

Suterra®

Mating Disruption Solutions

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Making Your World a Better Place. Naturally.™

Key Topics

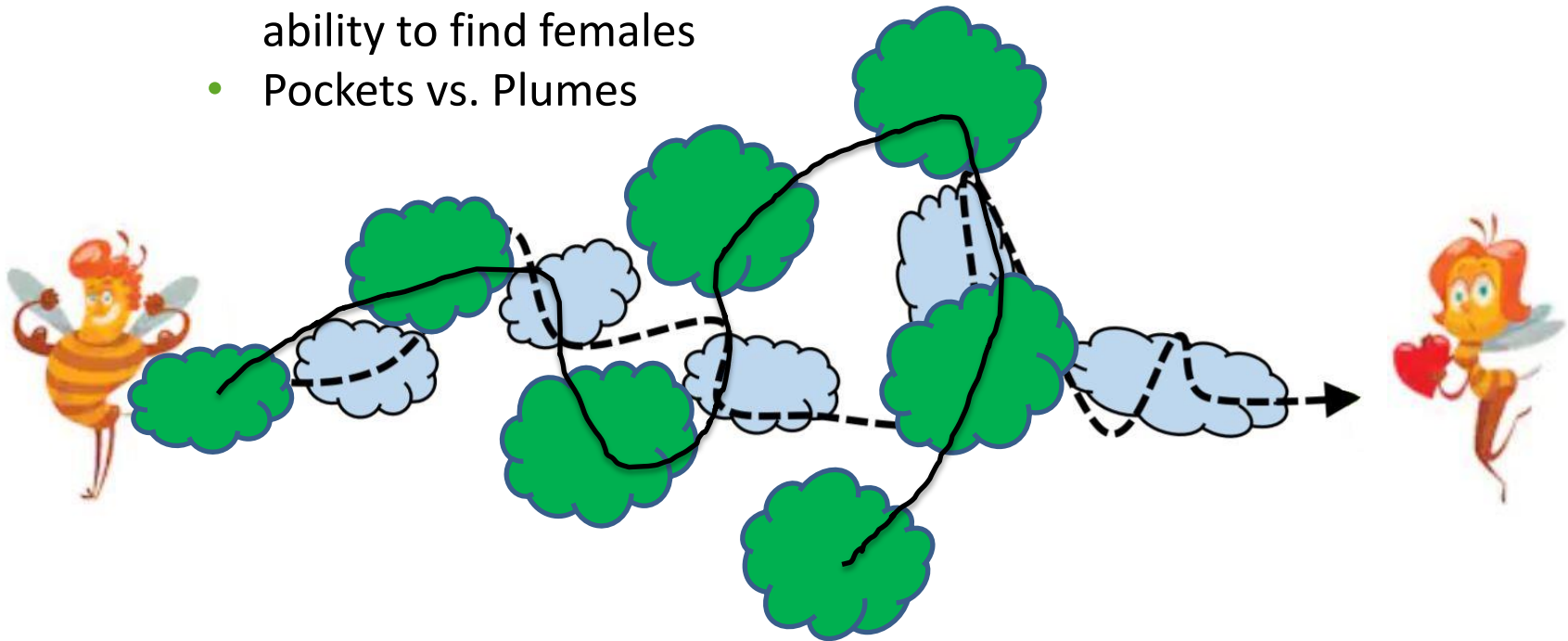
- **Mating Disruption**
 - What are pheromones?
 - What we sell
- **VMB Mating Disruption**
 - Targeting flights
 - Monitoring
 - **Choosing the Best Delivery Mechanism**
 - Flowable™
 - Dispensers™
- **Field Services**
 - Technical Support

