

EXTENSION

UtahState
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Alternatives for Cherry Fruit Fly Management

Utah State Horticultural Association

January 25, 2005

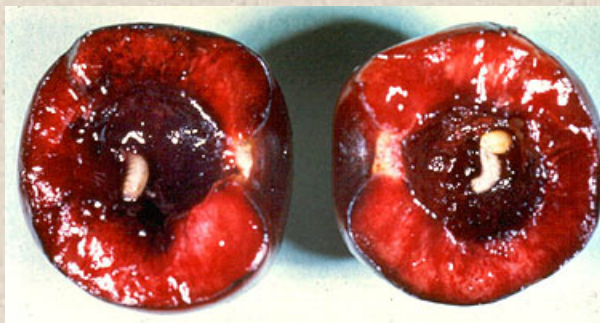
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Utah State University



G. Nelson

Rhagoletis indifferens



WCFF Management in Western U.S. Cherry Orchards

- Primary insect pest of western cherry orchards
- Zero tolerance for larvae in fruit
- EPA's FQPA – loss of OPs
- Guthion – future uncertain
 - Limited to 3 lb/acre (2 appls./season)
 - 15 d REI / 15 d PHI
- Neonicotinoids and spinosad most promising alternatives



Neonicotinoids Registered for Cherry

- Chloronicotinyl
 - nicotine
- Contact, Ingestion
- Neurotoxin, Antifeedant
 - Chewing & sucking insects
 - Toxic to pollinators
 - Fairly broad-spectrum
- Systemic
- Poor to Moderate Adulticide
- Drive insect larvae out of the fruit
- Provado (4-8 oz/acre; 7 d PHI, 12 h REI)
- Actara (4.5-5.5 oz/acre; 14 d PHI, 12 h REI)



Spinosad

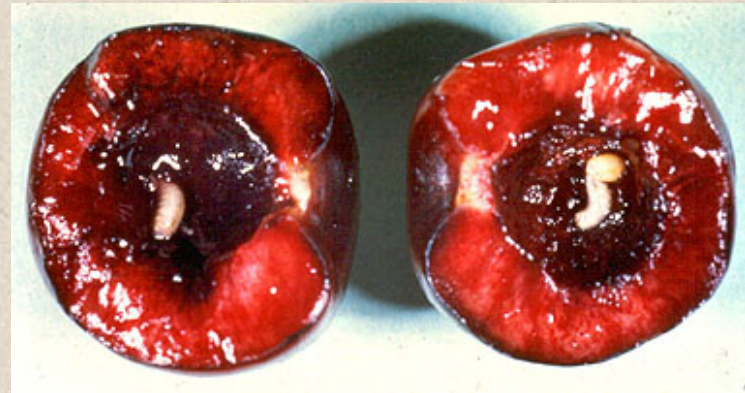
- Soil bacterium
 - *Saccharopolyspora spinosa*
- Ingestion
- Neurotoxin
 - Chewing
 - More selective
- Translaminar (local systemic)
- Good adulticide
- Naturalyte
 - Success (4-6 oz/acre; 7 d PHI, 4 h REI)
 - Entrust – organic version
 - GF-120 NF Fruit Fly Bait (20 oz/acre; 0 d PHI, 4 h REI)



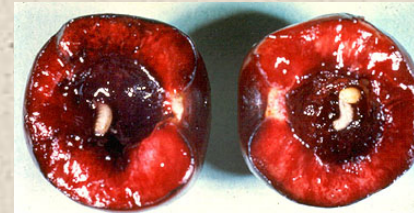
Utah Cherry Fruit Fly Control Trials: 1999-2004

- **Neonicotinoid:**
 - Provado 1.6F @ 8 fl oz / acre
 - Calypso 4F @ 4 fl oz / acre (not registered)
- **Spinosad:**
 - Success @ 6 fl oz / acre
 - GF-120 NF Bait @ 20 fl oz / acre
- **Organophosphate/Carbamate:**
 - Guthion 50WP @ 1.5 lb / acre
 - Sevin XLR Plus @ 2 qt / acre

