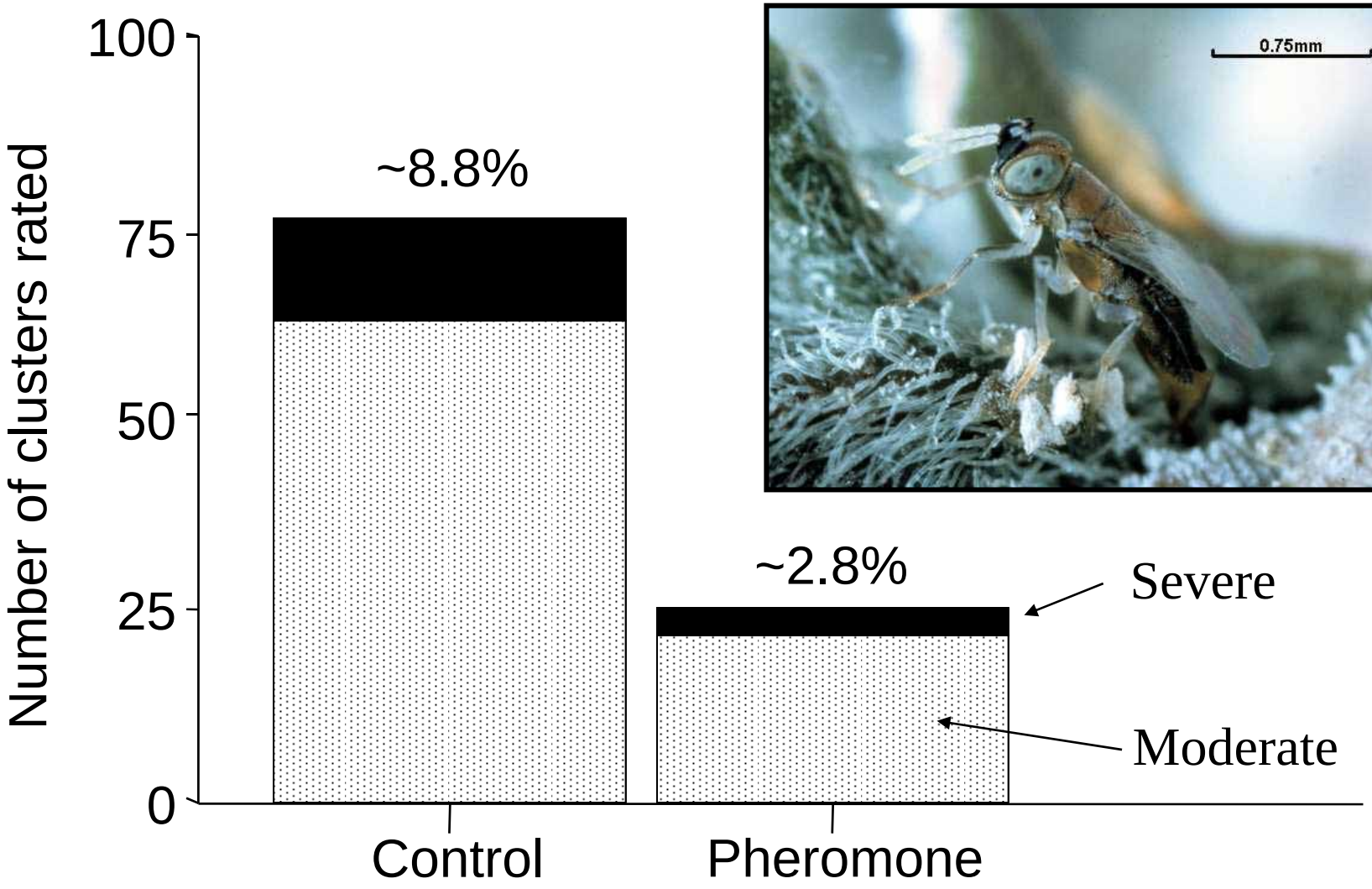
Rating is more “accurate”

- More samples per search hour
- Economic-base
- Harvest-time, VMB in clusters
- 100’s or more vines per plot
- Try to get 20% vines:
  - 1 cluster per vine
  - cluster is touching bark

