Cherry Fruit Fly and Leafroller Research Updates

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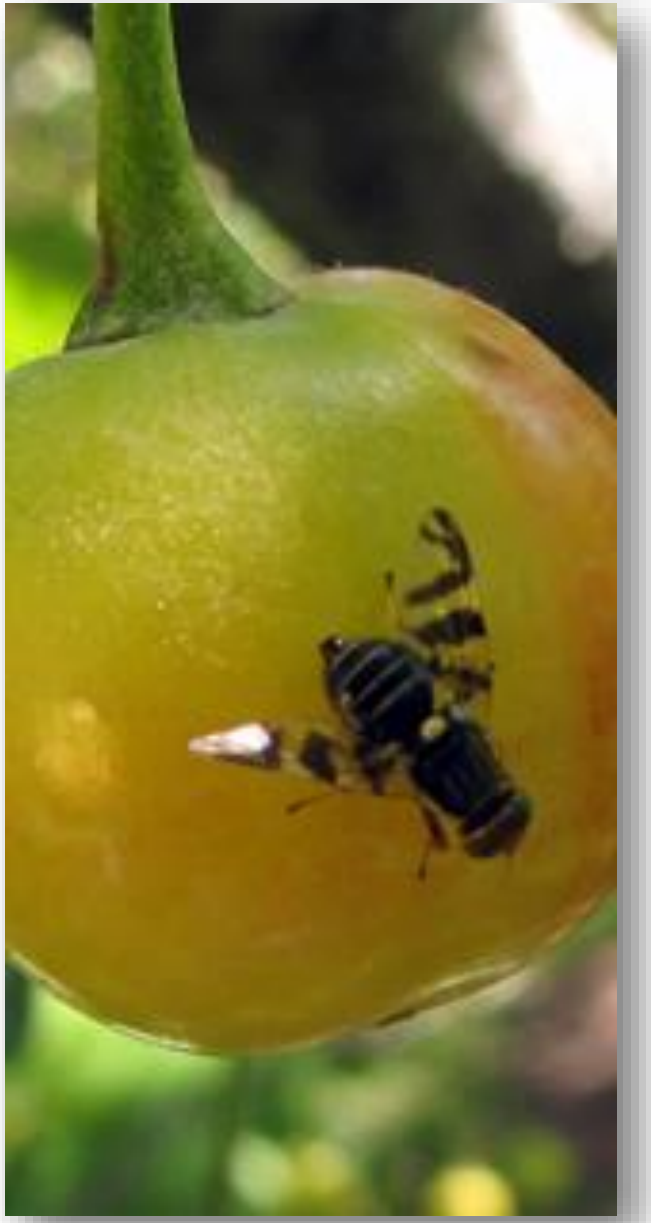
Topics

- Cherry Fruit Fly
  - New insecticides
  - New traps
  - Killing stations
- Leafroller Survey
  - Adults
  - Larvae



New Insecticides for Cherry Fruit Fly

Cherry Fruit Fly Control – the Challenges

- In managed orchards, the primary sources of CFF:
  1. External - gravid females (with mature eggs) fly into orchard – infestation in border trees
     - No delay between first immigration & egg laying
  2. Internal – a hotspot in the previous season may generate emerging flies
- Insecticides must prevent egg-laying – rapid kill
- New control technologies:
  - Systemic activity to kill eggs & larvae within fruit
  - Add feeding stimulants to encourage flies to ingest insecticide droplets before eggs are laid

Diamide Insecticides

- IRAC Class 28: ryanodine receptor modulators – calcium channels
  - Impair nerve and muscle function
  - Stop feeding quickly, regurgitation, reduce movement, paralysis
  - Translaminar (local) and limited systemic activity
  - Safe to mammals, birds, & aquatic organisms
- Altacor (Chlorantraniliprole) - DuPont
- Exirel (Cyantraniliprole) – DuPont
  - Greater mobility within plant & activity against a broader spectrum of pests
- Cyclaniliprole – ISK Biosciences
  - Anticipate registration in 2016

DuPont™ Altacor®

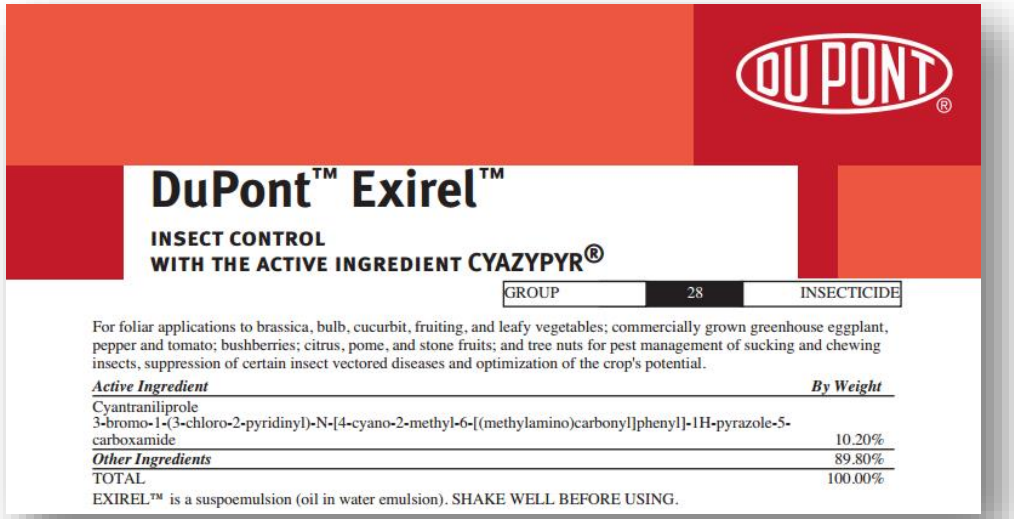
INSECT CONTROL
WITH THE ACTIVE INGREDIENT RYNAXYPYR®

GROUP	28	INSECTICIDE

ALTACOR® is a water dispersible granule.

Active Ingredient	*By Weight*
Chlorantraniliprole 3-Bromo-N-[4-chloro-2-methyl-6-[(methylamino)carbonyl]phenyl]-1-(3-chloro-2-pyridinyl)-1H-pyrazole-5-carboxamide	35.0%
Other Ingredients	65.0%
TOTAL	100.0%

codling moth, leafrollers, fruitworms, peach twig borer, cherry fruit fly, apple maggot, plum curculio



DuPont™ Exirel™

INSECT CONTROL
WITH THE ACTIVE INGREDIENT CYAZYPYR®

GROUP	28	INSECTICIDE

For foliar applications to brassica, bulb, cucurbit, fruiting, and leafy vegetables; commercially grown greenhouse eggplant, pepper and tomato; bushberries; citrus, pome, and stone fruits; and tree nuts for pest management of sucking and chewing insects, suppression of certain insect vectored diseases and optimization of the crop's potential.

Active Ingredient	*By Weight*
Cyantraniliprole 3-bromo-1-(3-chloro-2-pyridinyl)-N-[4-cyano-2-methyl-6-[(methylamino)carbonyl]phenyl]-1H-pyrazole-5-carboxamide	10.20%
Other Ingredients	89.80%
TOTAL	100.00%

EXIREL™ is a suspoemulsion (oil in water emulsion). SHAKE WELL BEFORE USING.