I. Prevention of Fruit Injury



Summary of 6 Years of WCFF Control Trials



Insecticide Treatment (initiated within 7 d of biofix & before rosy fruit present)	No. larvae & exit holes per 100 fruit at harvest*						
	1999	2000	2001	2002	2003	2004	2004
	Research Farm Trials						On-Farm
Calypso (14 d)		0 B	0.1 B		2.7 B		
Provado (14 d)		0 B	0 C	0.001 B	0 B		0
Success (7 or 14 d)	1.1 B (14 d)	0 B (7 d)					
GF-120 NF Bait (7 d)						0.3 B	
Guthion (14 d)	0.3 C	0 B	0 C	0 B	0 B	0.7 B	0
Check	10.3 A	0.3 A	2.8 A	94.1 A	20.6 A	43.7 A	

*1,600-4,000 fruits sampled per treatment

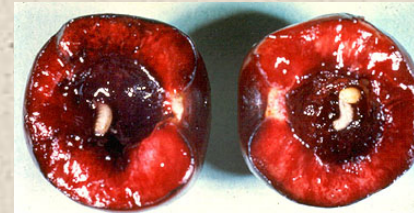
Small plots
0.08-0.23 A

Orchards
1-2 A

Large plots
0.5-0.7 A

Orchards
2-5 A

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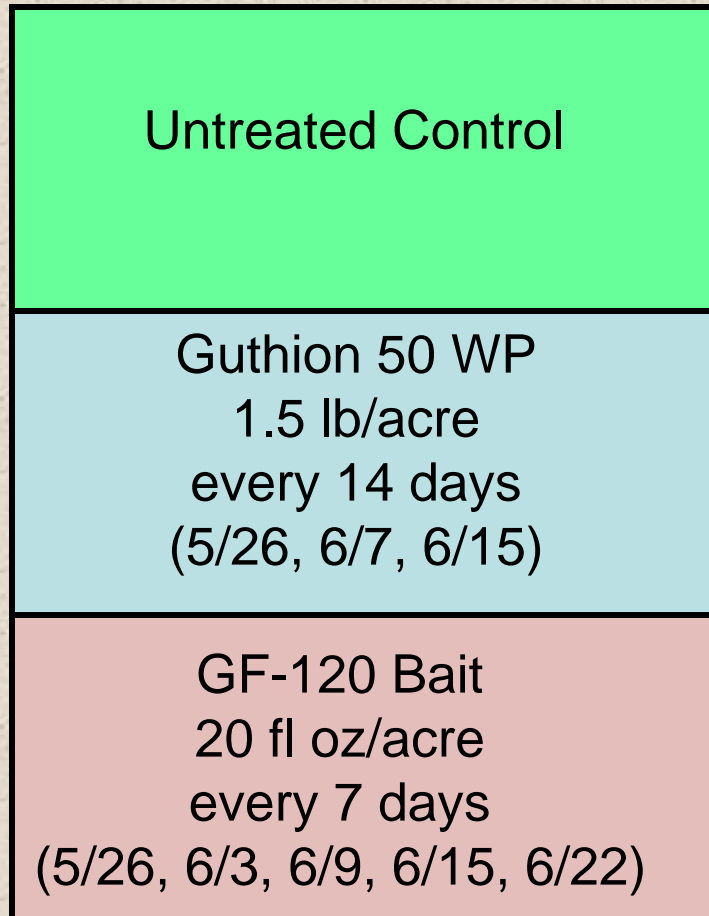
Dow GF-120 NF Naturalyte Bait

USU Kaysville Research Farm

- Facts about the bait:
 - Feeding attractant + 0.02% spinosad
 - Large droplets (5 mm)
 - 0-day PHI, 4-hour REI
 - 4-wheeler, 15 gal spray tank with 45-60 psi electric pump (ca. \$250 sprayer assembly)
 - D-3 nozzles, 10 mph
 - 20 fl oz bait product/acre (1:4 dilution; bait:water) (\$12.80/A/appl.)
 - Applied to both sides of every row
 - Reapply every 7 days
 - Quick application (2-5 min. / acre)