2005 RESULTS – CLUSTER DAMAGE



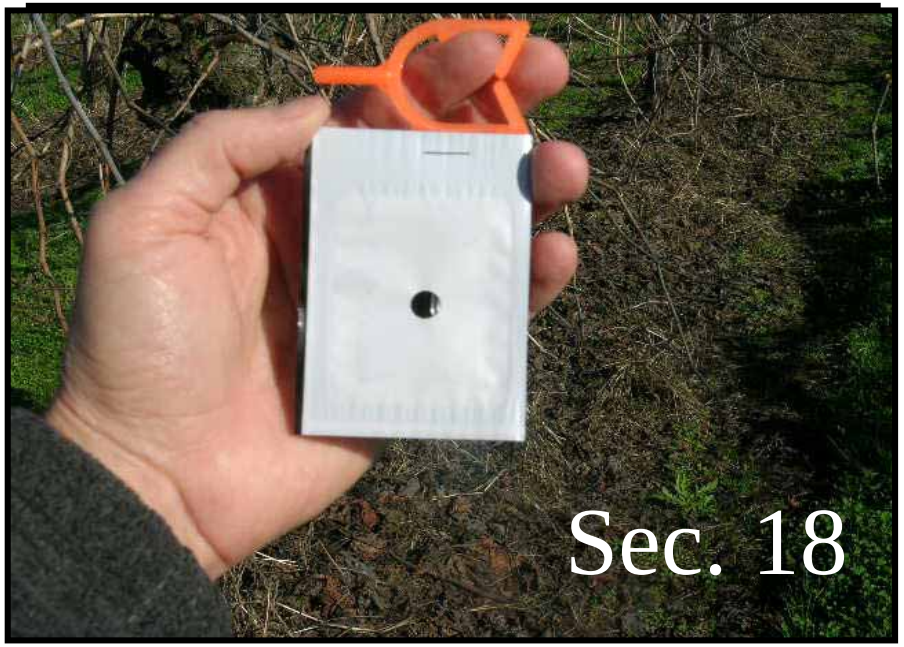
2005 RESULTS – CLUSTER DAMAGE

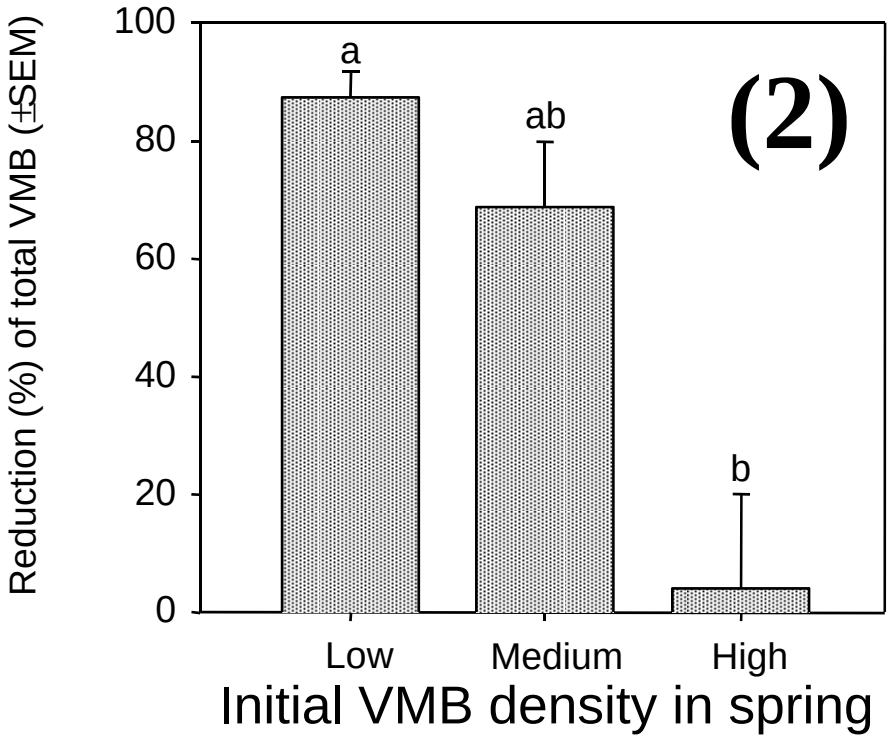


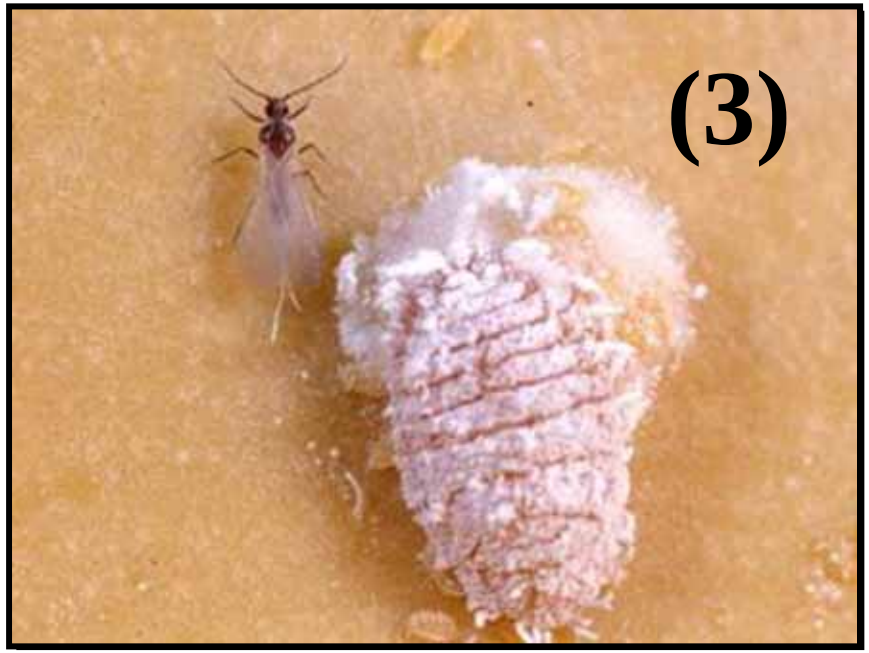
Total clusters rated – 850 per treatment