2014 Insecticide Trial – Diamides & Sugars

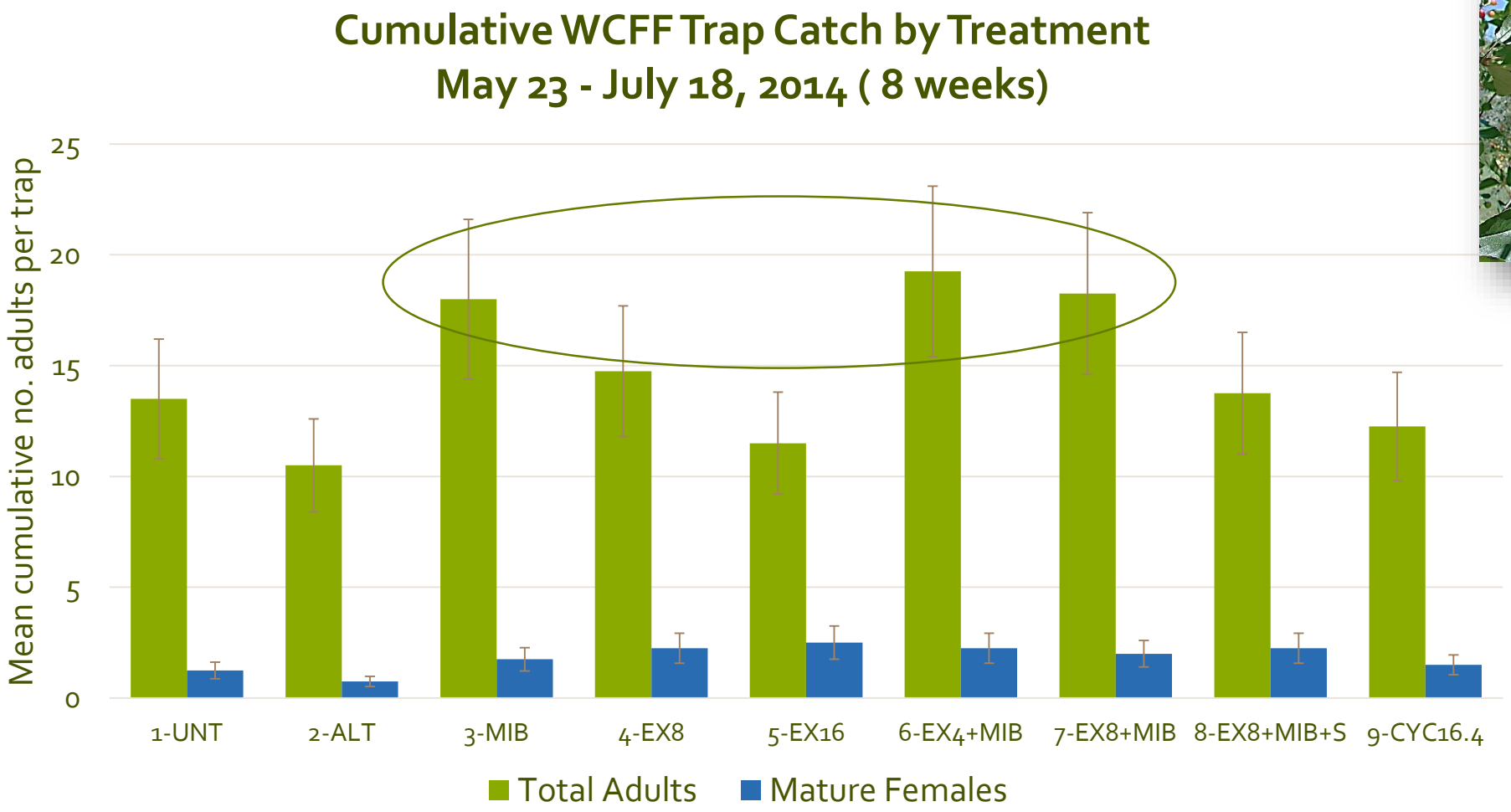
- Tart cherry, USU Kaysville Research Farm
- Plot size: 2 rows × 3 trees (6 trees) surrounded by untreated buffer trees
- 4 replicates, randomized complete block design
- Treatments applied thrice (8 or 10 day intervals) after first fly trap catch
  - June 12, June 20, and June 30
- Orchard airblast sprayer: 100 gpa & 100 psi
- Treatments*:
  1. Untreated Control (UNT)
  2. Altacor WG 4.5 oz/acre (ALT)
  3. Monterey Insect Bait 0.5% (MIB) – corn sugar
  4. Exirel 8 oz/acre (EX8)
  5. Exirel 16 oz/acre (EX16)
  6. Exirel 4 oz/acre + MIB (EX4+MIB)
  7. Exirel 8 oz/acre + MIB (EX8+MIB)
  8. Exirel 8 oz/acre + MIB + Sugar 2.0% (EX8+MIB+S)
  9. Cyclaniliprole 16.4 oz/acre (CYC16.4)
  10. Cyclaniliprole 22 oz/acre (CYC22)

*Induce, non-ionic surfactant added

Cherry Fruit Fly Trap Capture

1 trap per plot, flies counted & removed weekly

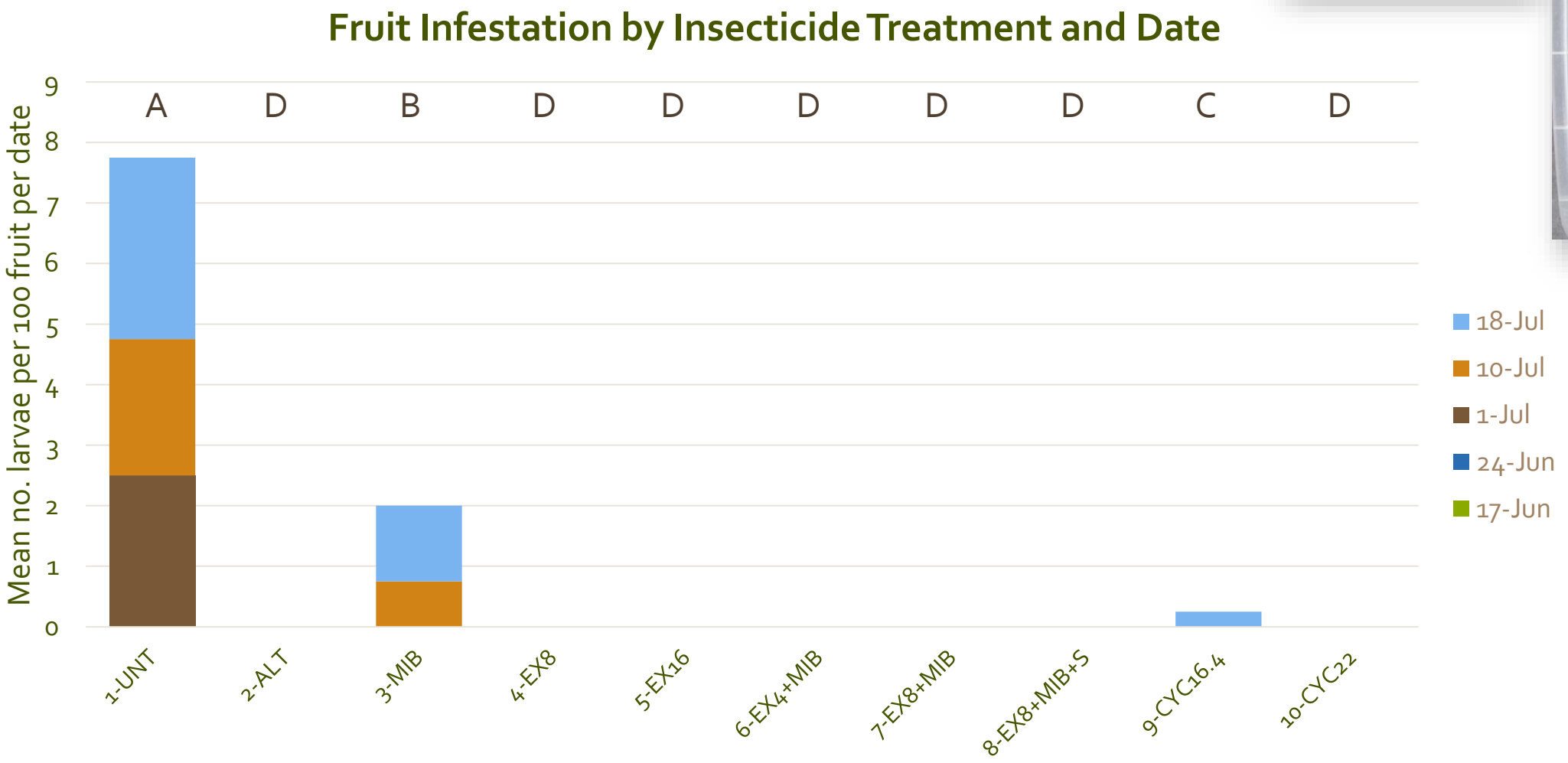
No statistical difference among treatments



