

Codling Moth, An Increasing Problem- Why?

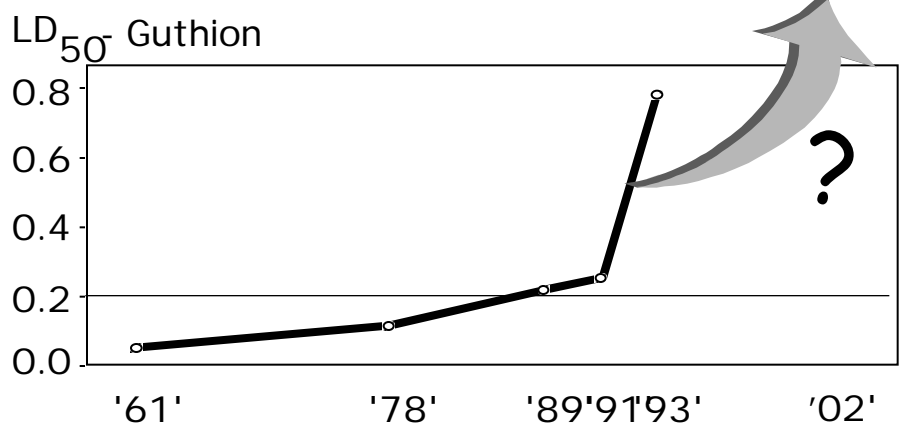
**Jay Brunner and Mike Doerr
Tree Fruit Research and
Extension Center
Wenatchee, WA**

Why is CM injury on the increase?

- **Higher CM populations**
 - “My neighbor isn’t spraying”
 - Economics- reduced control programs based on available resources
 - **Insecticides not as effective**
 - **Mating disruption not as effective**
 - **CM has altered its phenology to escape control**
- OR**
- **All of the above ???**

Have insecticides lost efficacy

- 1° control with OPs
- Some regions have documented resistance
- No surveys done recently



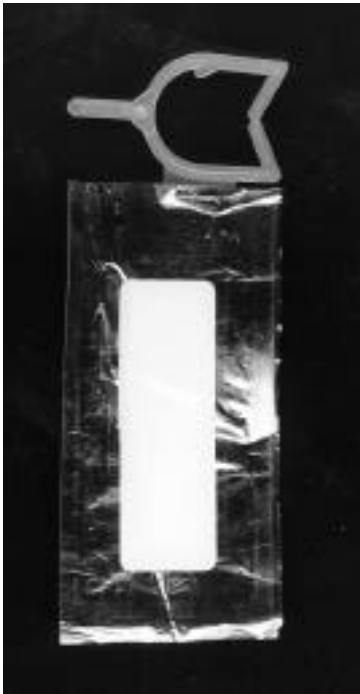
Has mating disruption lost efficacy?

- **2000 Survey shows only 12% using full rates**
 - **75% using 1/2 or 3/4 rates**
- **Reduced supplemental applications**
- **Leads to apparent reduced efficacy of MD technology**