MATING DISRUPTION

(1) Sprayable formula lasts only 21-28 days, requiring repeated applications

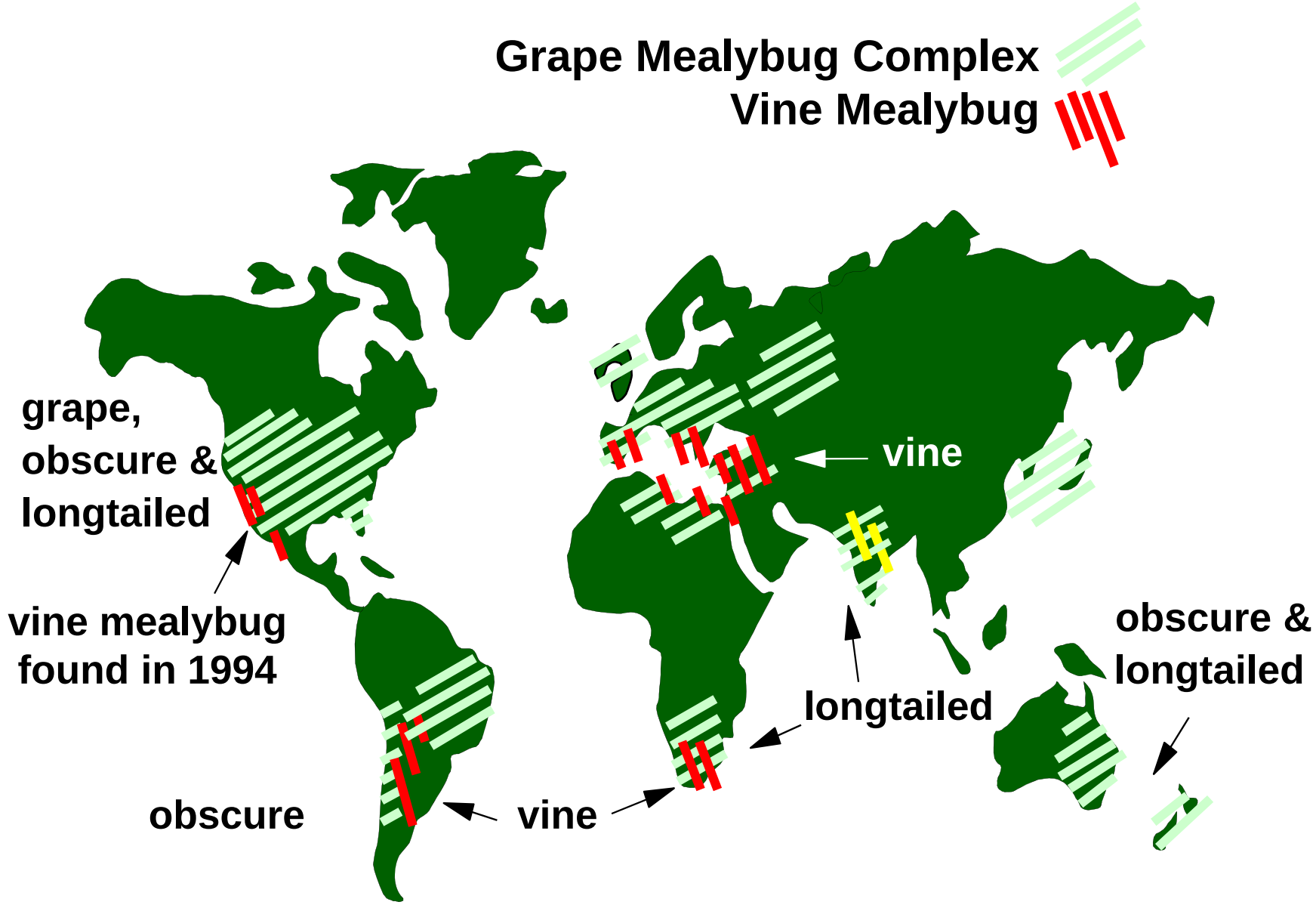


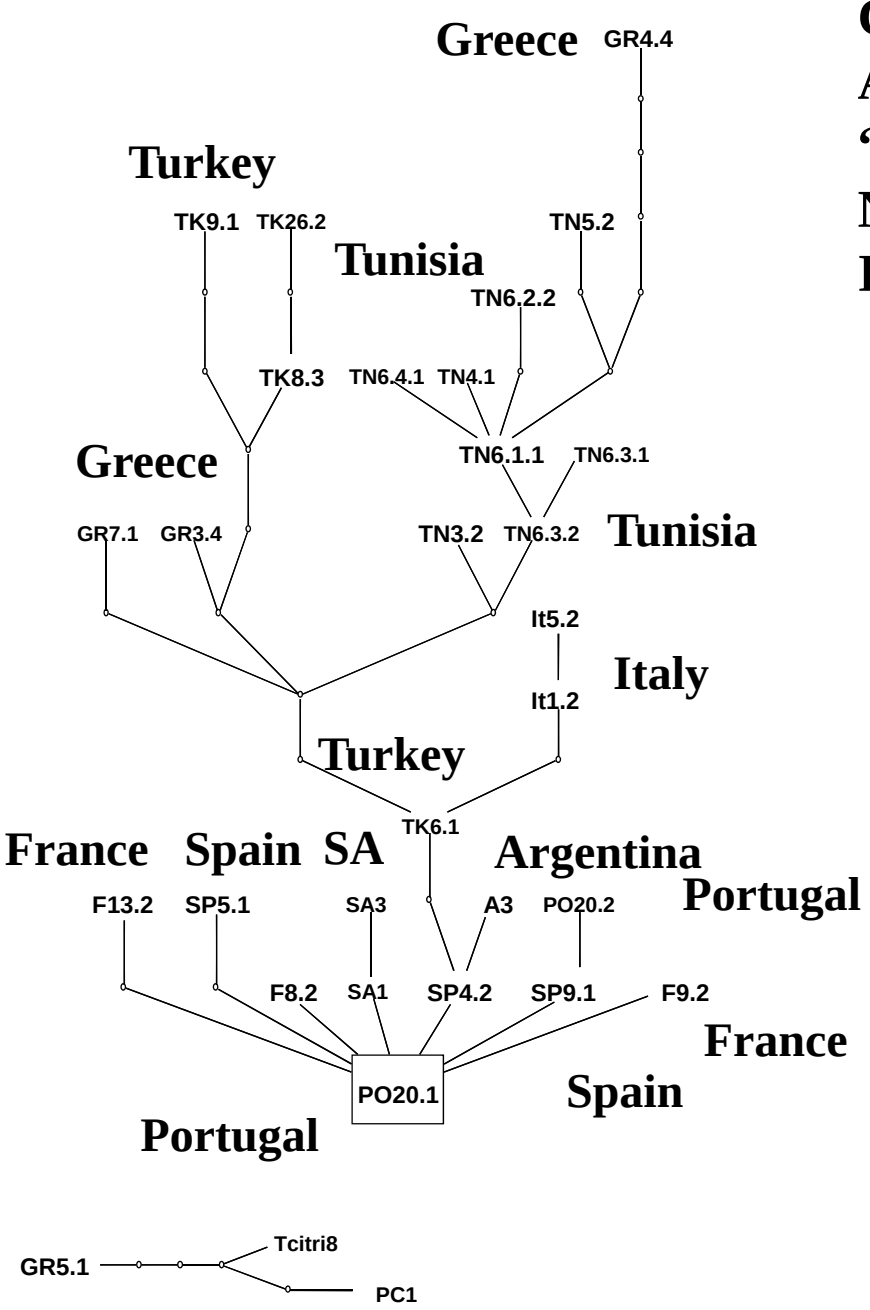