Cherry Fruit Infestation

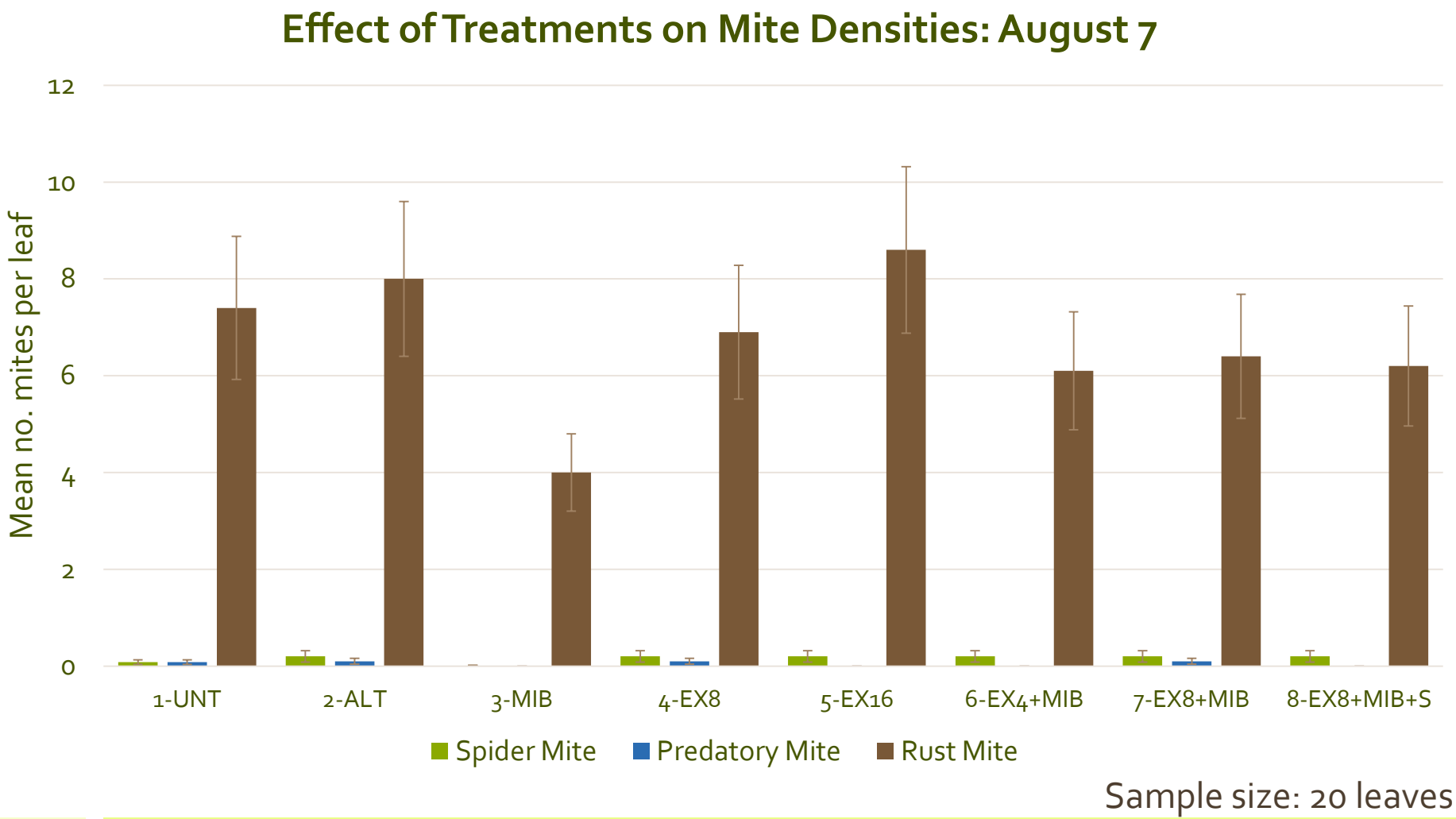
Sampled 2,000 fruit per treatment

Significant difference among treatments, $p < 0.0001$



Mite Flare? No

No significant differences among treatments



Sample size: 20 leaves

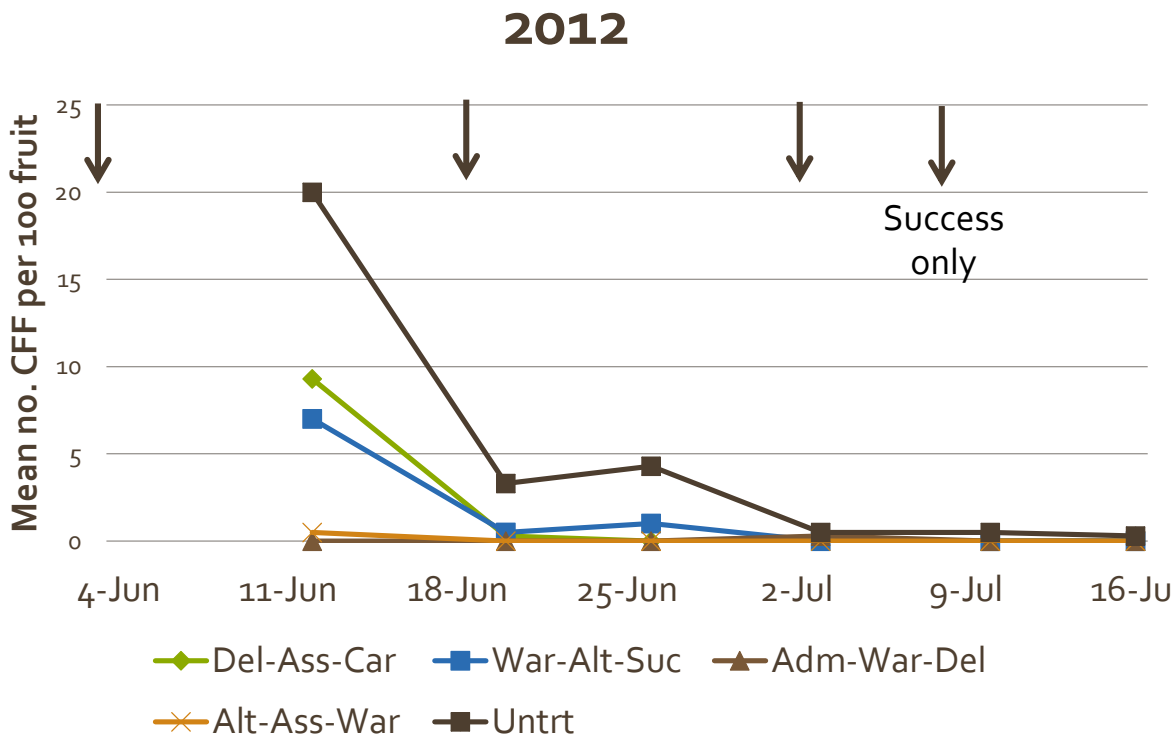
Twospotted spider mite

Western orchard predatory mite

Cherry rust mite

Remind you of the Results of the 2012 & 2013 Insecticide Rotation Study

- High CFF pressure
  - 2012: 150-200 flies per trap at peak
  - 2013: 50-80 flies per trap at peak
  - 2014: 5-7 flies per trap at peak
  - much higher than most commercial orchards
- Systemics applied first (Admire & Altacor) performed best
  - systemics killed early CFF eggs & larvae within fruit
  - Admire-Warrior-Delegate: 0%
  - Altacor-Assail-Warrior: 0.25%
- Pyrethroid or spinosyn applied first: some early infestation
  - Warrior-Altacor-Success: 7% in 2012 & 0.5% in 2013
  - Delegate-Assail-Sevin: 9% in 2012 & 1.5% in 2013
- If CFF pressure is high or first application is late, killing CFF adults and eggs/larvae within fruit are both important strategies



New Yellow Sticky Traps

Yellow Sticky Trap Comparison Study – 2014

Western Cherry Fruit Fly, USU Kaysville Research Station

Alpha Scents
Yellow Rectangle
Bright yellow
Translucent
No-mess adhesive

Scentry Multigard
Green-yellow
Fold-back cardboard
Not translucent
Sticky adhesive

Olson
Yellow Sticky Card
Bright yellow
Translucent
No-mess adhesive

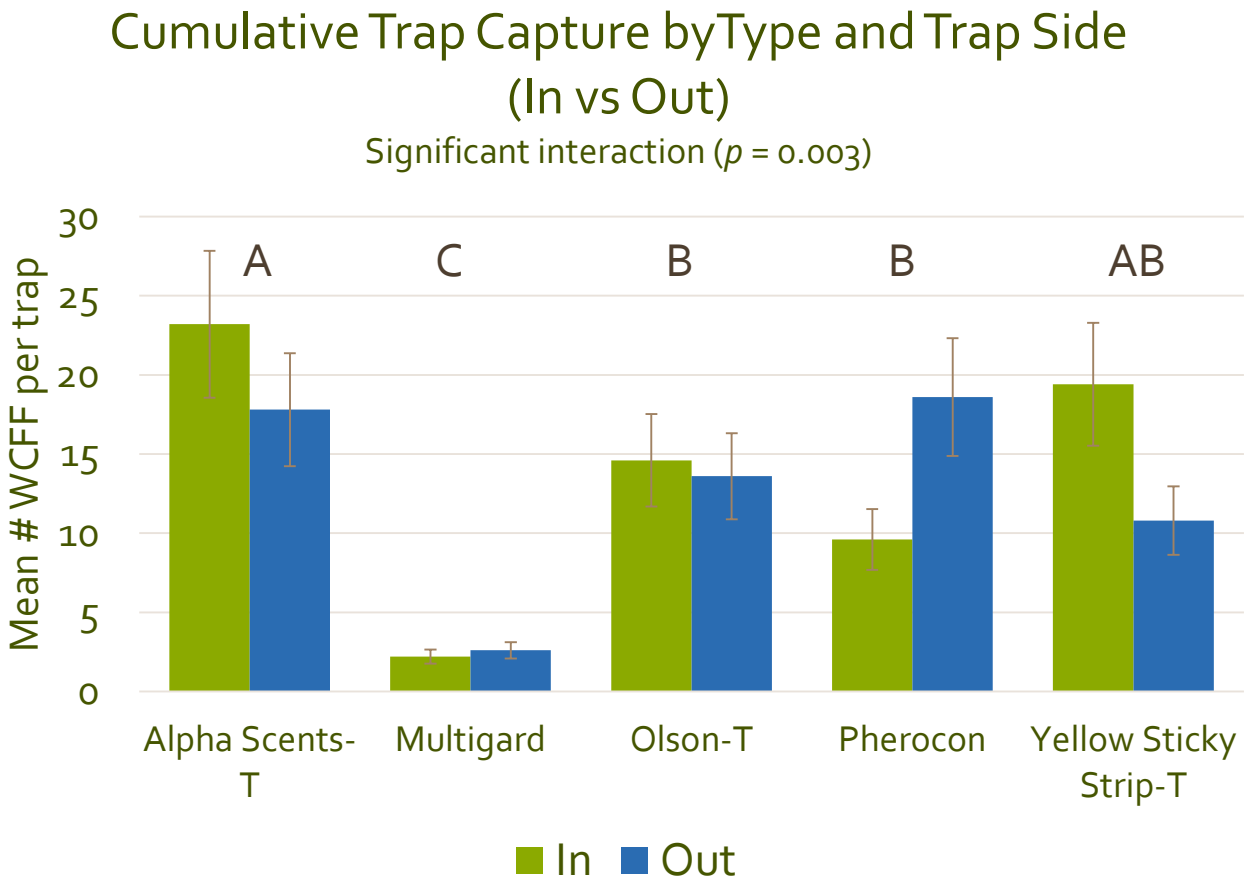
Pherocon
Yellow Sticky Trap
Bright yellow
Fold-back cardboard
Not translucent
Sticky adhesive
*Standard trap