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Mating Disruption

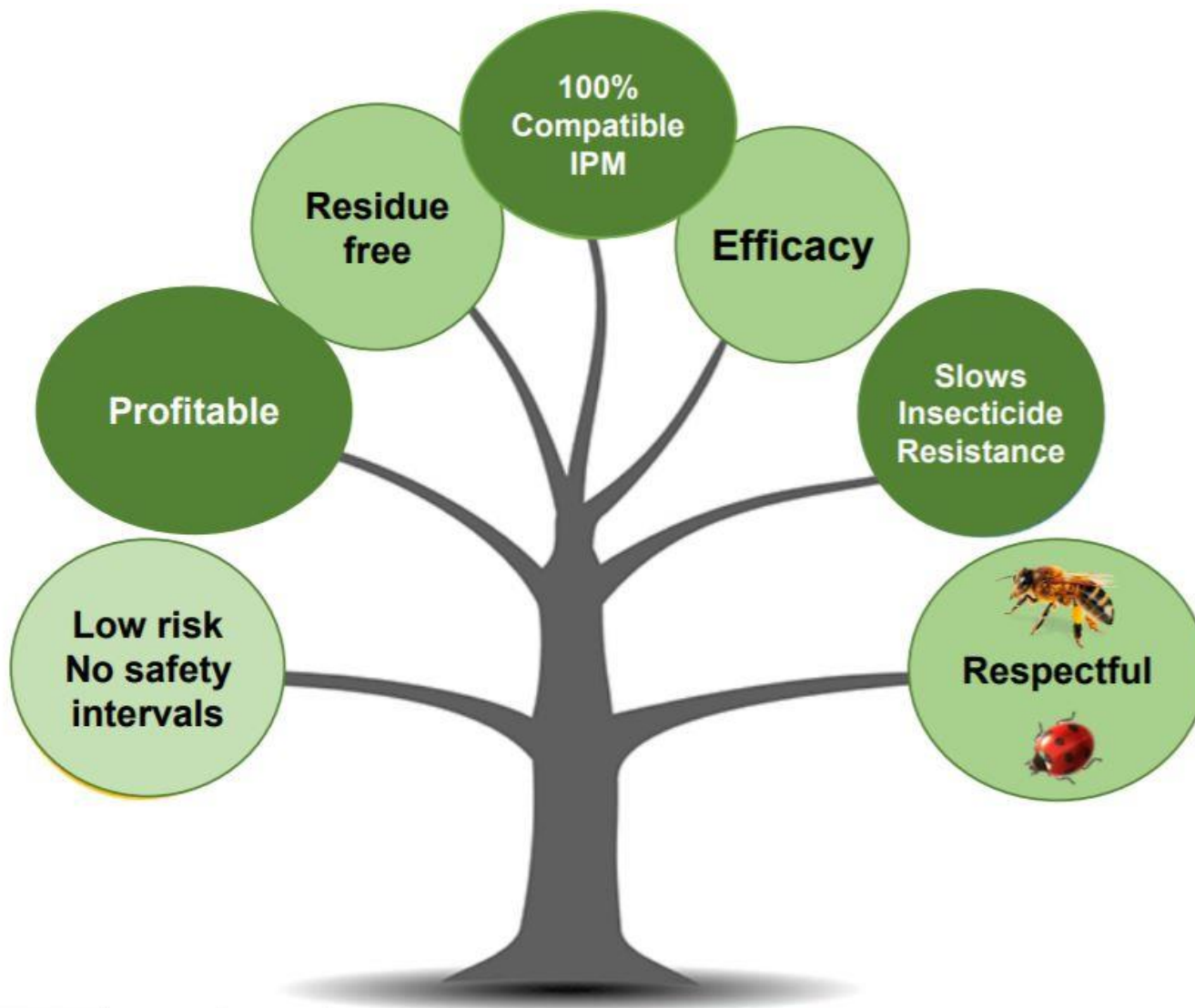
- **What are pheromones?**
 - Sex pheromones regulate behaviors related to reproduction
 - Typically females produce the sex pheromone to attract males
- **So...what is mating disruption?**
 - Abundance of pheromone released to interfere with males' ability to find females
 - Pockets vs. Plumes