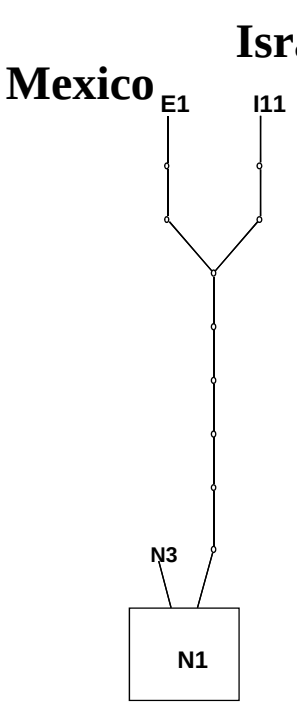
Biological Control

UC / USDA / CDFA Importation Program

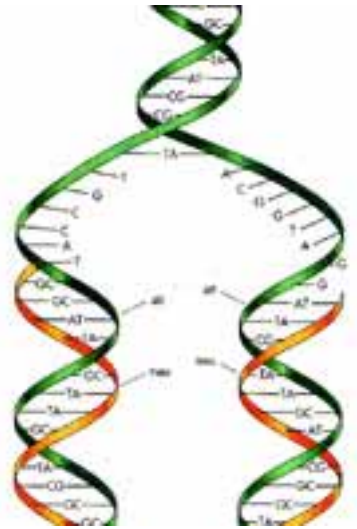




CA, Mexico, Israel, Egypt are similar