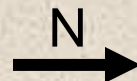
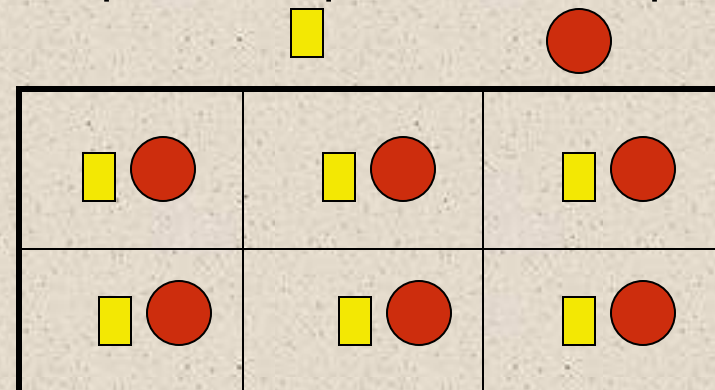
GF-120 Trial Plots



Orchard: 2.1 acres
Plot size: 0.7 acre
(9 rows x 14 trees)

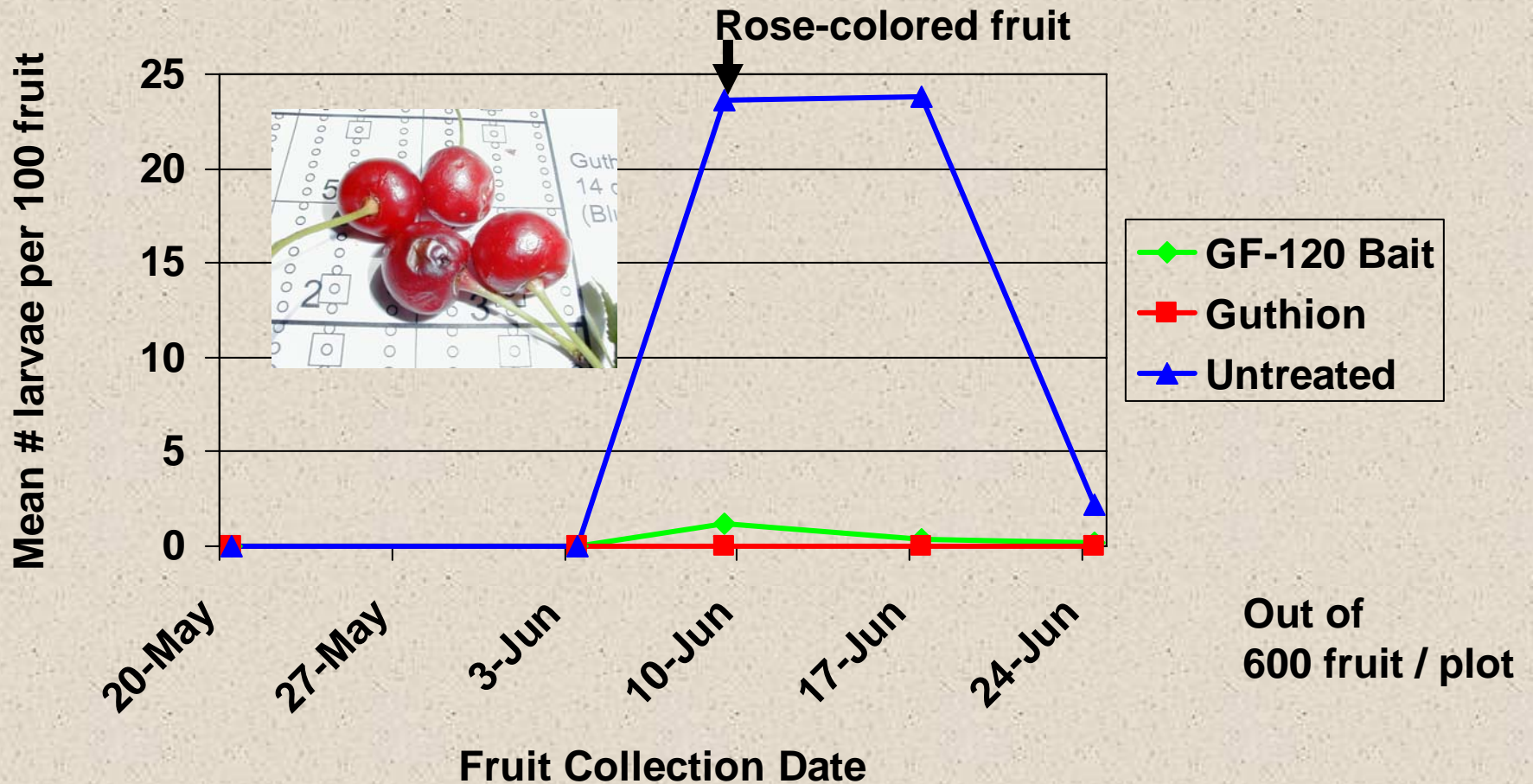
Biofix (First Fly Catch): May 17
High population pressure