Yellow Sticky Strip
Bright yellow
Translucent
No-mess adhesive
Too light-weight

^Ammonium carbonate external bait added to all traps

Trap Comparison Results

"In" faces tree, "Out" faces out from tree canopy
Cumulative trap catch from May 30 – July 8, 2014 (7 weeks)



Findings (one year):

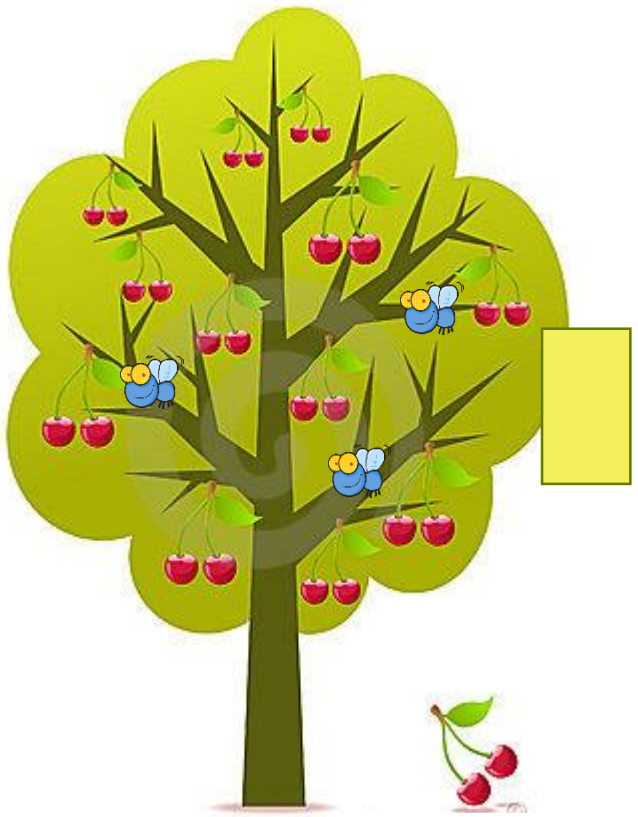
Total no. flies caught:

- Alpha Scents trap caught the most CFF
- Translucent traps (AS, OL, YSS) performed as well or better than Pherocon
- Multigard caught the least

Catch on "in" vs "out" sides of trap:

- Translucent traps caught the most on the inside of trap
- Fold-back cardboard (non-translucent) traps caught fewer flies on inside

Implications of New Traps



- CFF spends most time within tree canopy near fruit
- More CFF caught on inside of translucent traps
  - See yellow color shining through trap from sunlight
  - Solid cardboard traps looks dark from inside of tree canopy
- Translucent traps increased trap catch
  - Alpha Scents Yellow Rectangle Trap performed the best
    - Translucent, but heavier plastic
  - Yellow Sticky Strip and Olson traps
    - Translucent, but too light-weight – flop around in the wind
- No-mess adhesive is less messy
  - Tacky, but adhesive doesn't rub off
  - More difficult to remove flies
- External ammonium bait
  - Increases trap catch ≥2×
  - Increases attraction of non-target flies & insects

Killing Stations to Enhance Management of Cherry Fruit Fly

CFF Killing Station Trials

2013 & 2014

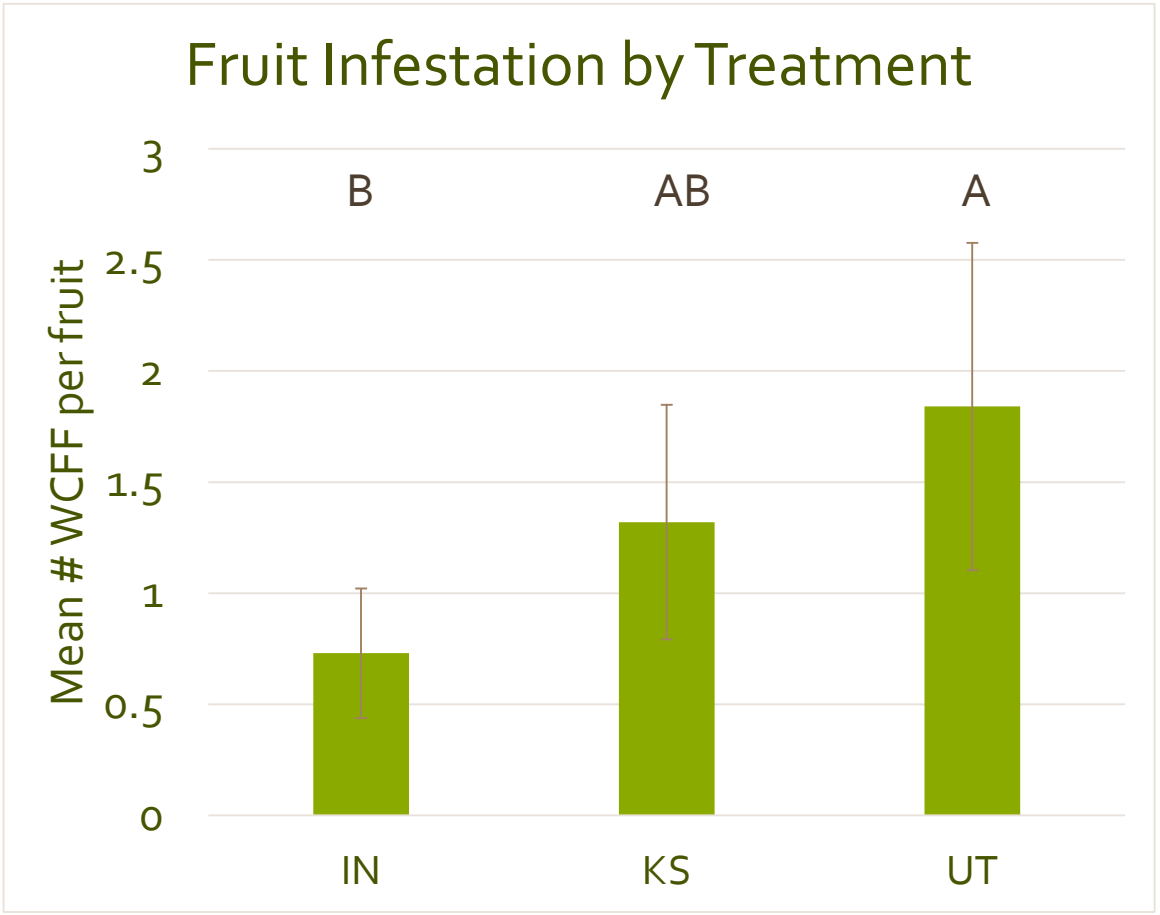
1. Home cherry trees
   - Reduce fruit infestation and external CFF sources for commercial orchards
2. Commercial orchards
   - Supplement control with border treatments
   - Reduce fruit infestation from migrating (external) gravid females
   - Grower insecticide program (very low pressure)
3. Research orchard
   - Supplement border control
   - No insecticides (moderate to high pressure)