Argentine & S. Africa close to Europe
“separate” species?
Need more samples
Implications for bio-control?



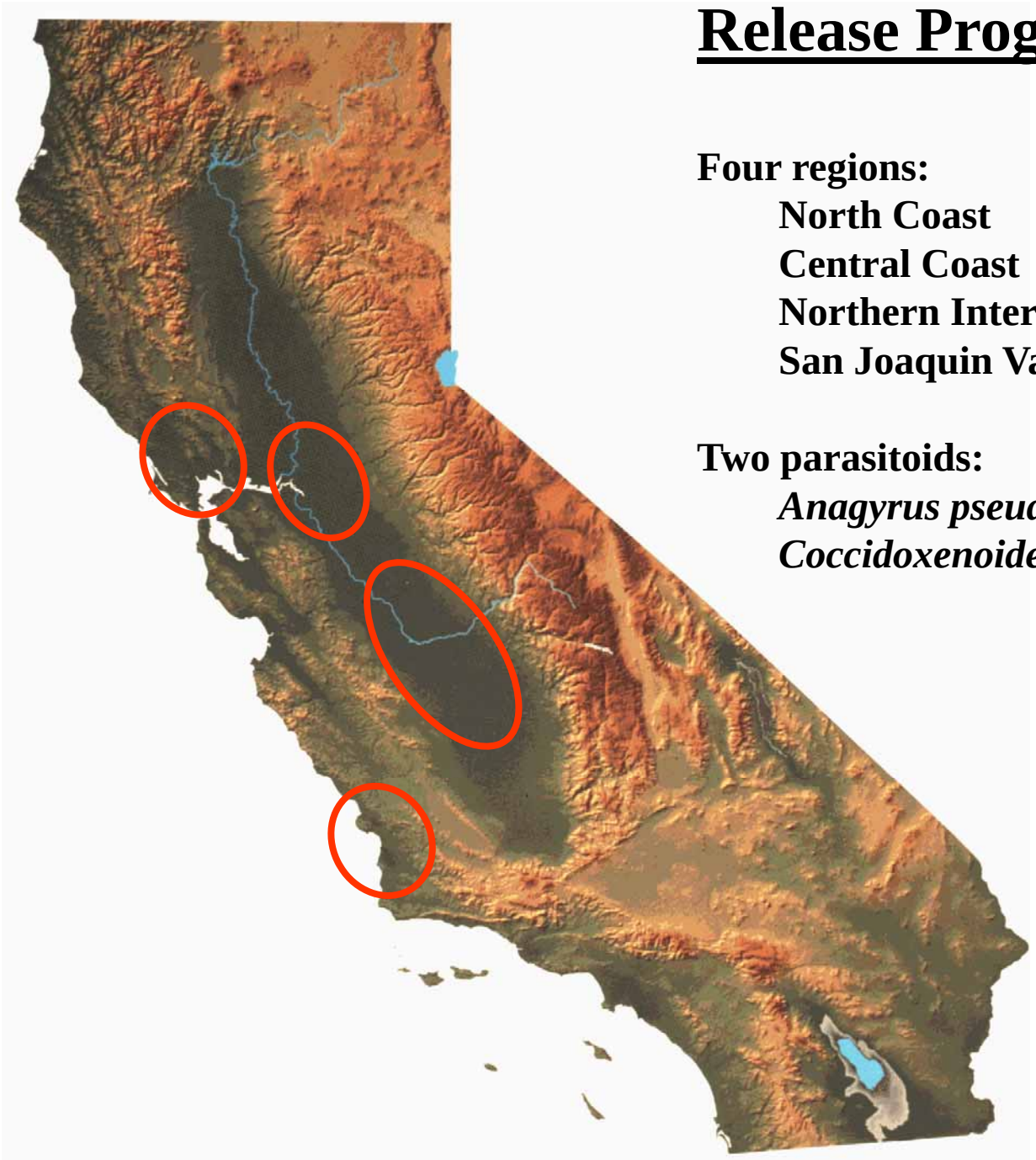
“PCR”