Subplots: Trap & Fruit Sample



In-Season Fruit Injury

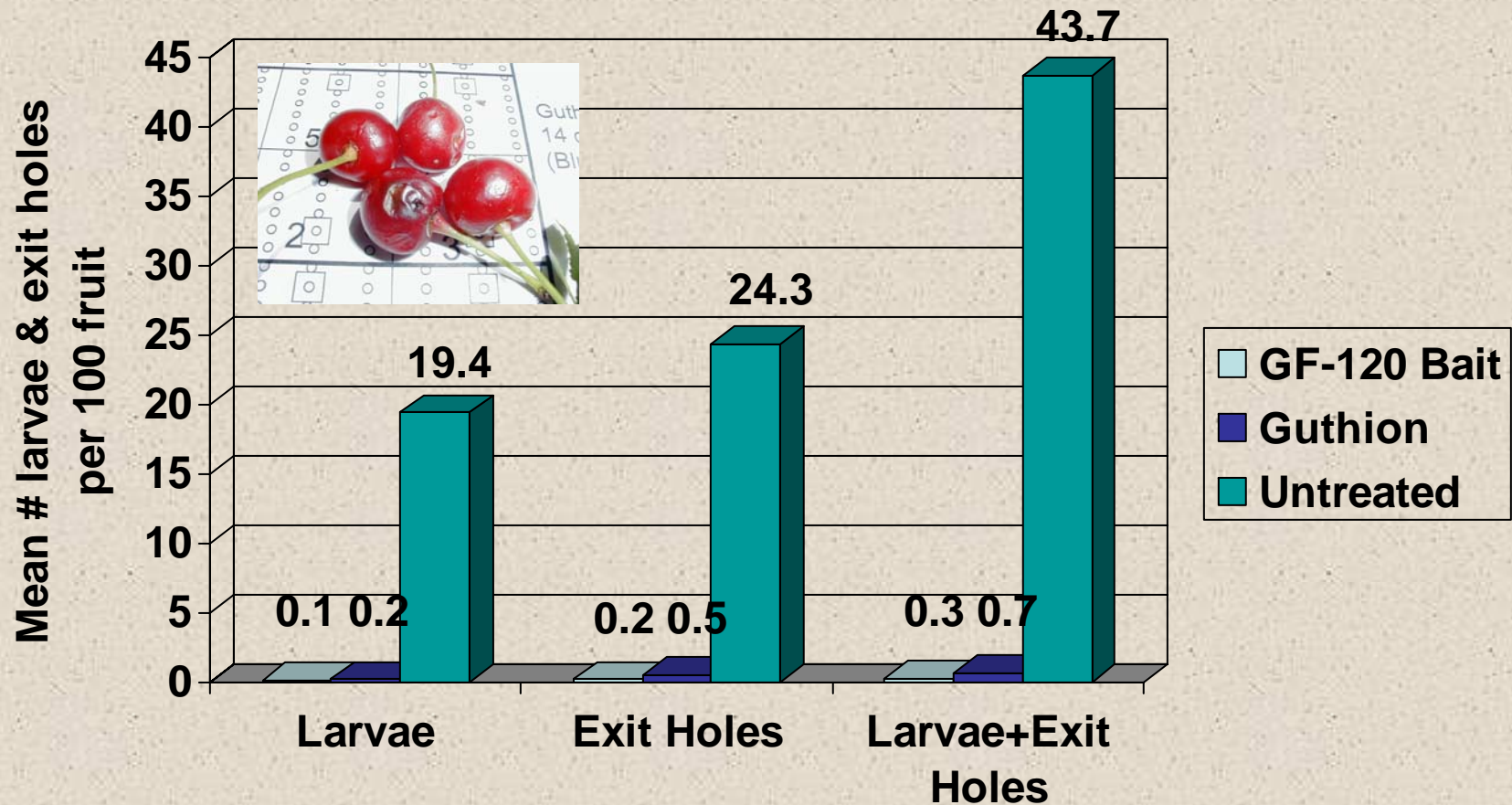
May 20 – Jun 24, 2004



High injury in Untreated (up to 24 larvae per 100 fruit)
Low injury in GF-120 Bait (0.2-1.2 larvae per 100 fruit)
No injury in Guthion