Hand applied dispensers

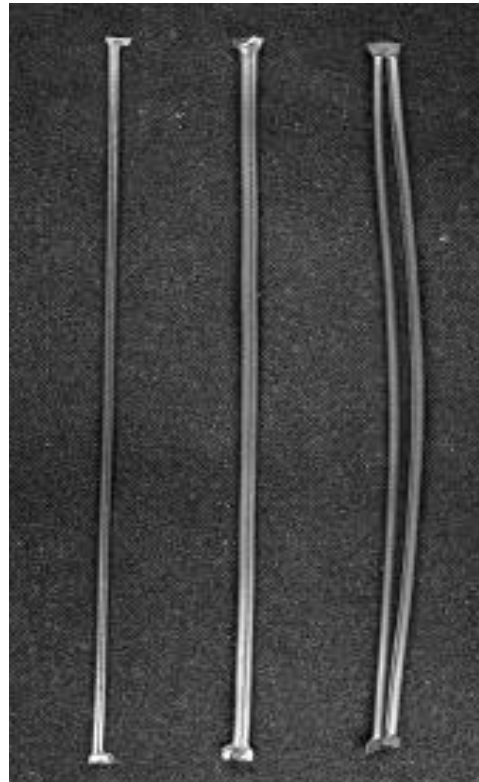
Checkmate



NoMate



Isomate



Disrupt

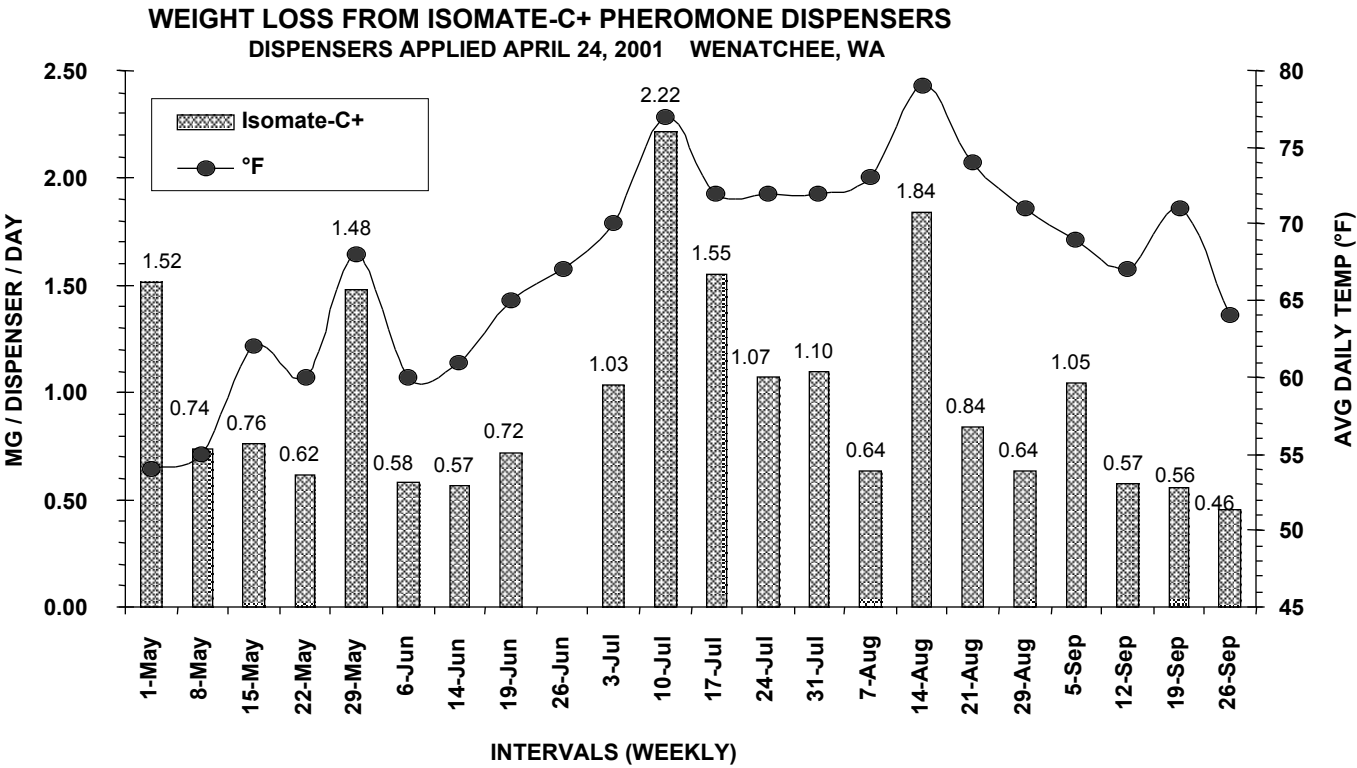
Factors controlling dispenser efficacy

- **Number of dispensers per acre (100-400)**
- **Release rate of pheromone**
- **Longevity of release rate**
- **Quality of released product (isomerization)**

Predicting dispenser performance

- **Assessing release rate**
 - **Gravimetric analysis**
 - **Capture of codlemone release**
 - **Residual analysis**
- **Some methods work better than others depending on product design**