Reduction/delay mating – lower population growth

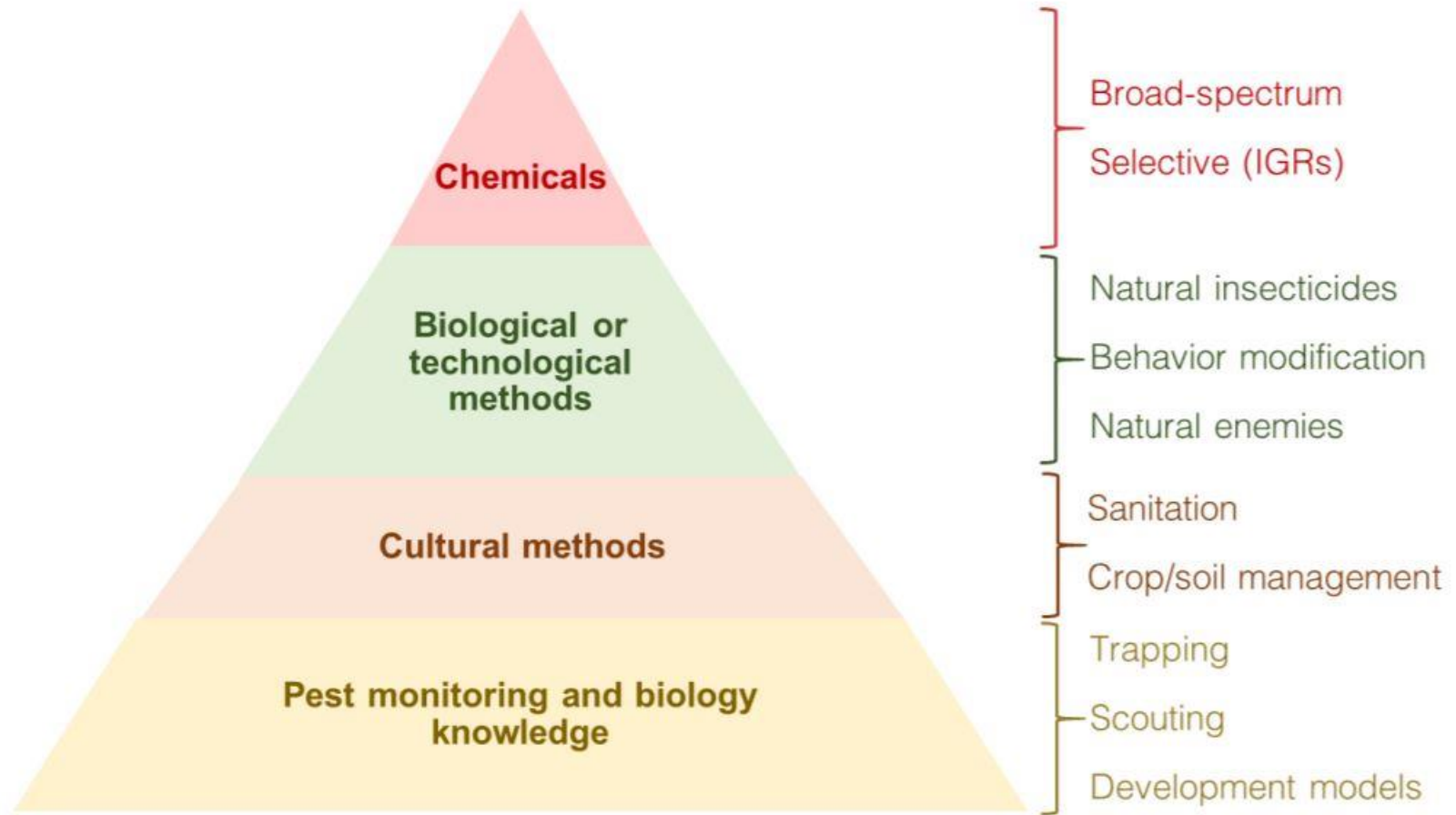
Mating Disruption

One of a kind tool...



Mating Disruption

... to be used in proper IPM program



All tools have a place within IPM, but they are prioritized depending on their potential impacts

Suterra®

Mating Disruption Platforms



What we sell

Suterra®

- **Mating Disruption** - Reduce damage by reducing reproduction
 - CheckMate Flowable™
 - CheckMate Dispenser™
 - Puffer™
- **All platforms accomplish MD**
 - Pest specific products/grower preference



- **Traps & Lures**
 - Monitoring and decision making
 - T&L for additional pests



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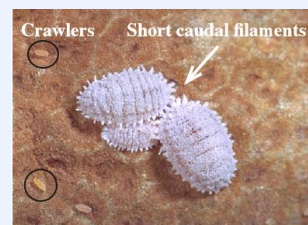
Vine Mealybug- VMB

Best Mating Disruption Practices



Targeting Flights with Mating Disruption

- Three to four generations per year in N. CA and up to six per year in San Joaquin Valley
- All life stages may be present on the vine throughout the year
- Overwinter primarily as mated females and nymphs
- Important to provide mating disruption when significant male flight is happening
- Monitor flights with traps