Napa
Fresno
Bakersfield
San Luis Obispo
Mexico


Coccidoxenoides peregrinus
0.5mm

Anagyrus combined with “soft insecticides” 80-90% parasitism of exposed VMB



Release Program 2006/07:

Four regions:

- **North Coast**
- **Central Coast**
- **Northern Interior Winegrape**
- **San Joaquin Valley**

Two parasitoids:

- ***Anagyrus pseudococci*** **(Northern Italy)**
- ***Coccidoxenoides peregrinus*** **(South Africa)**

Total 2006 releases

500,000 CpSA

12,000 Ap

***Anagyrus*—recovered from all sites, even where it was not released**

Cp recovered from 50% of sites


0.75mm
0.5mm

Insecticides

Eradication program is pesticide intensive:

Delayed-dormant Lorsban

Bloom-time Admire or Venom
(neonicotinoid)

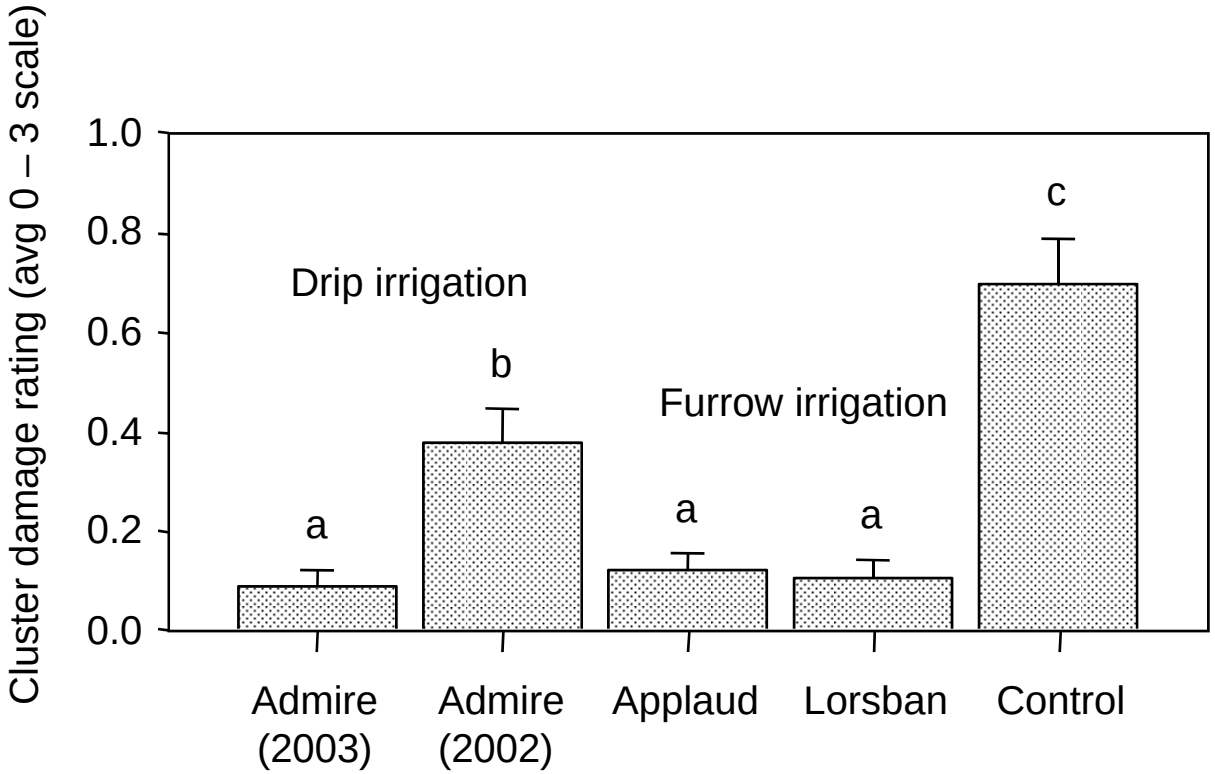
In-season with various contacts

Lannate/Sevin (blows up mites)
Dimethoate/Imidan
Applaud (insect growth regulator)

Post-harvest Lorsban (OP)

Sustainable?
Resistance?

