# Prune Aphid Research Update

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# Mealy plum aphid (MPA)
## *Hyalopterus pruni*




# Leaf-curl plum aphid (LCPA)
## *Brachycaudus helichrysi*



# Aphid Life Cycle

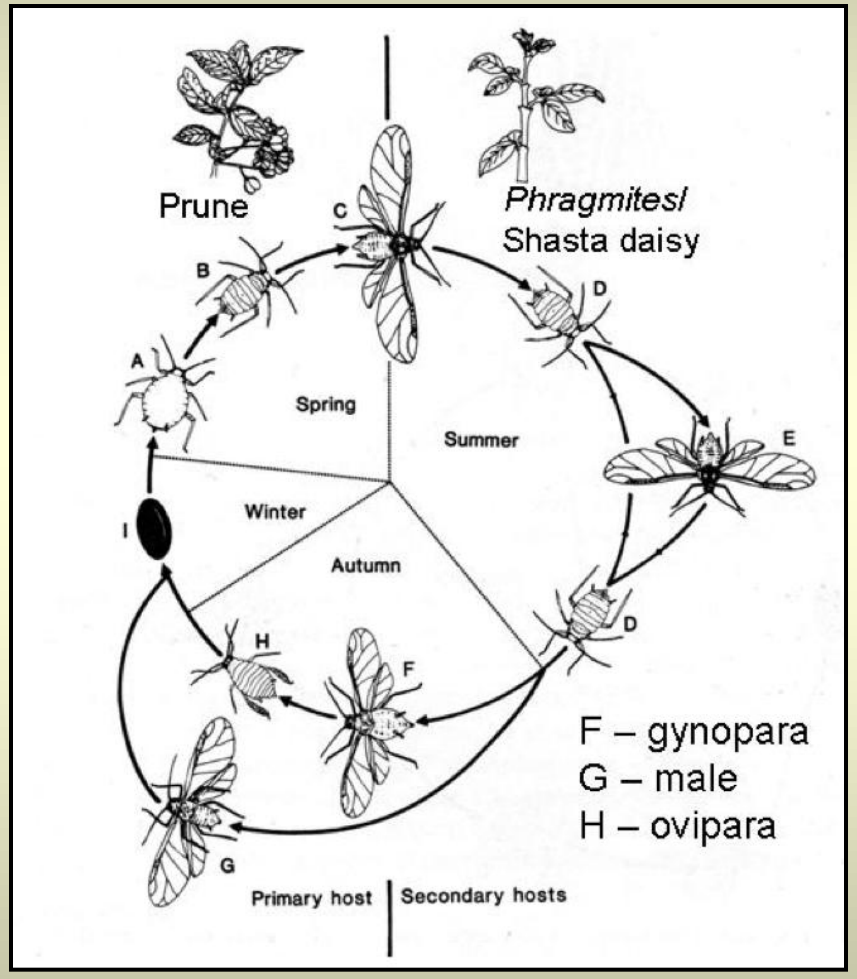



**Diagram credit: Mills et al. 2004**

# Damage

- **Foliage**
  - **Stunting, curling, distortion, honeydew**
- **Fruit**
  - **Honeydew, cracking, reduced sugar content**
- **Tree**
  - **Devitalized, slowed growth**