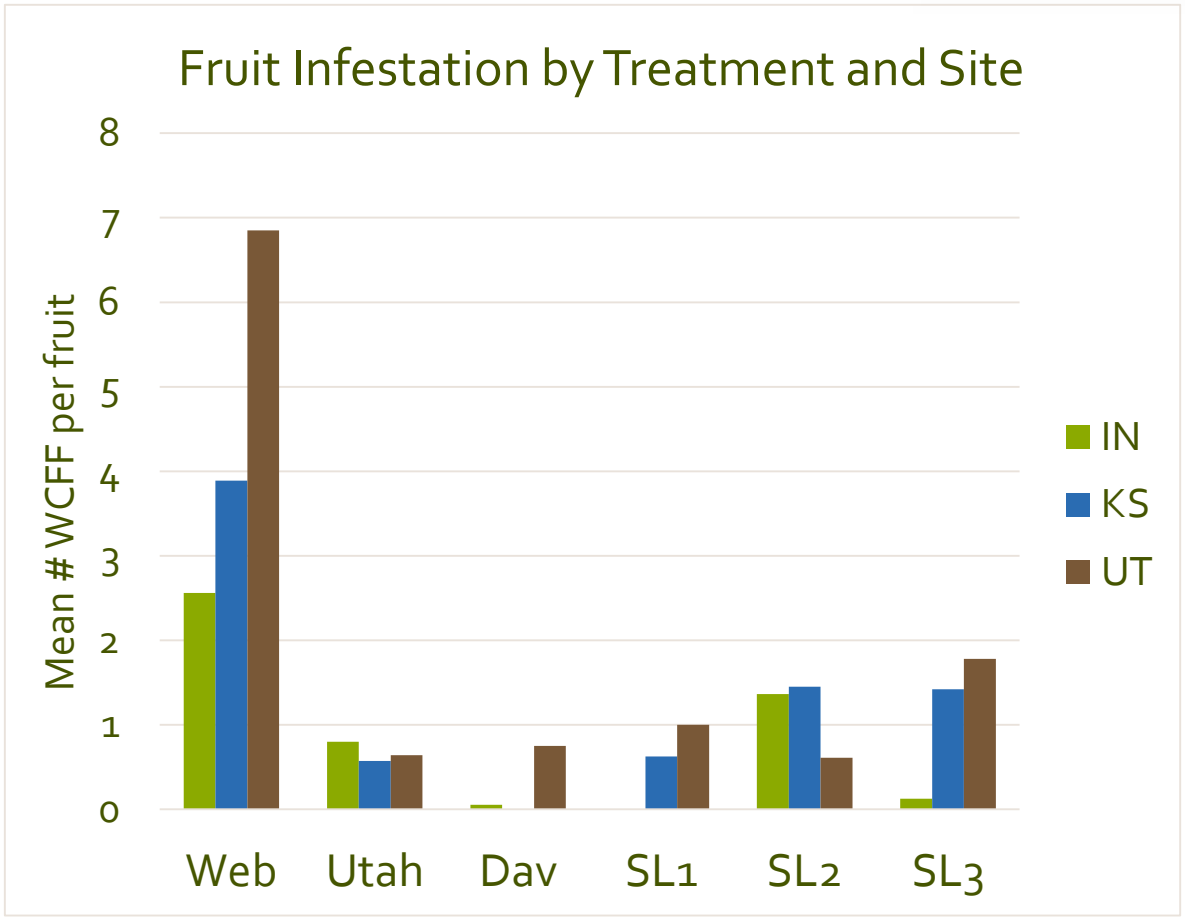
A killing station is a 14 inch diameter bright yellow disc hung in the tree from a branch with 20% GF-120 (spinosad) applied weekly to the underside

Hypothesis: CFF adults will be attracted to yellow color and arrested to feed on GF-120 droplets, resulting in rapid fly mortality