Gravimetric method



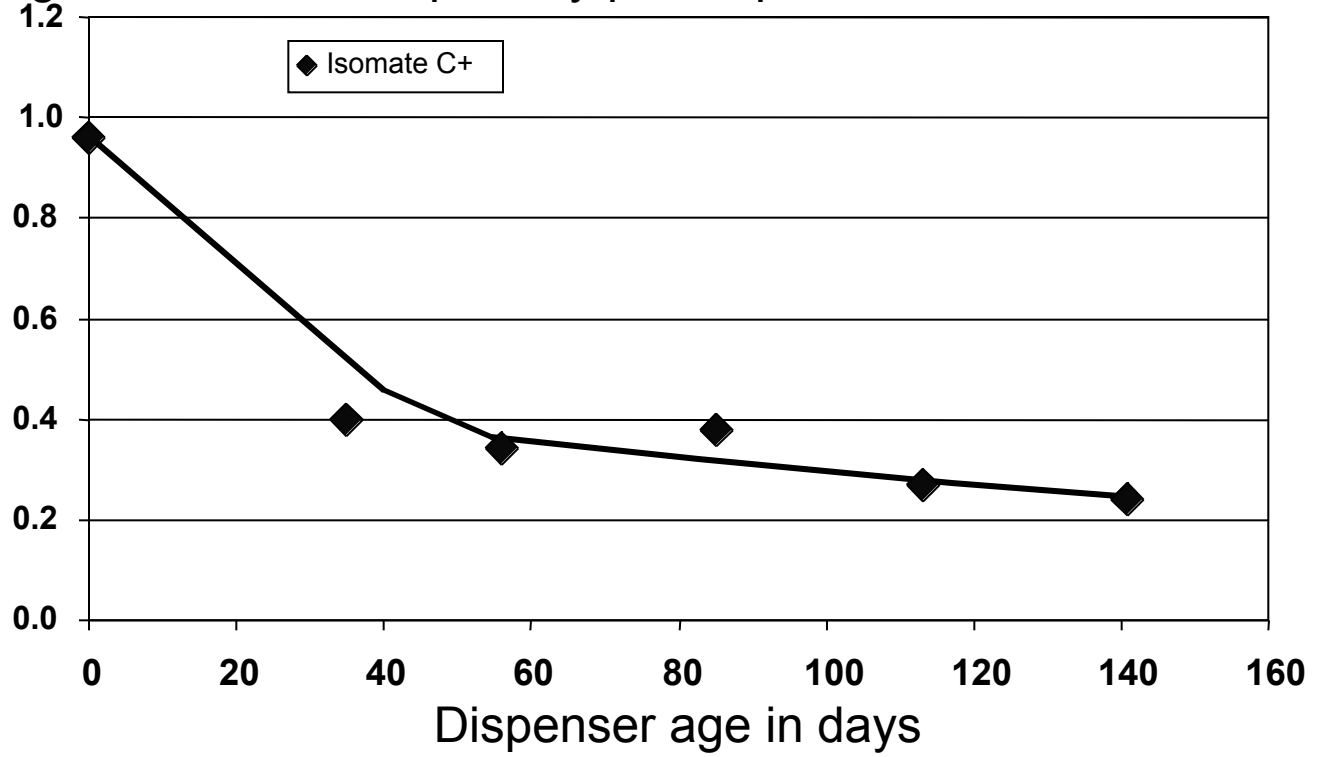
Volatile recapture



Analysis commissioned through PheroTech

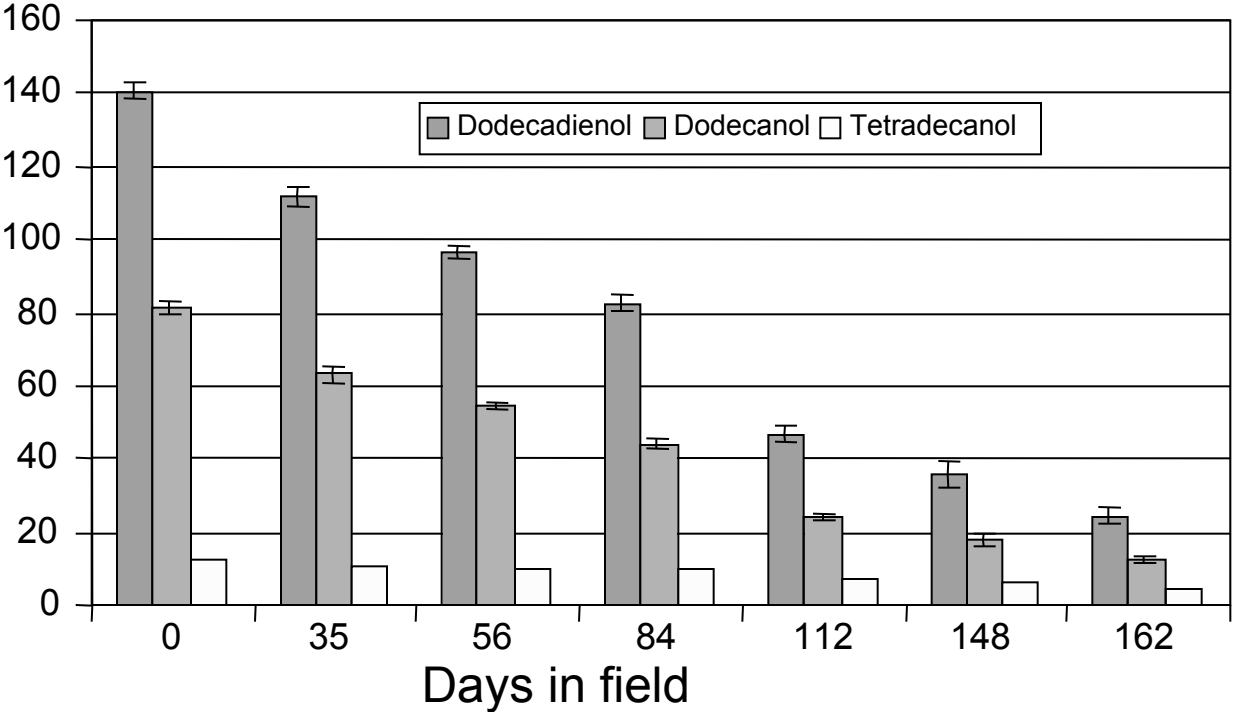
Volatile recapture

mg **codlemone** per day per dispenser



Residual Analysis

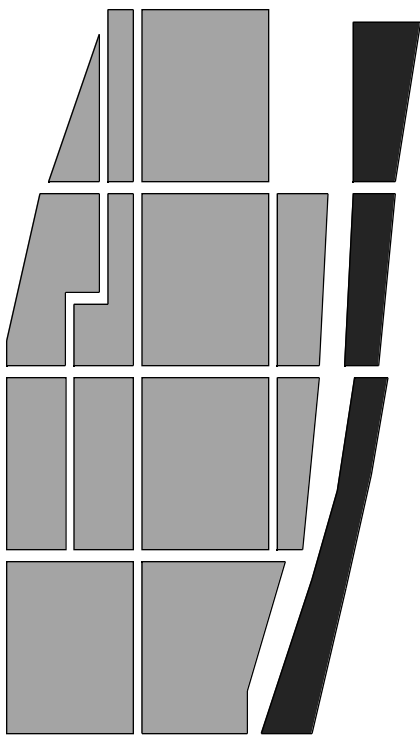
Average mg remaining in dispenser



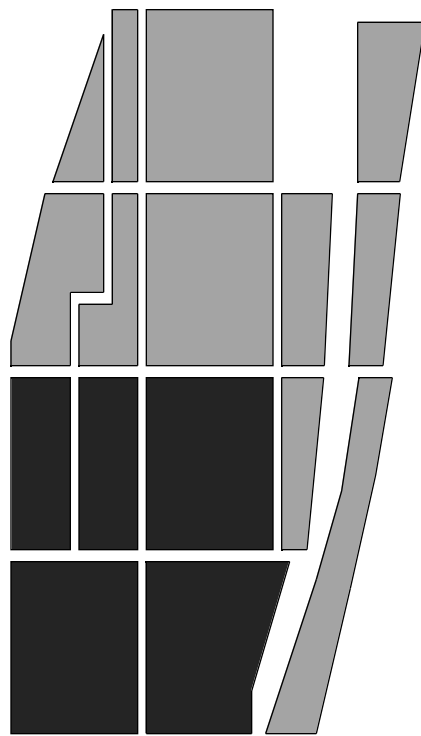
Strategies to eliminate MD failures

- Location, location, location!
 - Size, shape and past pressure
- Product selection
 - Release rate, point sources
- Monitoring
 - Trap design, placement, management
 - Lure selection (Longevity, release rate)
- Supplemental treatments
 - Follow trapping thresholds
 - Focus on border controls