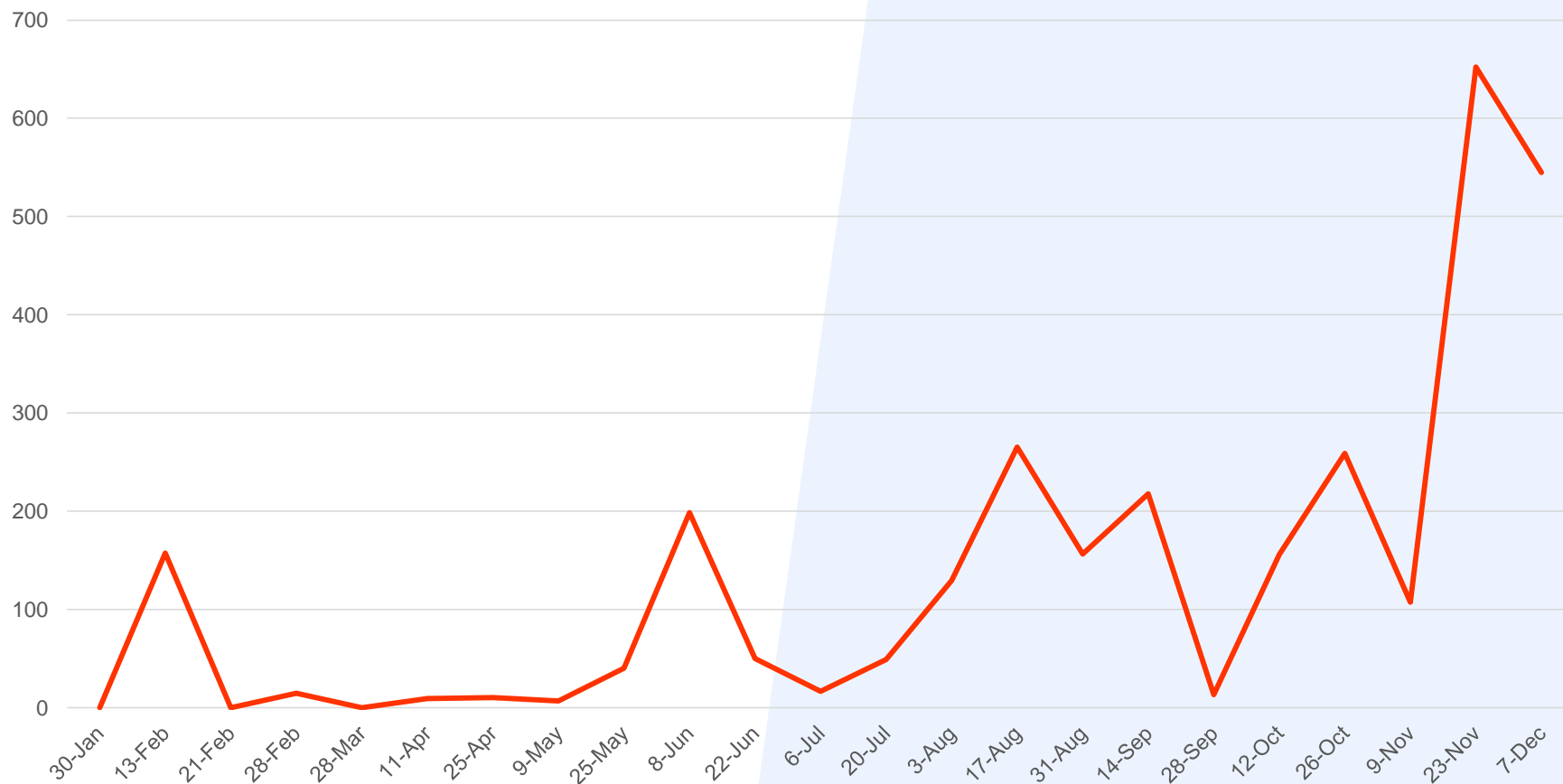
**Pheromones
affect *male*
behavior**

**Weak
flyers**

**Traps
monitor
local
activity
only**

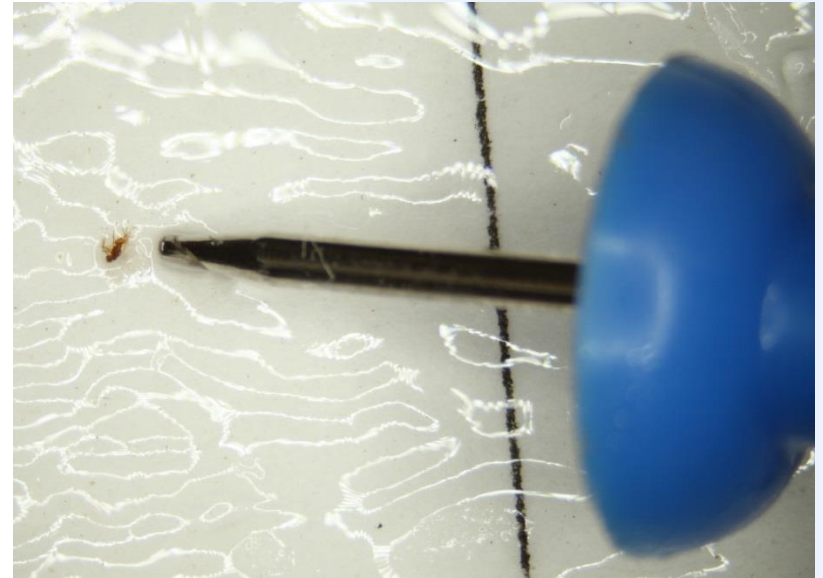
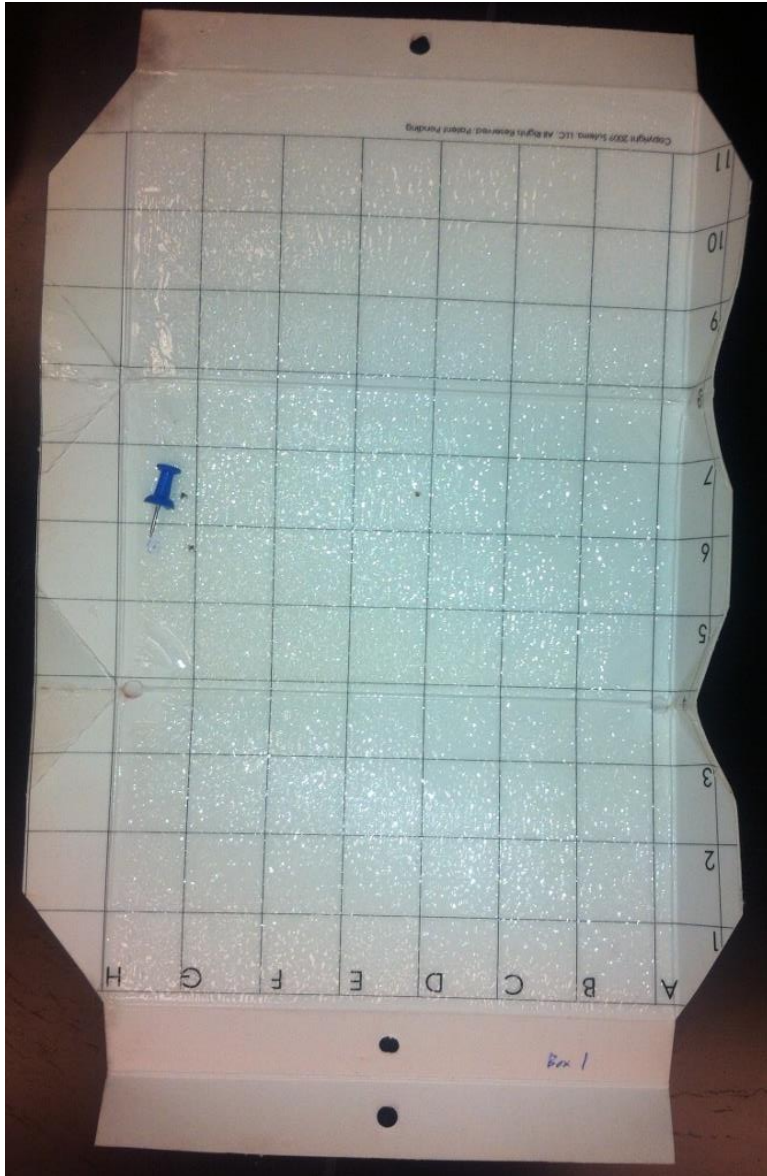
Male flight 2020 - Central CA Coast