Home Cherry Tree Killing Stations – 2013

Extremely high CFF pressure in many sites



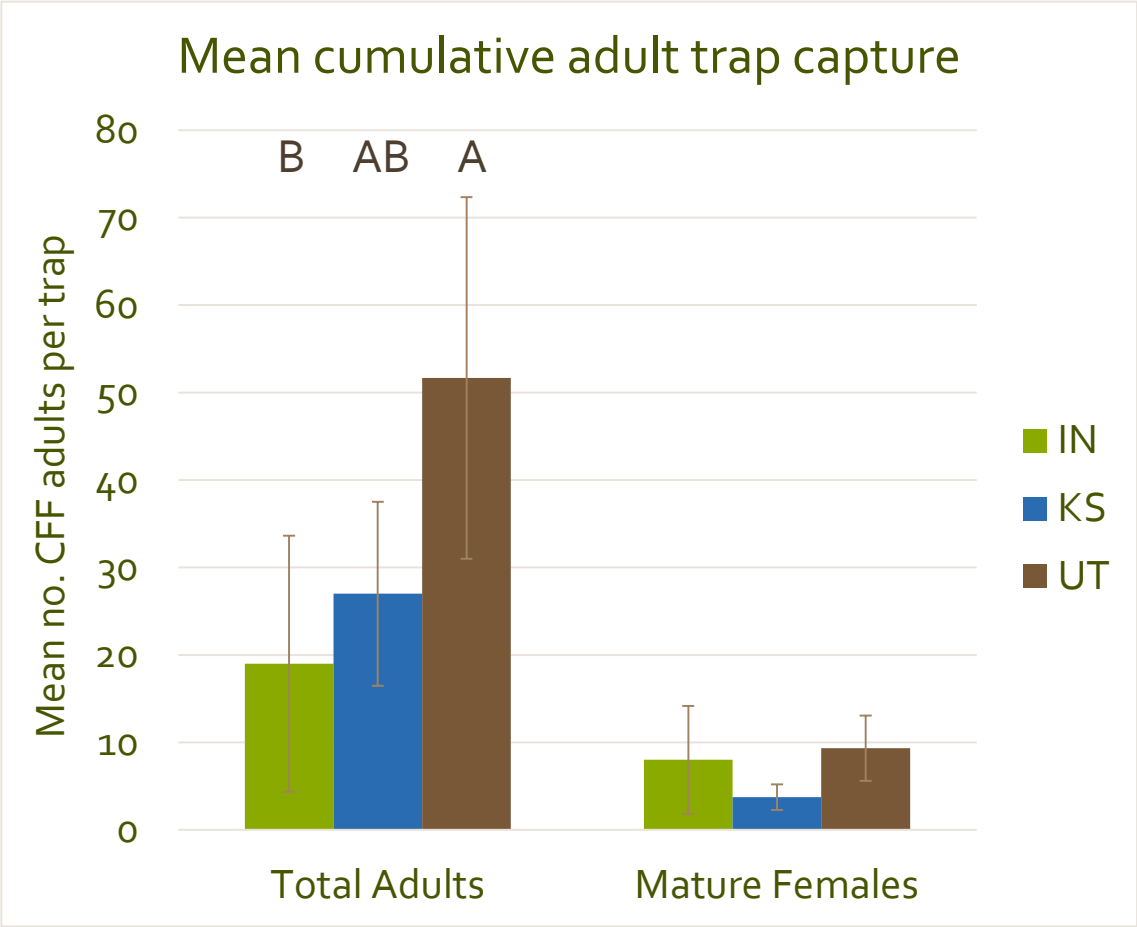


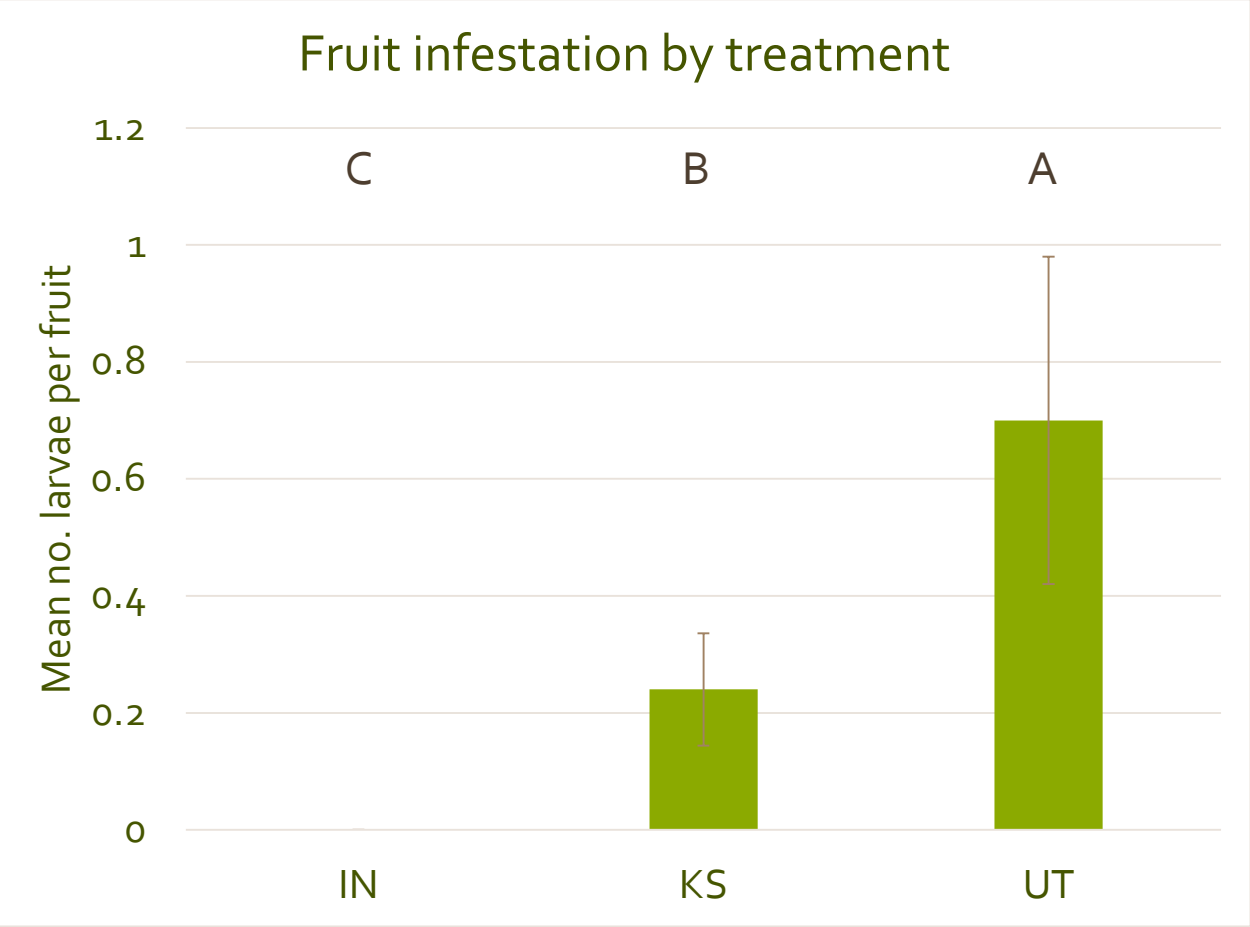
IN = acetamiprid (2 or 3 applications), KS = killing station with weekly GF-120, UT = untreated

No difference in trap capture among treatments

Home Cherry Tree Killing Stations – 2014

Selected sites with moderate CFF pressure

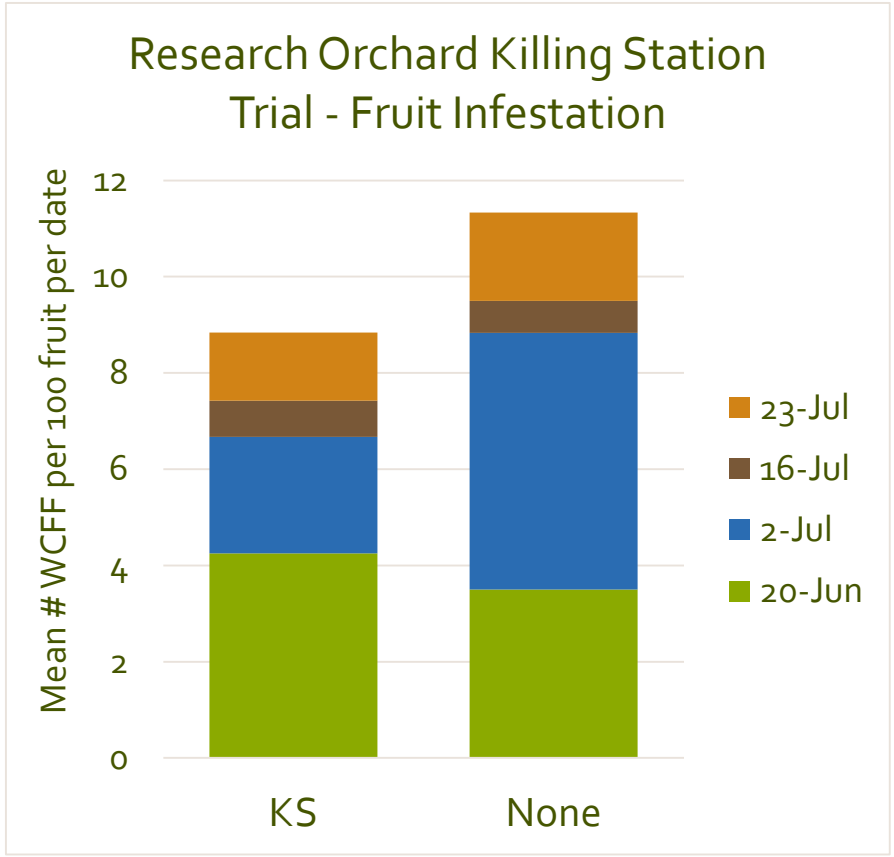




Commercial & Research Orchard Killing Stations

KS hung on border trees: 2013

- Similar trap capture on orchard borders with or without killing stations
- Research orchard (6 replicate plots)
  - No insecticides applied
  - Significant reduction in fruit infestation on peak date (July 2)
  - Similar fruit infestation on other dates
- Commercial orchards (4 orchards × 4 replicate plots each)
  - 2 CFF larvae found in 1,000 fruit
  - One in KS plot and one in no-KS plot



Summary of Killing Station Study Findings

- Home cherry trees
  - KS significantly reduced fruit injury when trap capture was ≤ 25 flies per week, but not as much as IN (acetamiprid)
  - Hanging KS in home trees and applying 20% GF-120 weekly is easy & convenient
  - Large home trees can be difficult to achieve good spray coverage
  - GF-120 is organic, yellow color of KS enhances attraction of CFF to ingest droplets
  - KS protects GF-120 from sunlight and rain
- Research orchard
  - Under moderate CFF pressure (5-40 flies per week), KS did reduce fruit infestation on peak date, but not overall
  - KS did not lower trap capture
- Commercial orchards
  - We hypothesized that KS on border rows would reduce CFF capture on nearby traps – not proven
  - Under very low CFF pressure, KS did not lower fruit infestation on border trees