# Aphid Life Cycle

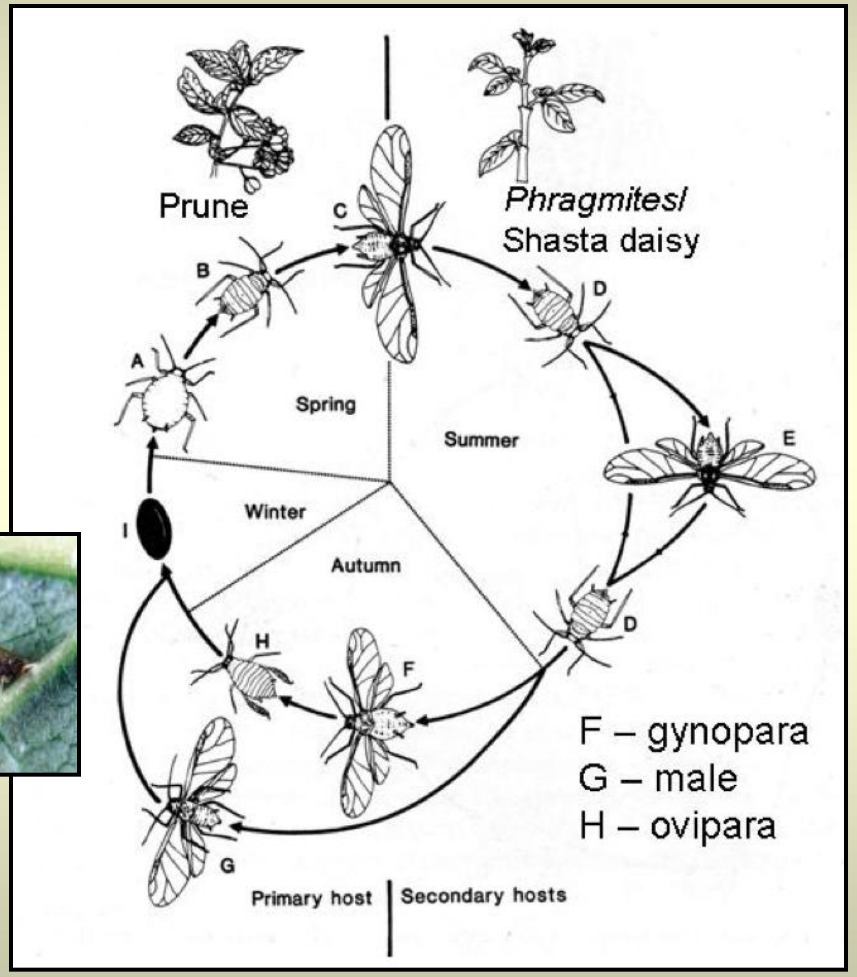
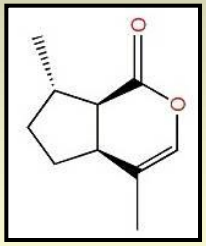


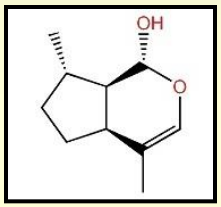

**Diagram credit: Mills et al. 2004, Photo credit: Simon et al. 2002**

# Sex Pheromones

- (*4aS, 7S, 7aR*)-nepetalactone




- (*1R, 4aS, 7S, 7aR*)-nepetalactol




- MPA

  3.4:1 (nepetalactone:nepetalactol)

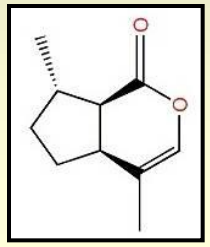
- LCPA

  2.6:1 (nepetalactone:nepetalactol)

Pickett et al., unpubl.

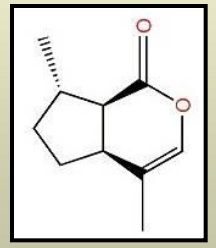
# Nepetalactone

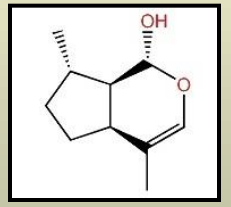
- Obtained in high yield from fresh plant material
  - Catnip, *Nepeta cataria* (Lamiaceae)
  - Steam distillation process




# Nepetalactol

- Obtained via chemical reduction of nepetalactone
  - Sodium borohydride, $NaBH_4$