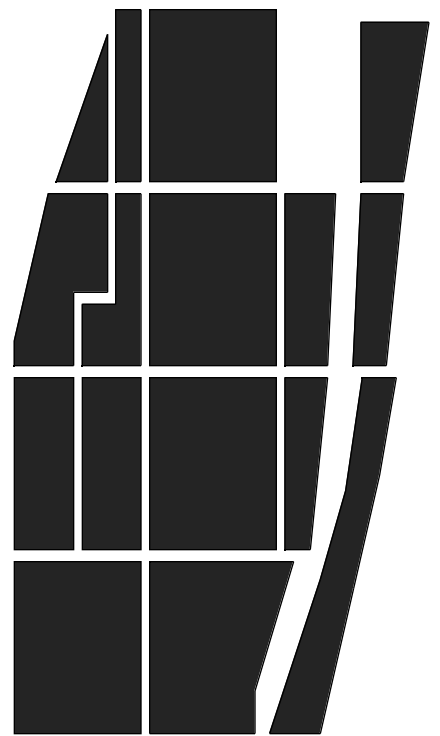
Location



Worst



Better

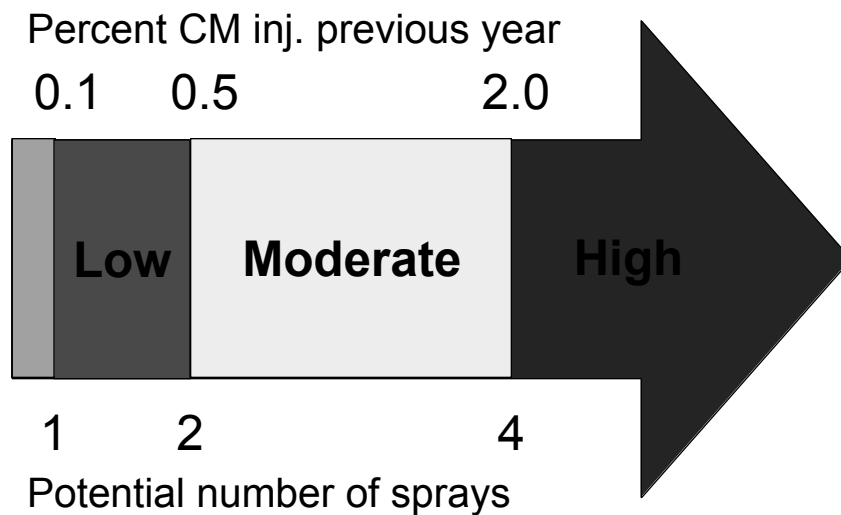


Best

Location

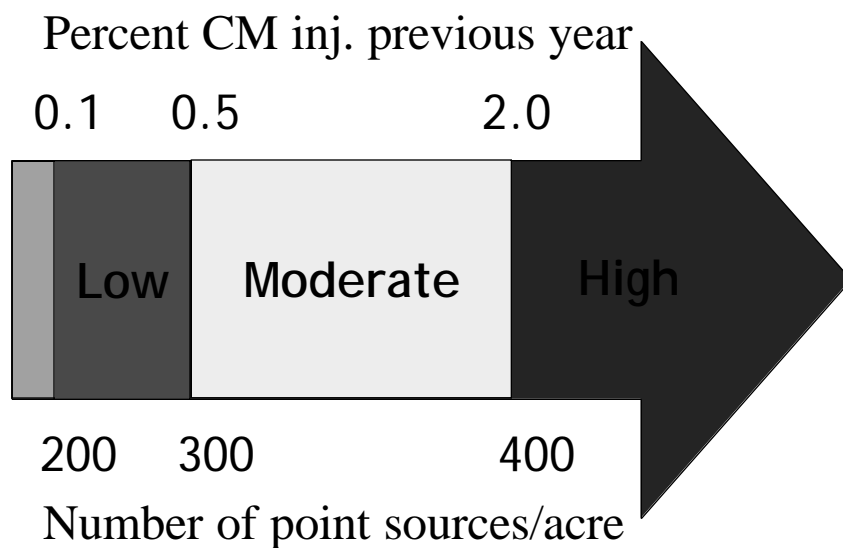
Supplemental controls

- Supplemental controls may be required in moderate pressure orchards

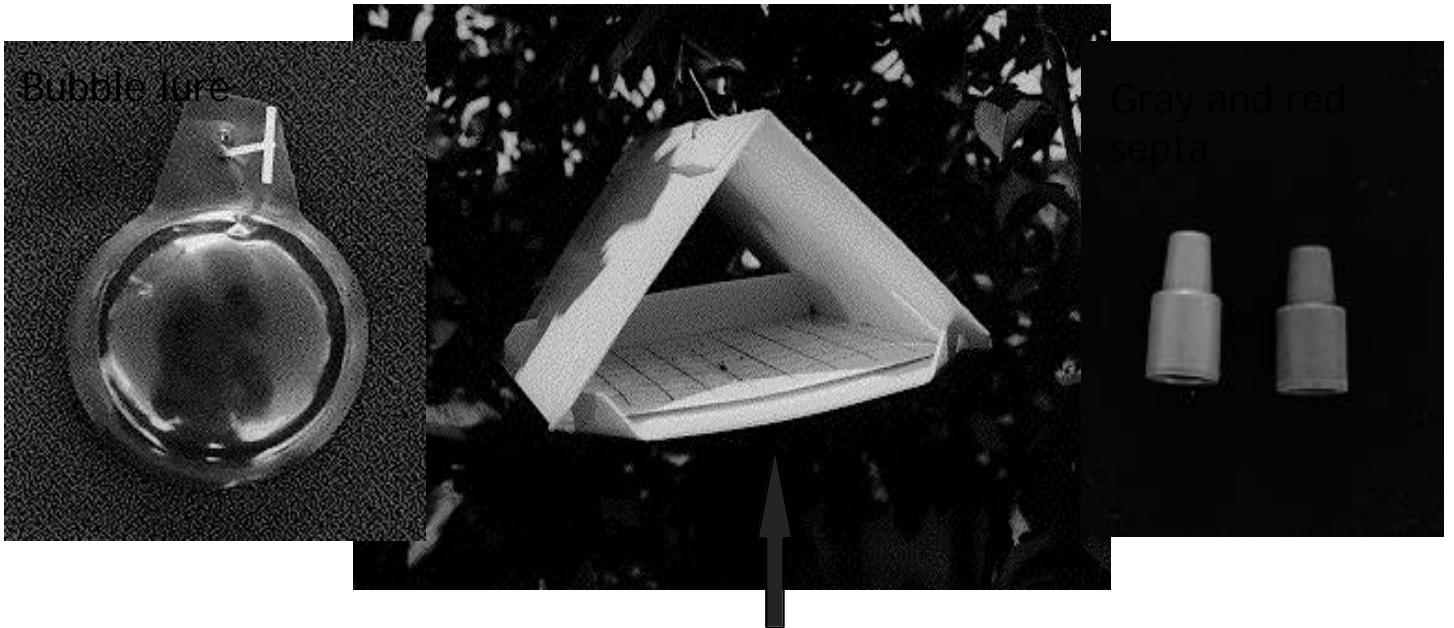


Application rate