Avg Males/Trap
Santa Maria, CA -2020



Monitoring

Check traps bi-weekly



Two VMB Mating Disruption Platforms to Suit Grower Needs

Suterra®

- ✓ Proven financial return on investment for growers
- ✓ Easy to deploy within typical grower operations
- ✓ Three decades of research
- ✓ Continuous investment in new technology
- ✓ Millions of units deployed

Flowable™



Dispenser™



Dispenser[™]



CHECKMATE VMB-XL DISPENSERS

HAND-APPLIED PHEROMONE MATING DISRUPTION

Suterra®

- MEMBRANE-BASED CONTROLLED RELEASE TECHNOLOGY
- EASY APPLICATION: HOOK DESIGNED TO SNAP ONTO THE WIRE
- ONE APPLICATION PER SEASON
- NATIONAL ORGANIC PROGRAM (NOP) APPROVED
- FOR USE WITH WINE, RAISIN AND TABLE GRAPES
- CLIP HAS UV-DEGRADABLE COLOR FOR EASY IDENTIFICATION OF OLD DISPENSERS IN THE FIELD



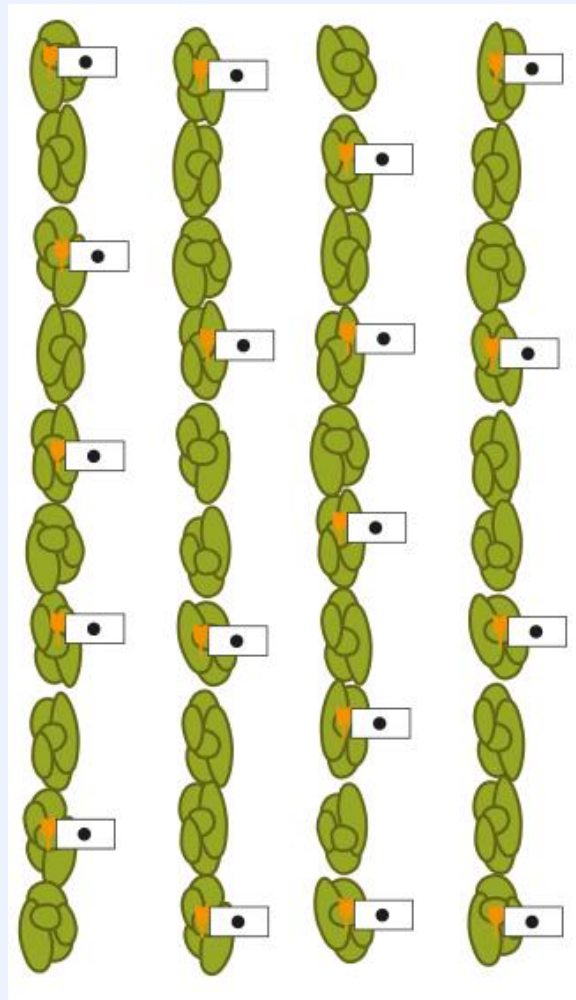
CHECKMATE VMB-XL DISPENSERS

RATE

- APPLY 250 CHECKMATE VMB-XL DISPENSERS PER ACRE
- 37.5 GRAMS OF A.I. PER ACRE
- 1000 DISPENSERS PER BUCKET (= 4 ACRES)

HANG PATTERN

- DISTRIBUTE DISPENSERS EVENLY THROUGHOUT THE ACRE
- HANG APPROXIMATELY 1 DISPENSER EVERY 10-30 FEET, DEPENDING ON PLANTING DENSITY
- USE EASY PATTERNS (EXAMPLE: EVERY THIRD VINE IN ONE ROW, AND EVERY OTHER VINE IN THE NEXT ROW)



CONSULT A SUTERRA REPRESENTATIVE FOR MORE PATTERN OPTIONS.