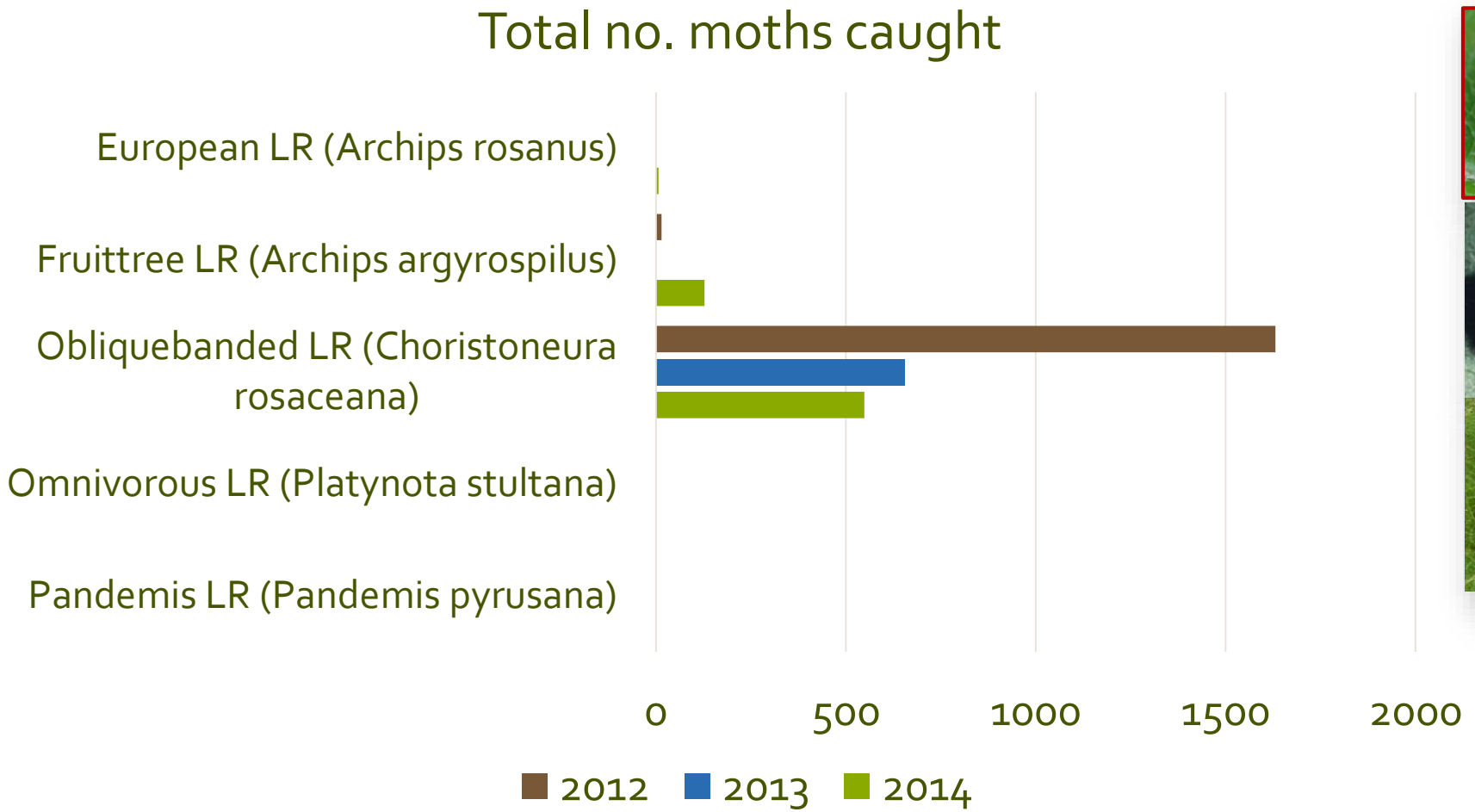


Leafroller Survey

Tortricid moths, larvae roll and chew leaves and chew into fruit

UtahState University

Orchard Leafroller Survey - 2014



Invasive

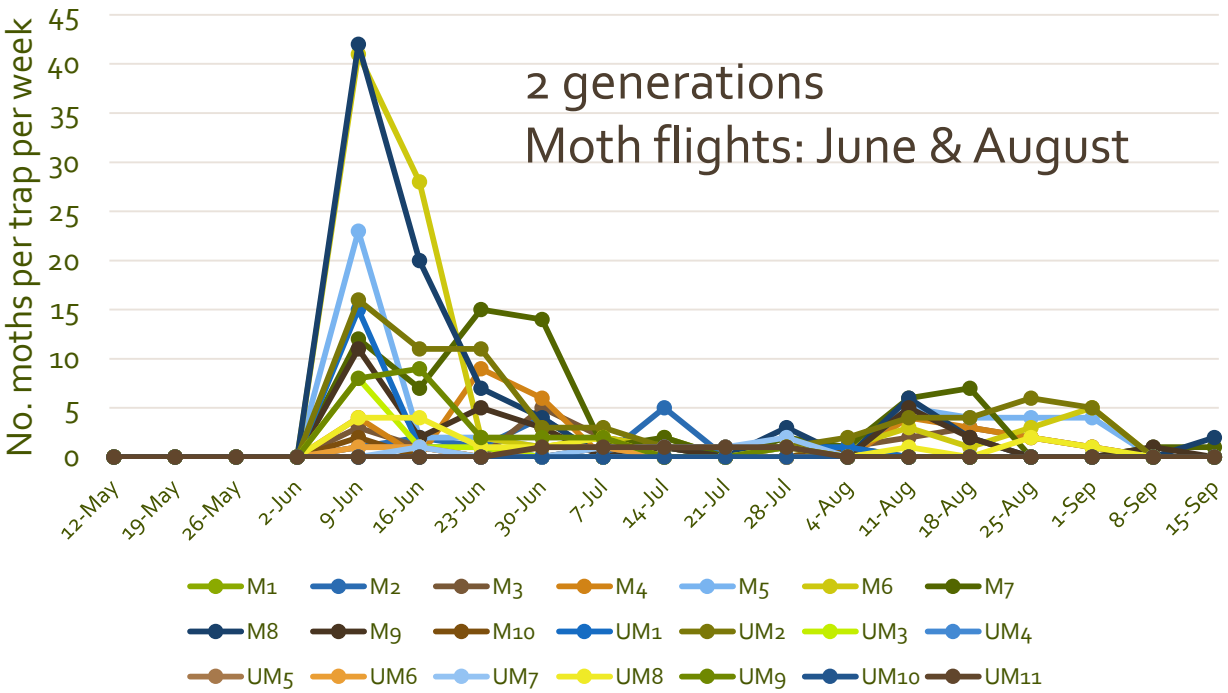
2012 & 2013: 6-8 orchards

2014: 10 managed and 11 unmanaged/low managed apple & cherry orchards: Cache, Box Elder, Davis, Weber, & Utah Counties

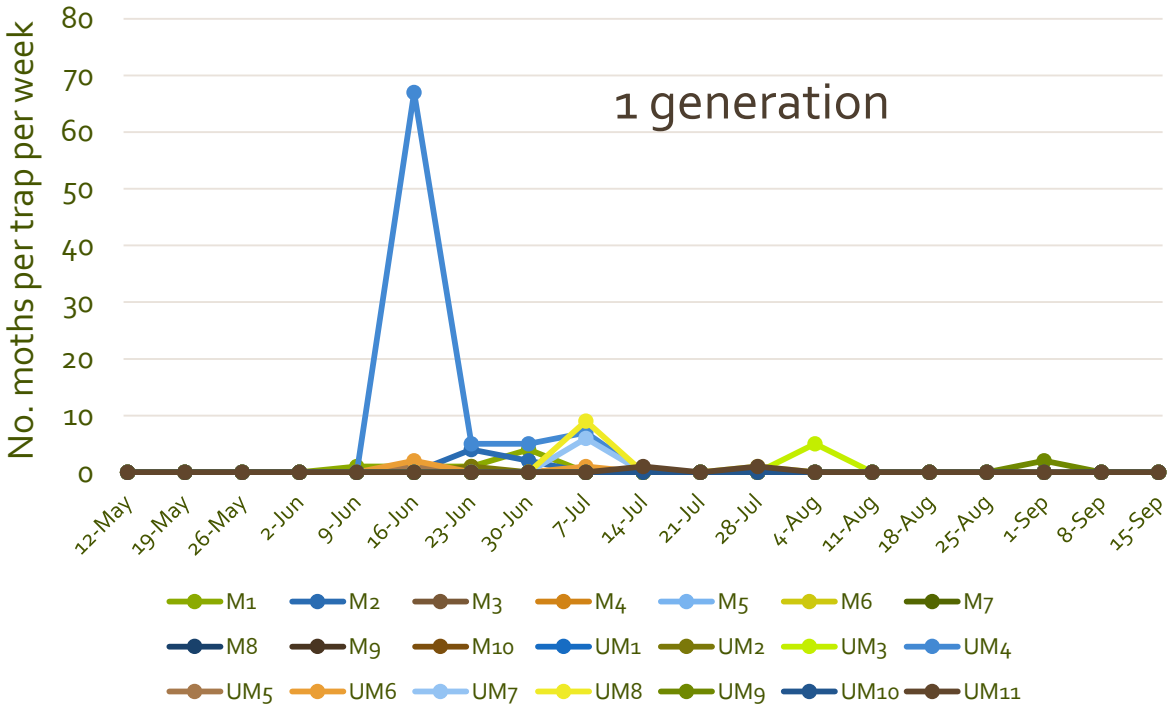
Leafroller Survey - 2014

Moth trap capture

Obliquebanded Leafroller (OBLR)