Alternative Insecticides

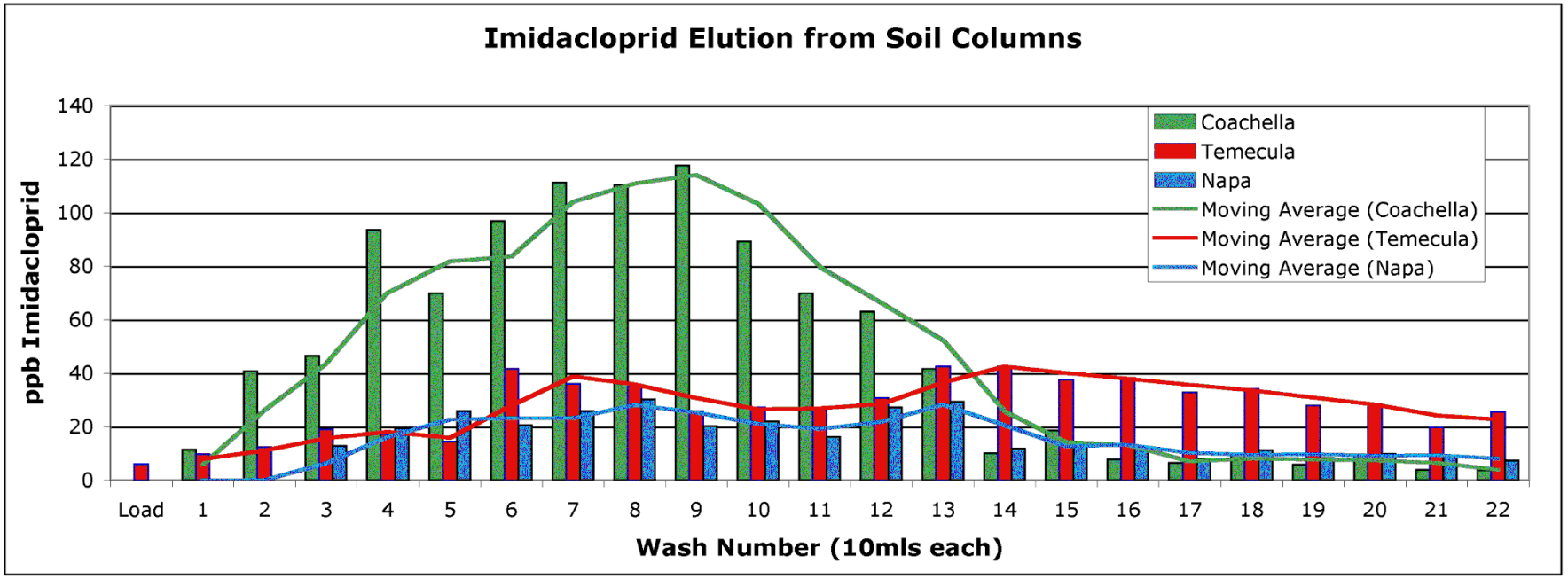


New materials, application methods and better timing.
Goal: Replace chlorpyrifos (24(c) exemption)

Daane et al. 2006. Calif. Agric.; Bentley et al. 2005. CTGC

Efficacy of Admire depends on soil type and irrigation:

Is it bound to the soil or available to the plant?