- Start with high rate of dispensers while developing expertise



Monitoring

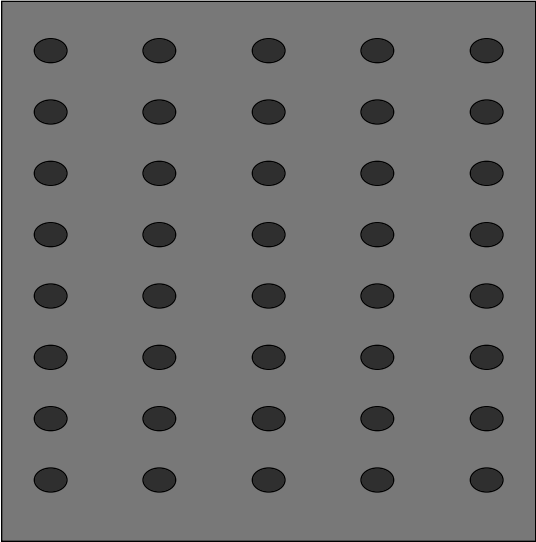


Note: Delta traps maintain integrity and are easier to service. Keep clean bottoms in trap.

Monitoring

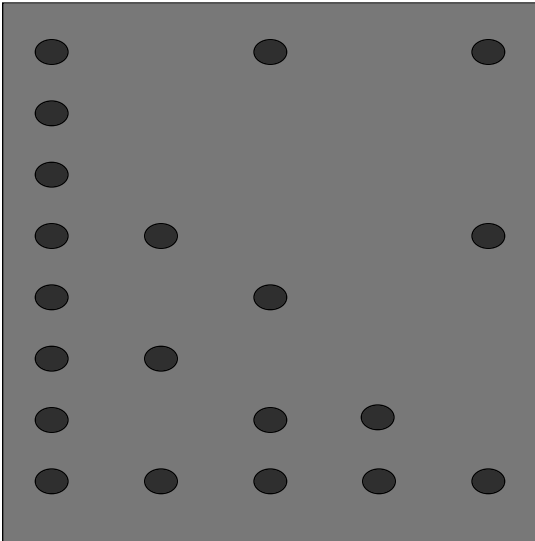
• **General recommendation is 1 trap/2.5 acres**