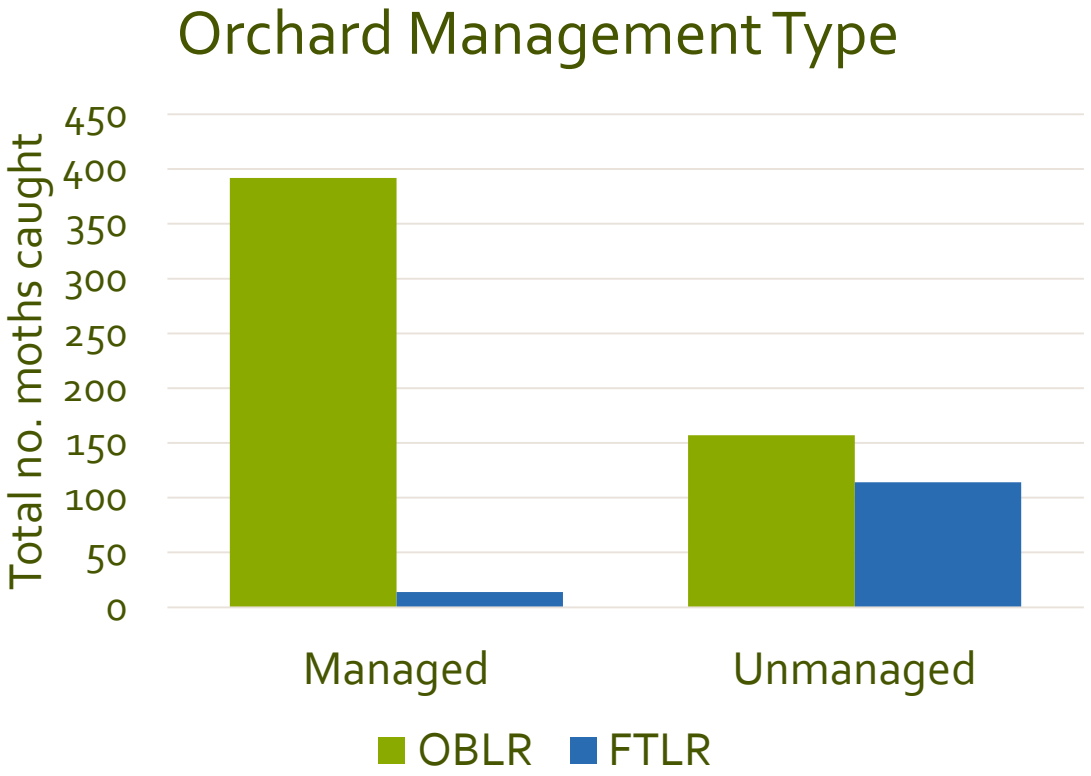


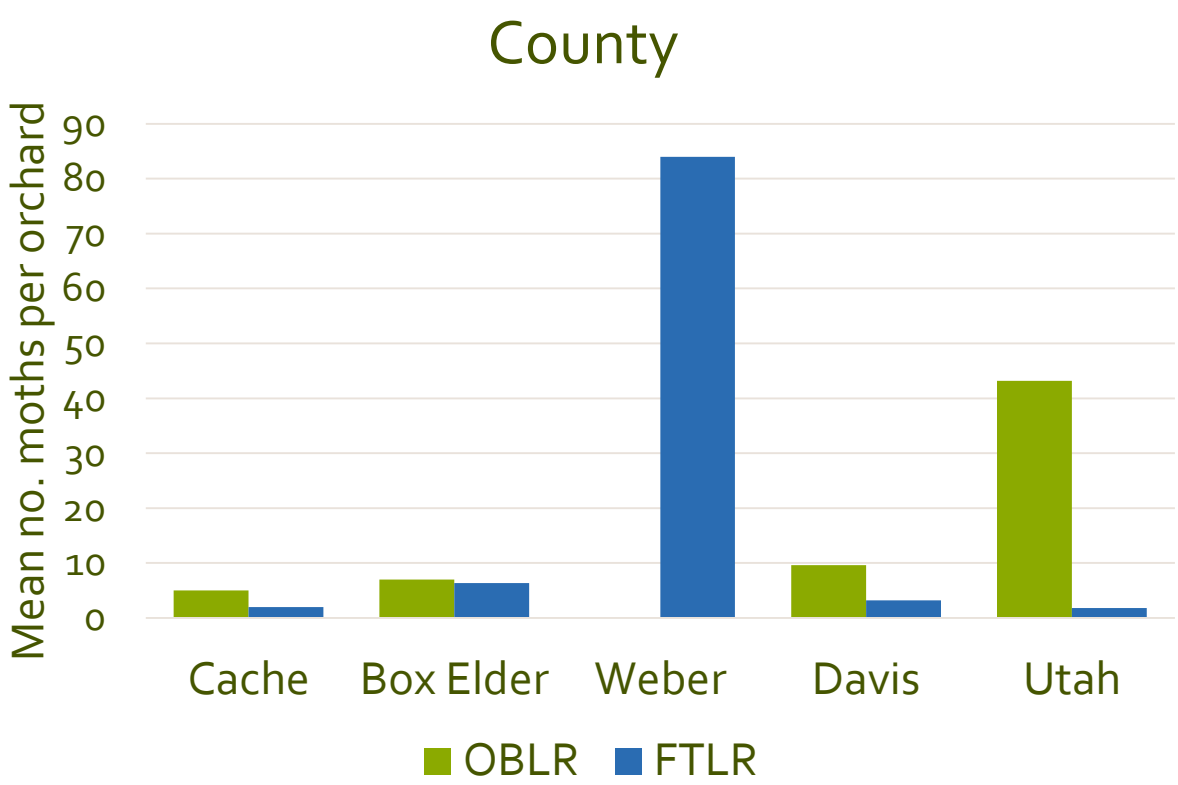
Fruittree Leafroller (FTLR)



Leafroller Survey - 2014

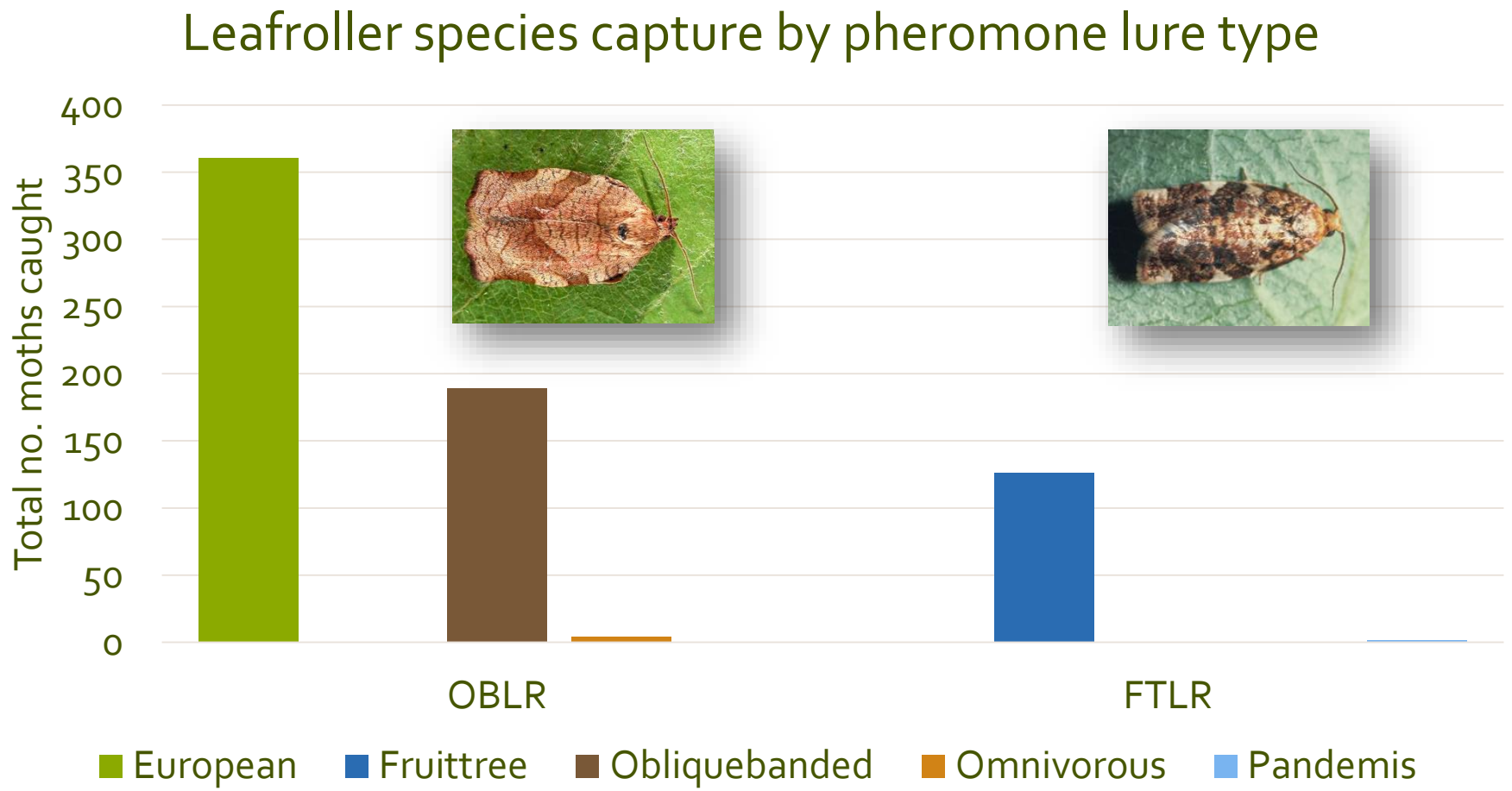
Moth capture by orchard management type and county





Leafroller Survey – 2014

Attractiveness of pheromone lures



Leafroller Survey – 2014

Survey for larvae (caterpillars)

- Weekly beating tray and timed visual observations
  - No leafroller larvae were found in any of the 21 orchards
- Unmanaged orchards
  - Linden Looper (Family Geometridiae)
  - Pyramidal Fruitworm (Family Noctuidae)
  - California Pear Sawfly (Hymenoptera: bees & wasps)
- 2015
  - Expand moth and larval surveys to 18-20 managed orchards
  - Validate WA OBLR degree day model

Linden Looper

Pyramidal Fruitworm

California Pear Sawfly

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