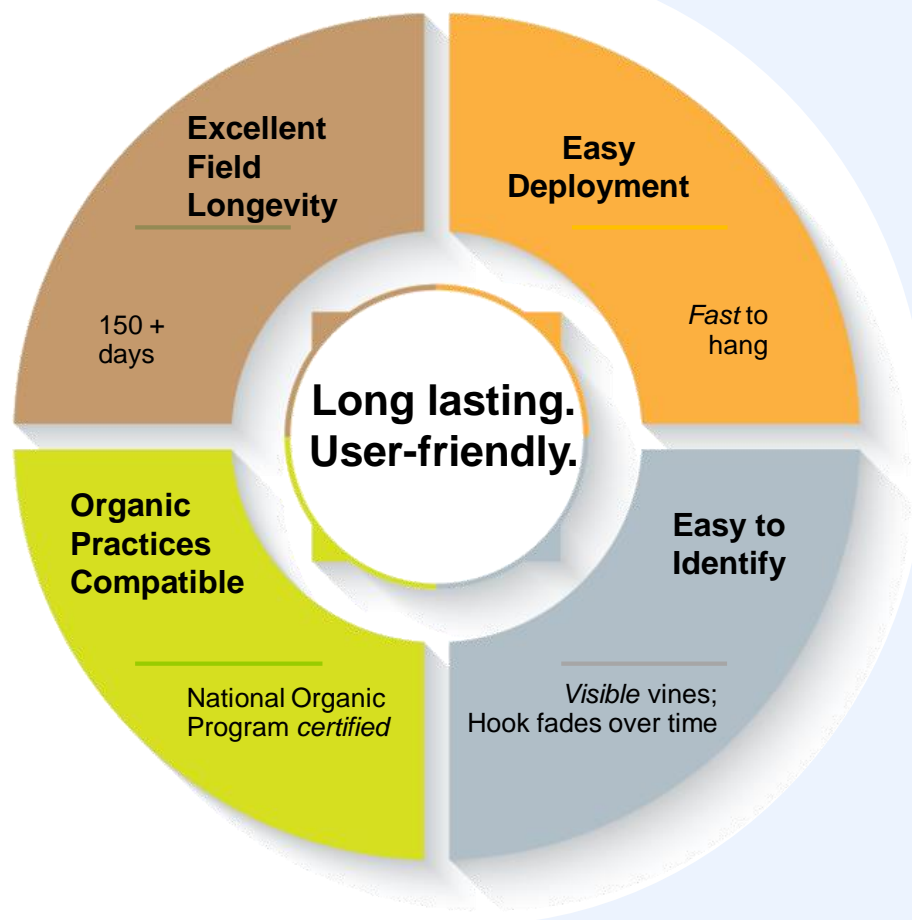
CHECKMATE VMB-XL DISPENSERS

APPLICATION

- POSITION DISPENSER NEAR TRUNK (CLOSE TO THE CORDON)
- HANG ON TRELLIS WIRE OR THUMB-SIZE CANES
- THIS POSITION WILL MINIMIZE CONTACT WITH MECHANICAL HARVESTERS, AND MAXIMIZE EFFICACY
- HANG ON THE SHADY SIDE OF VINE FOR MAXIMUM FIELD LIFE



Why do Growers Choose CheckMate® Dispensers?



Flowable™

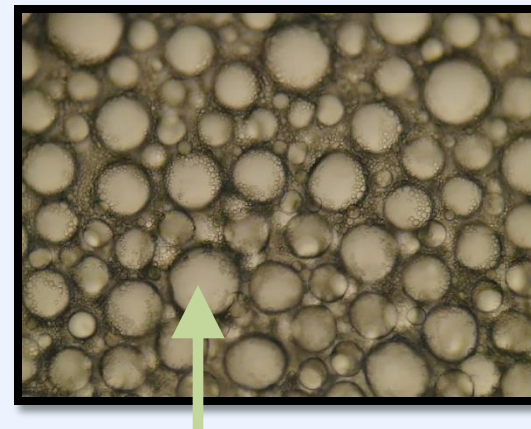


CHECKMATE FLOWABLE

Suterra®

LIQUID FLOWABLE PHEROMONE MATING DISRUPTION

- MICRO-ENCAPSULATED FOR CONTROLLED RELEASE OF PHEROMONE
- CAN BE APPLIED USING COMMONLY AVAILABLE SPRAY EQUIPMENT
- FLOWABLE FORMULATION ALLOWS MORE FLEXIBILITY THAN DISPENSERS
- TANK MIX OPTIONS
- EFFECTIVE FOR APPROXIMATELY 4 WEEKS, BASED ON ENVIRONMENTAL CONDITIONS
- FOR USE WITH WINE, RAISIN AND TABLE GRAPES



Micro-encapsulated pheromone



How to Use CheckMate Flowables

- SHAKE WELL!
- For best results, apply immediately after mixing
- Apply to area of pest activity: trunk, cordons, shoots and leaves
- Target application to undersides of leaves to reduce UV degradation
- Reapply after heavy rain or overhead irrigation
- For medium to high target pest populations, supplement with insecticides and/or release of beneficial insects
- The larger the treated area, the better the results – be a good neighbor
- Population suppression occurs over time