100 acre block



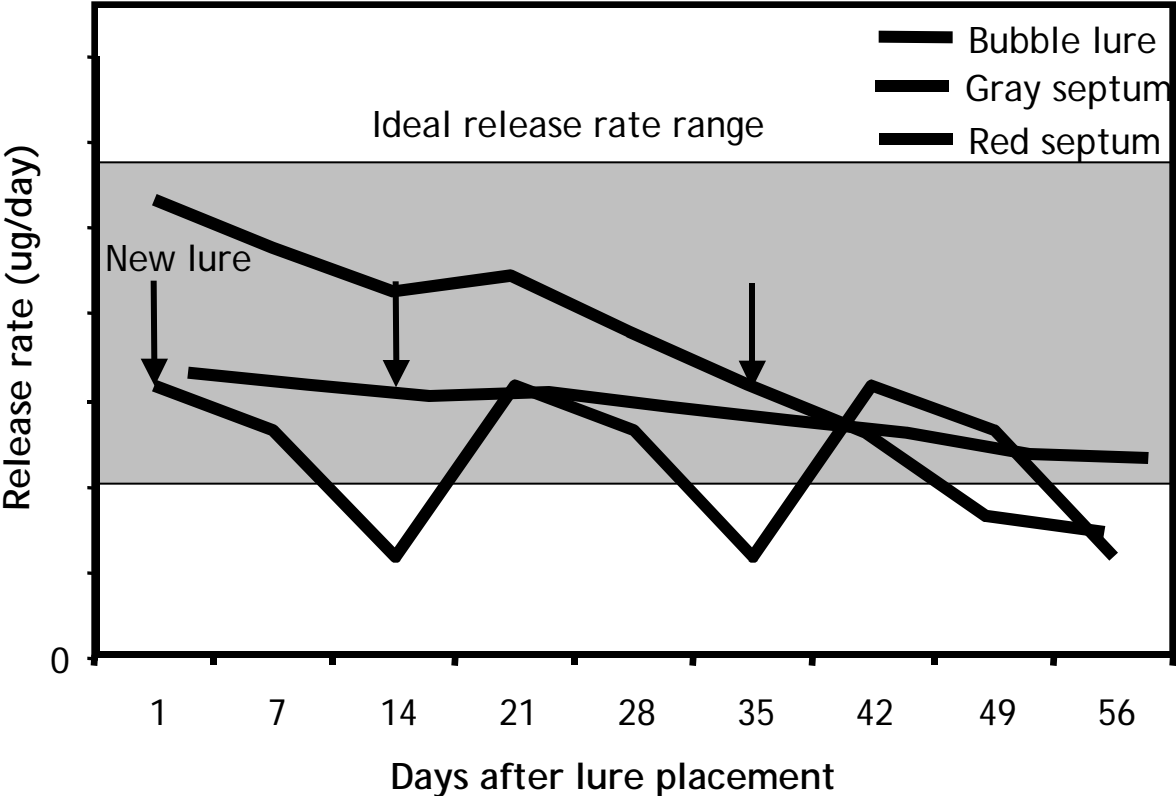
Ideal design (40 traps)

100 acre block



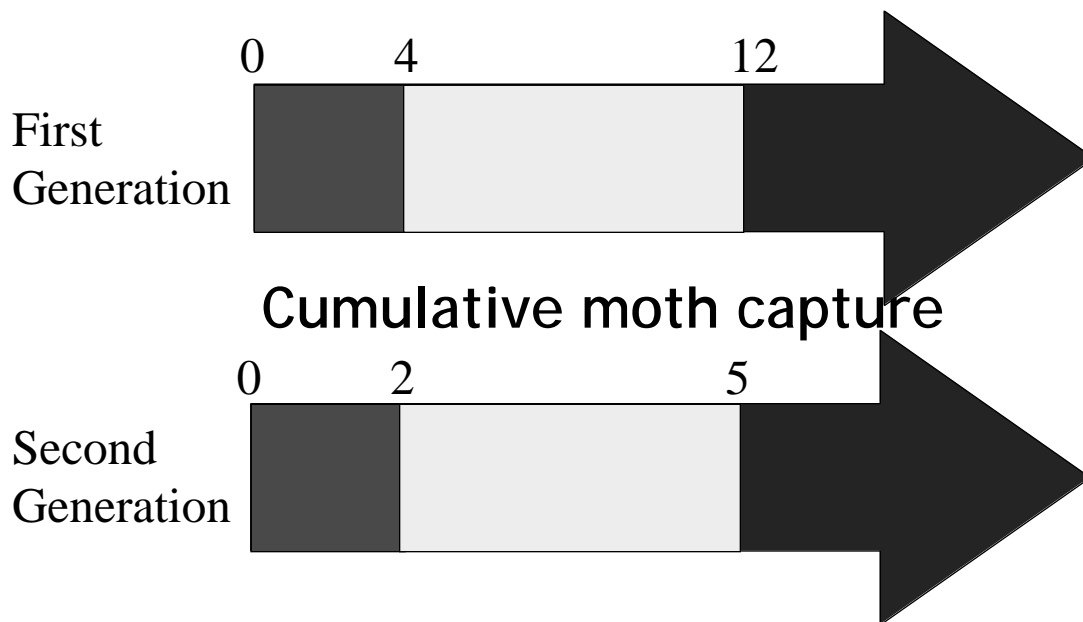
Practical application (20 traps)