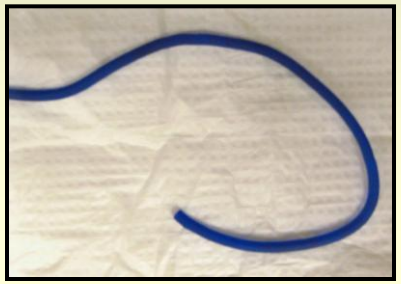


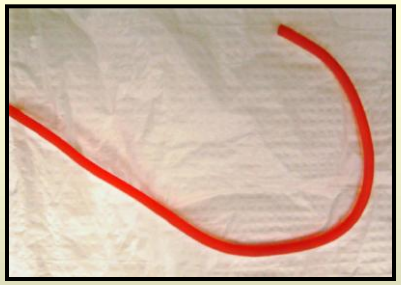




Birkett & Pickett 2003. Phytochemistry 62: 651-656

# Commercial Product

- Flexible PVC rope
  - 5% extrusions
- Prevents UV degradation & oxidation
- Slow, consistent release rate
  - Stable release profile for >1 month
- Nepetalactone
  - Standard lure length = 4cm
  - Release rate = min. 200 μg/day
- Nepetalactol
  - Standard lure length = 8cm
  - Release rate = min. 200 μg/day
- Cut to different lengths to deploy desired pheromone ratios





# Current Practices

- **Monitoring**
  - **Dormant spur sample - eggs**
  - **Problems**
    - **Reliability, implementation**


- **Management**
  - **Dormant insecticide treatment**
    - **Pyrethroid or OP ± oil**
  - **Problems**
    - **Water quality**


- **Potential for improvement**

# Research Objectives

## I. Monitoring:

- Investigate whether aphid sex pheromones may be used to develop monitoring protocol for MPA & LCPA in prune orchards

## II. Management:

- Explore the use of aphids sex pheromones for mating disruption of MPA & LCPA in prune orchards

# Fall 2008 Ratio Trials

- Evaluated responses of male MPA and LCPA to different blend ratios of aphid sex pheromone
  - Pheromone baited water traps
  - RCBD
    - 18 total replicates (4 orchards)
      - Yolo and Sutter Counties
  - 8 pheromone ratio treatments
    - Nepetalactone:nepetalactol
      - 0:0, 1:0, 0:1, 1:1, 2.6:1, 3.4:1, 5:1, 7:1
  - Traps processed weekly & counts summed over entire season for analyses

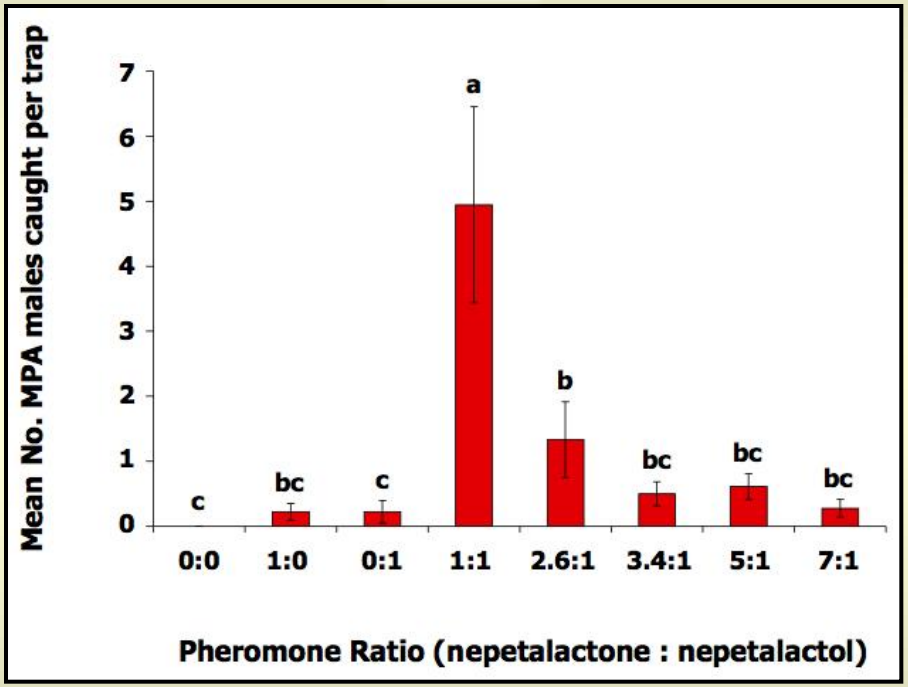
# Fall 2008 Ratio Trials

| Pheromone ratio (lactone : lactol) | Total # Males | |
|---|---|---|
| | MPA | LCPA |
| 0 : 0 | 0 | 0 |
| 1 : 0 | 4 | 3 |
| 0 : 1 | 4 | 0 |
| 1 : 1 | 89 | 186 |
| 2.6 : 1 | 24 | 195 |
| 3.4 : 1 | 9 | 163 |
| 5 : 1 | 11 | 146 |
| 7 : 1 | 5 | 122 |