Tank Mixing CheckMate Flowables

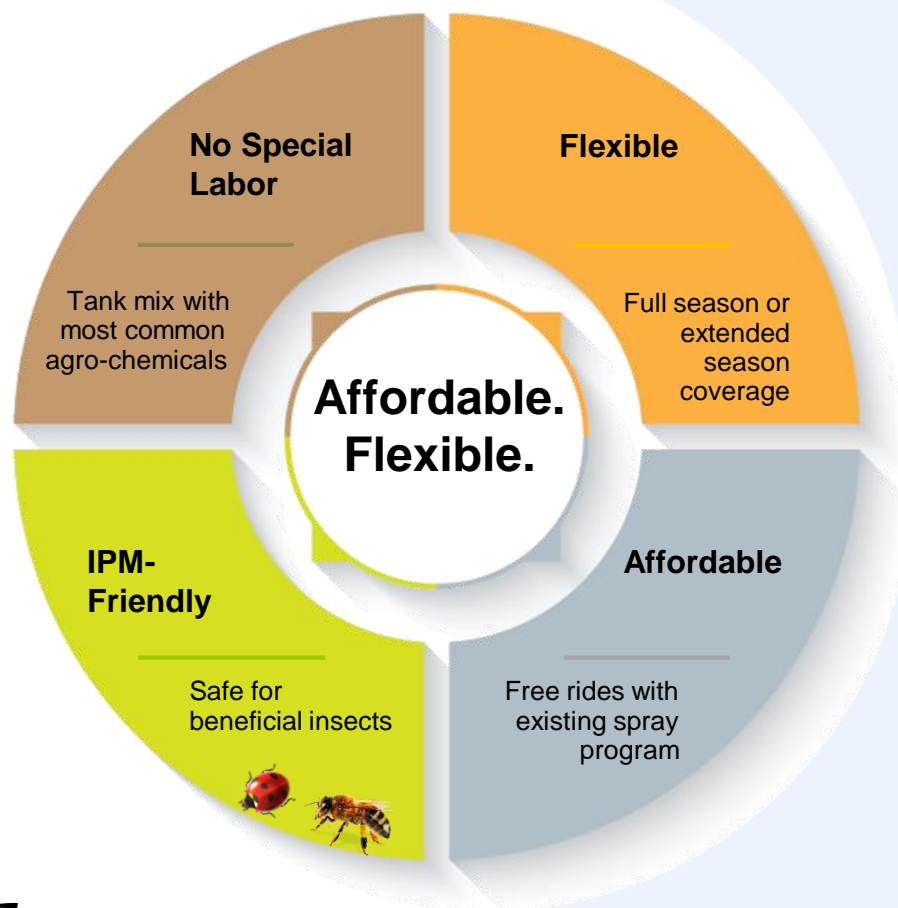
- Generally safe to mix with materials that dissolve or suspend in water including insecticides, fungicides or fertilizers*
- AVOID tank mixing with emulsifiable concentrates, organosilicone spreaders, and Stylet Oil, as they can interfere with the microencapsulated formulation

*Consult the CheckMate® Flowable Compatibility Chart or see you Suterra Rep for specific compatibility questions

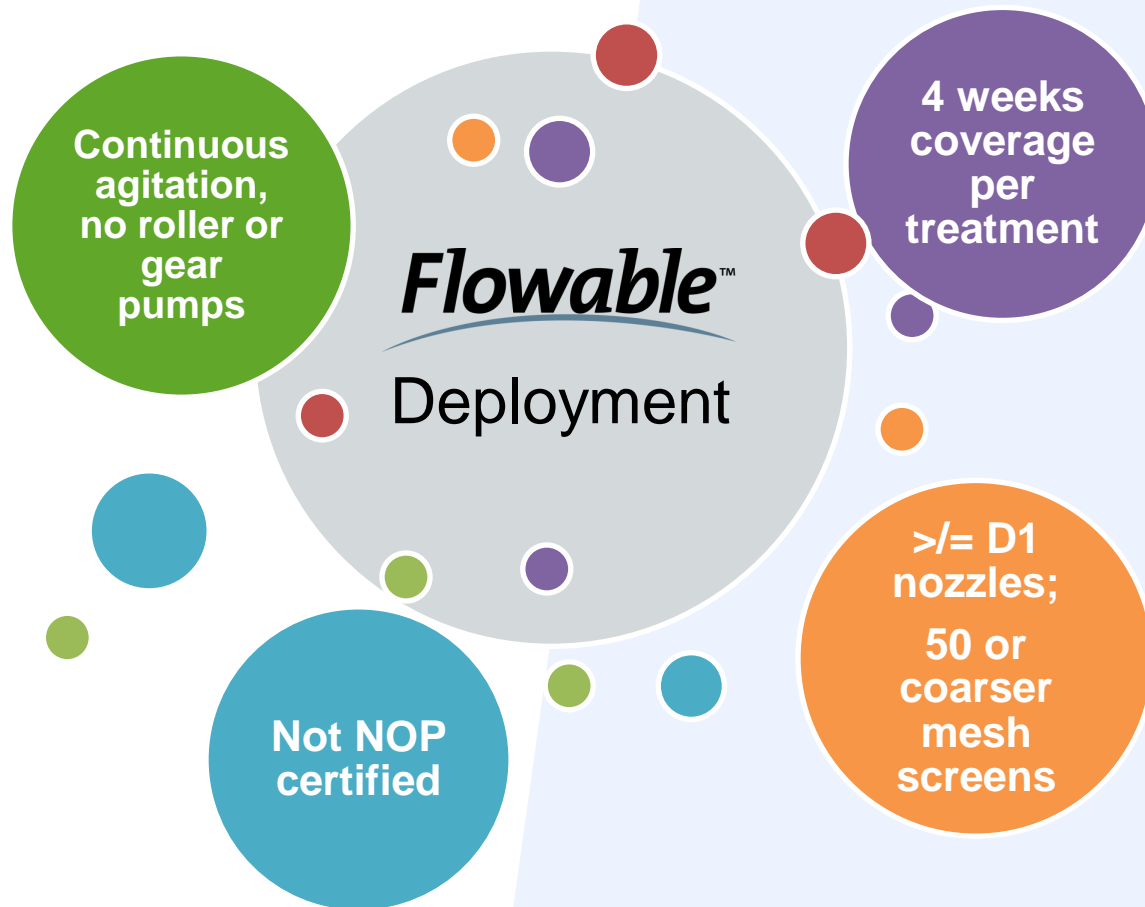


Why do Growers Choose Flowable™?