Choosing a lure



When to spray

- Visual inspections exceed economic threshold
- Sample borders and hot-spots separately



WSU research on delivery technology

- **Hand applied dispensers**
 - Most reliable
 - Comparisons needed b/w competing products
- **Puffers**
 - Show promise combined with other technology
 - May be cheaper for multiple species
- **Sprayables**
 - Technology shows promise
 - Efficacy and longevity remain issues
- **Fiber formulations**
 - Proven technology in cotton
 - Results preliminary in apple

Potential supplemental insecticides

- Guthion
 - 4.0 pounds AI per year
 - No restriction on number of applications.
 - 14 day re-entry (REI) all activities.
 - 14 or 21 day pre-harvest interval (PHI) depending on rate used
- Imidan
 - 3.85 pounds AI per application
 - No restriction on number of applications.
 - 3 day re-entry (REI) all activities.
 - 7 day pre-harvest interval (PHI)

Potential supplemental insecticides

- **Esteem**
 - Juvenile hormone mimic
 - Ovicide against **codling moth**
 - Larvicide against **leafroller**
 - Activity against **San Jose scale**
 - PHI 45 days
 - Limited to 2 applications per season
 - Limited to 10 ounces per season
 - REI 12 hours

Potential supplemental insecticides

- **Intrepid**
 - **Molt Accelerating Chemical**
 - Larvicide against **codling moth**, **leafroller** and **lacanobia**
 - Ovicide activity against **codling moth** and **leafroller**
 - No contact activity, slow acting, premature molt in larvae
 - PHI 14 days
 - No limit on the number of applications per season
 - Limited to 64 ounces per season (16 fl oz/appl.)
 - REI 4 hrs

Potential supplemental insecticides

- **Assail**
 - **Chloronicotinyl class of insecticides**
 - Provado-type chemical with lep activity
 - Neuro-active chemical
 - Larvicide against **codling moth**
 - **PHI 7-14 days**
 - **REI expected to be short (24 hr)**
 - **Possible registration in 2002**

Predicting viable CM alternatives

-Reduced larval entries

Chemical	LC50	Field rate	Toxicity
Guthion	6.9	300	0.023
Imidan	12.9	840	0.015
Assail	3.1	44	0.075
Success	9.3	30	0.310
Proclaim	0.5	4	0.125
Avaunt	21.3	33	0.645
Intrepid	470.3	75	5.33

Predicting viable CM alternatives

-Delayed mortality (after 21d)

Chemical	LC50	Field rate	Toxicity
Proclaim	0.07	4	0.018
Intrepid	1.2	75	0.089
Virus	No significant reduction		

Predicting viable CM alternatives *-Ovicidal products*

Chemical	LC50	Field rate	Toxicity
Assail	34.9	44	0.793
Esteem	1.9	32	0.059
Intrepid	0.9	75	0.012

Field testing new CM products

Chemical	Rate/a	No. apps/yr	% reduced inj at harvest
Guthion	2.0 lb	4	96, 97, 89, 93, 98, 90
Imidan	5.0 lb	4	96, 97
Assail	0.2 lb	4	90, 91, 89, 70

Field testing new CM products

Chemical	Rate/a	No. apps/yr	% reduced inj at harvest
Intrepid	16 fl. oz.	6 oviposit	90
Intrepid	16 fl. oz.	6 hatch	82, 75, 81
Success	6 oz.	6	76, 61,
Avaunt	6 oz.	10	62, 66

Field testing new CM products

Chemical	Rate/a	No. apps/yr	% reduced inj at harvest
Oil (Orchex)	1 %	6	60
Surround	50 lbs	6 oviposit	66
Surround	50 lbs	6 hatch	69
Virosoft	4.4 fl. oz.	12	14, 5

Non-target affects of Assail

Chemical	# Spider mites/lf	# Predators/lf	Ratio
Test #1			
Assail	84	0.16	525:1
Imidan	2.8	3.0	0.9:1
Untreated	4.5	2.3	2:1

Non-target affects of Assail

Chemical	# Spider mites/lf	# Predators/lf	Ratio
Test #2			
Assail	34	0.2	170:1
Intrepid	7.7	1.6	4.8:1
Guthion	3.9	2.6	1.5:1
Untreated	7.5	7.7	1:1