**Numbers of male MPA and LCPA caught in water traps releasing different ratios of nepetalactone:nepetalactol sex pheromone components in fall 2008**

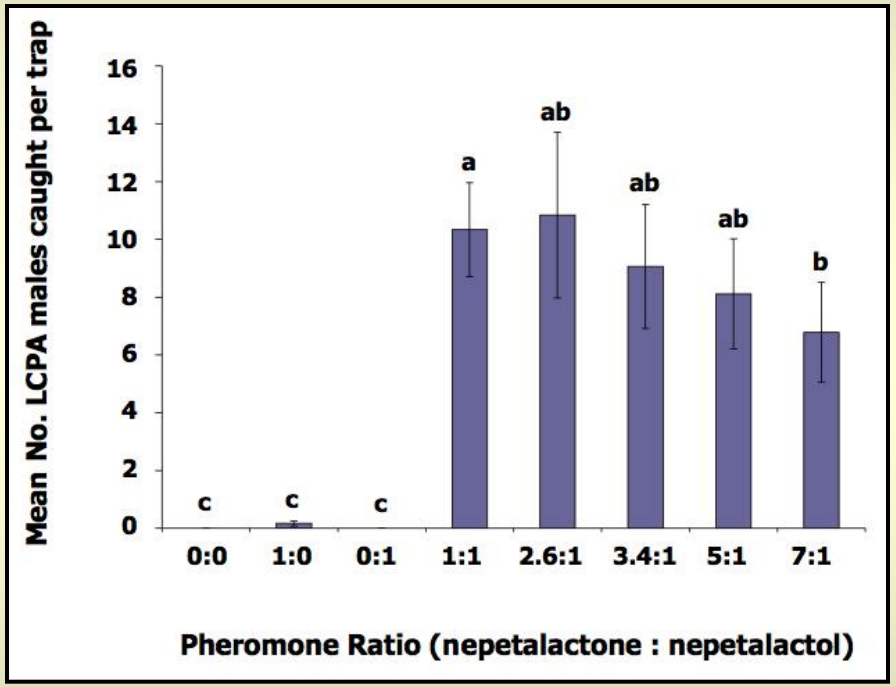
# Numbers of male MPA and LCPA caught in water traps releasing different ratios of nepetalactone:nepetalactol sex pheromone components in fall 2008

## MPA




$F = 15.03$, df = 7, 119, $P < 0.0001$

## LCPA




$F = 38.07$, df = 7, 119, $P < 0.0001$

Friedman nonparametric ANOVA on ranked mean ($\alpha = 0.05$)

LS means multiple comparison (Bonferroni $\alpha' = 0.00179$)

# Monitoring Objective

- **2009 Season - ongoing**
  - 27 monitoring subplots (3 orchards)
  - Fall populations
    - 1 pheromone-baited water trap/subplot - weekly
  - OW egg populations
    - Spur samples - 75 trees/subplot
  - Spring populations
    - Population rating scale - 75 trees/subplot
  - Regression analyses
    - Correlate fall trap counts with OW egg populations
    - Correlate fall trap counts with spring populations

- **2010 Season**
  - Repeat current experiments (water traps)
  - Evaluate additional trap types
    - Sticky cards (yellow/white)

# Mating Disruption Objective

- **2010 Season**
  - Split-plot design
  - Min. 6 replicates, multiple orchards
  - Compare
    - Trap catches of male MPA & LCPA in MD vs. control blocks
      - Pheromone-baited water-traps
    - OW egg populations in MD vs. control blocks
      - Spur samples
    - Spring populations in MD vs. control blocks
      - Population rating scale