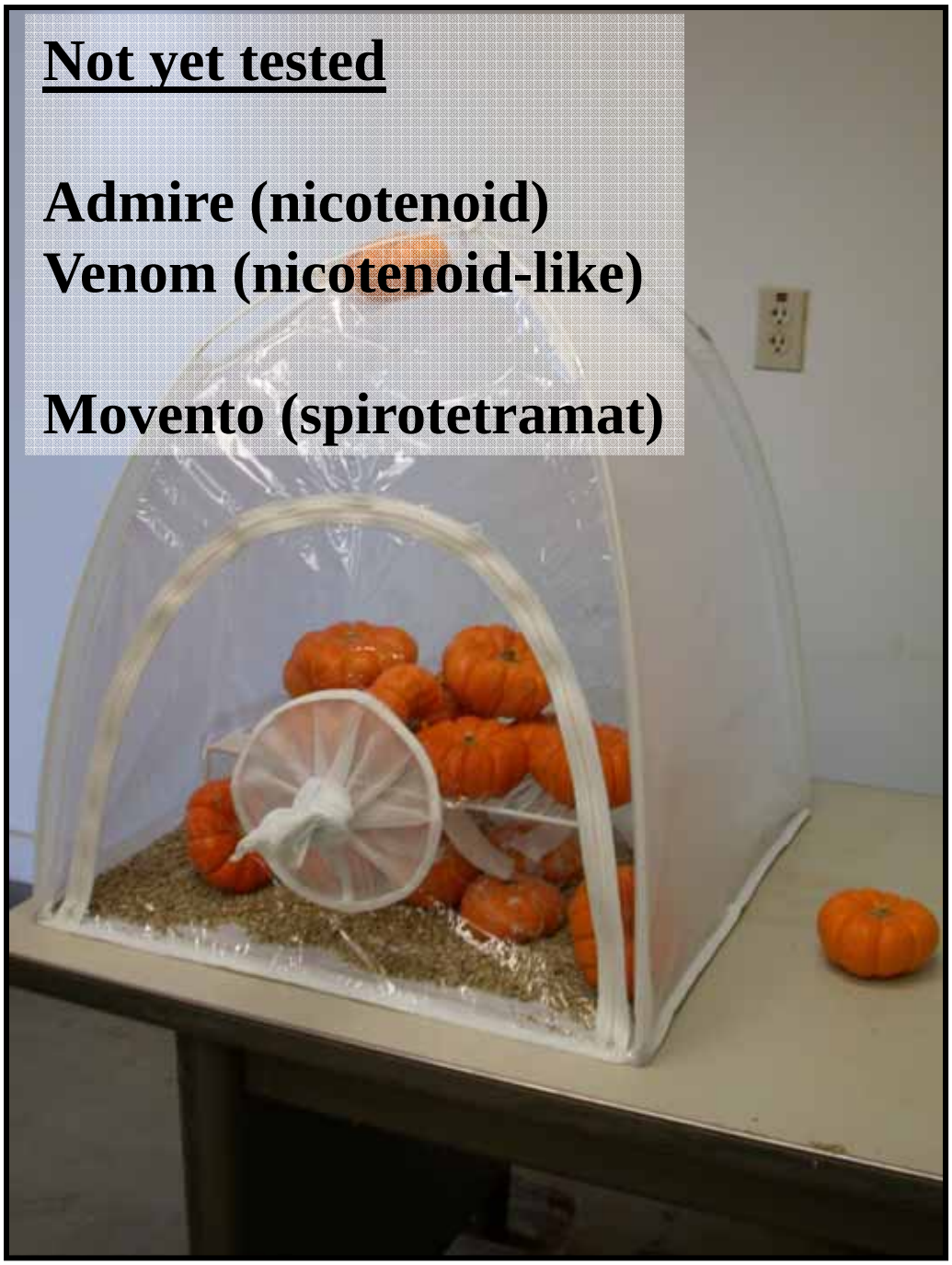


Weber, Byrne and Toscano 2005

Efficacy of Applaud depends on timing

Insect growth regulator

Target crawlers (1st instar) and 2nd instar nymphs



Laboratory tests

(2 of 9 replicates)

Lorsban (OP)
Lannate (Carbamate)
Applaud (IGR)
JMS Stylet Oil (oil)

Dimethoate (OP)
Assail (nicotenoid)

Ecotrol (Oil/Neurotoxin)
M-Ped (Soap)
Pyganic (Pyrethrum)
Saf-T-cide (Petroleum oil)

Danitol (Pyrethroid)
Neemix (neem, botonical)

Impact of Argentine ant on VMB:

Liquid baits target ant colony

No silver bullet, but…

Sustainable Management Tools:

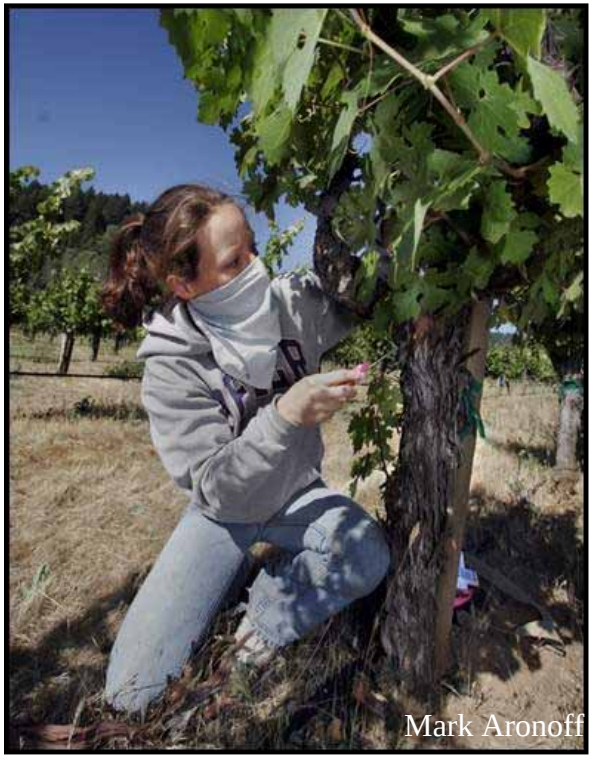
Mating Disruption

Biological Control

“Softer” Insecticides

Argentine Ant Management

American Vineyard Foundation
California Table Grape Commission
California Raisin Marketing Board
Viticulture Consortium West
Bayer Crop Science (gift, product)
Suterra Inc. (R&D, product)
California Dept. Food & Agriculture
California Dept. Pesticide Regulation
Central Coast Vineyard Team
UC Cooperative Extension
USDA – ARS (France)
Western Regional SARE



Lab Assistants

John Andrews, Insectary Manager