Suterra®



Flowable™



CHECKMATE VMB-F FOR VINE MEALYBUG MATING DISRUPTION

RATES

CHECKMATE VMB-F RATES	
LABEL RATE/ACRE	0.9 FL OZ (26.4 ML) TO 1.8 FL OZ (52.8 ML)
GRAMS OF A.I./ACRE	5 G TO 10 G
APPLICATIONS PER BOTTLE	15 TO 30 ACRES



***DO NOT EXCEED 150 G
A.I./ACRE/YEAR (VMB-F AND
VMB-XL DISPENSERS
COMBINED)**

Benefits of CheckMate VMB-F

- No insecticide residue on fruit
- Extend dispenser-based pheromone mating disruption program
 - Early treatment before deployment of dispensers
 - Late treatment extends season after dispenser release period
- Supplement/Integrate to general VMB control materials (insecticides)
- Applications can be timed to target VMB activity periods
- Safe environment for pollinators
- No harm to naturally occurring or released beneficials such as
 - ***Anagyrus pseudococci***, parasitic wasp
 - ***Cryptolaemus montrouzieri***, Mealybug destroyer


























Mealybug destroyer, *Cryptolaemus montrouzieri*



Anagyrus pseudococci adult & VMB

VMB-F® + VMB-XL® Timing Options



April	May	June	July	Aug	Sept	Oct	Nov
VMB-XL 					VMB-F 	VMB-F 	
	VMB-XL 					VMB-F 	VMB-F 
VMB-F 	VMB-F 	VMB-XL 					
	VMB-F 	VMB-F 	VMB-XL 				
		VMB-F 	VMB-F 	VMB-XL 			
VMB-F 	VMB-F 	VMB-F 	VMB-F 	VMB-F 	VMB-F 	VMB-F 	VMB-F 

Vine Mealybug (VMB)

Planococcus ficus

MONITORING GUIDE

Traps	Suterra® Small Paper Delta Trap (shown at right)
Lures	Suterra® VMB Septa Lure (shown at right)
Trap Density	At least 1 pheromone trap per 10-20 acres, minimum of 2 traps per block
Good Practices	<p>Hang traps in March to detect early activity, and continue to trap until late October/November</p> <p>Hang traps at cordon height, entrance should be free of branches and leaves</p> <p>Check traps and record captures a minimum of once every 2 weeks</p> <p>Replace traps at every check</p> <p>Replace lures monthly</p> <p>Keep unused lures in cold storage</p>

Sources: UC IPM Guidelines

Pest Identification

Adult Males Length 0.7 mm (0.03 inches)	<p>Traps catch adult males only</p> <p>Males have 2 wings and 6 legs,</p> <p>Body is amber or brown</p> <p>Large eyes and long antennae</p> <p>Abdomen is narrow and thorax is wide</p> <p>Wings are transparent</p> <p>A lens or microscope may be necessary for identification</p>
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Vine Mealybug (VMB)

Planococcus ficus

MONITORING GUIDE

Crop Damage Assessments

Timing	Conduct one survey after each flight or monthly
Sample Size and Examination	<p>At least 100 plants per block during each survey</p> <p>Look for presence of honeydew, wet trunks, or ant activity</p> <p>Look for infested grape clusters; rotting grapes cause unmarketable fruit</p> <p>Trunk inspections are cumbersome but provide the best information: peel back bark to see females and crawlers</p> <p>Females and juveniles have very soft bodies, with a waxy coating and an overall cottony appearance</p> <p>Adult females are 2.5 - 3.5 mm long</p>
Additional Techniques	Bunch inspections can be conducted, but ideally detection should occur before the fruit is reached

Sources: UC Guidelines

VMB infestation in fruit



VMB infestation under bark



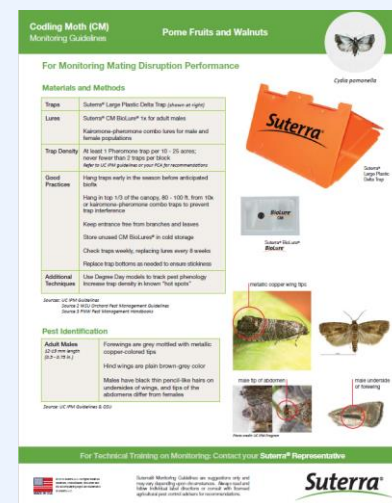
VMB Females and Juvenile



Field Services Offered by Suterra

Suterra®

- ✓ Step-by-Step Deployment Guides
- ✓ Monitoring Guides
- ✓ Hanging patterns
- ✓ **Experienced Technical Team** who can train in scouting, monitoring, and pest behavior



Thank you!

Suterra[®]

- ✓ Unparalleled Quality Control at Every Stage
- ✓ Grower Owned
- ✓ Made in Bend, Oregon
- ✓ Largest dedicated pheromone facility in the world
- ✓ Early stage research in synthesis and formulation
- ✓ Product design and manufacturing



Every Product Is Proudly Made in the USA

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