Harvest Fruit Injury

June 30, 2004



High injury in Untreated

Low injury in GF-120 Bait and Guthion

Influence of adult source on harvest fruit injury - 2004

<p style="text-align: center;">48.9% fruit injured</p> <p style="text-align: center;">Untreated Check: 43.7%</p> <p style="text-align: center;">38.5%</p>
<p style="text-align: center;">1.3%</p> <p style="text-align: center;">Guthion 50 WP: 0.7%</p> <p style="text-align: center;">0.1%</p>
<p style="text-align: center;">0.1%</p> <p style="text-align: center;">GF-120 Bait: 0.3%</p> <p style="text-align: center;">0.5%</p>

Cumulative
mean # adults
per trap for
Season

2,425

WCFF pressure
came from
Untreated Check and
exterior sources

497

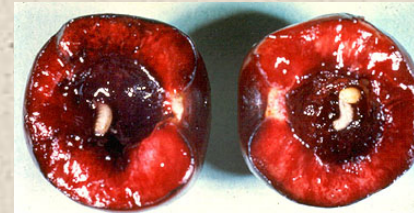
Guthion plot buffered
pressure
from Untreated
Check for

374

GF-120 Bait plot

Plot size = 0.7 acres

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1-2 A

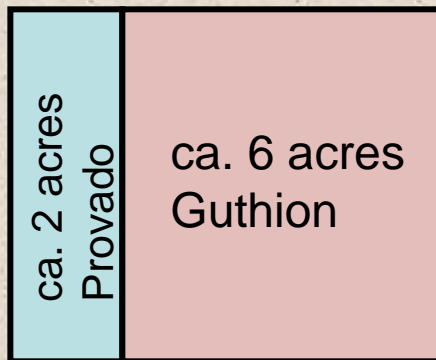
Large plots
0.5-0.7 A

Orchards
2-5 A

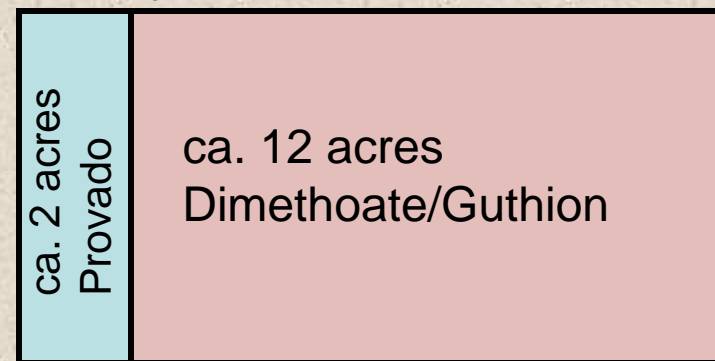
On-Farm Trial Plots

 = Provado plot

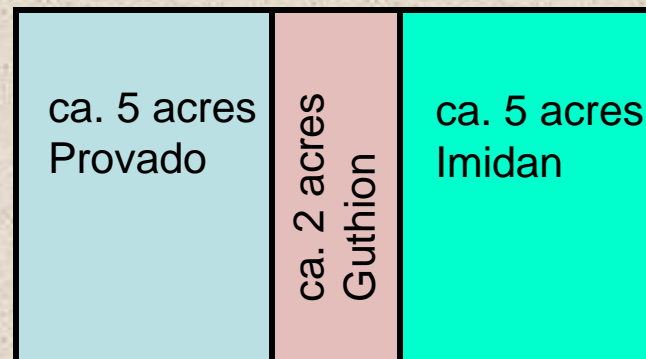
Genola



Payson



Santaquin



Fruit Injury



- No fruit injury!
- In-season: Larval emergence from fruit
 - 5 samples of 100 fruit per date (500 fruit)
 - 7 fruit collection dates:
May 25; Jun 2, 8, 16, 22, & 28; Jul 13
- Harvest: Growers reported no floating larvae, injury, or down-grading of fruit
- All treatments were effective for eliminating larval injury

Conclusions – Fruit Injury

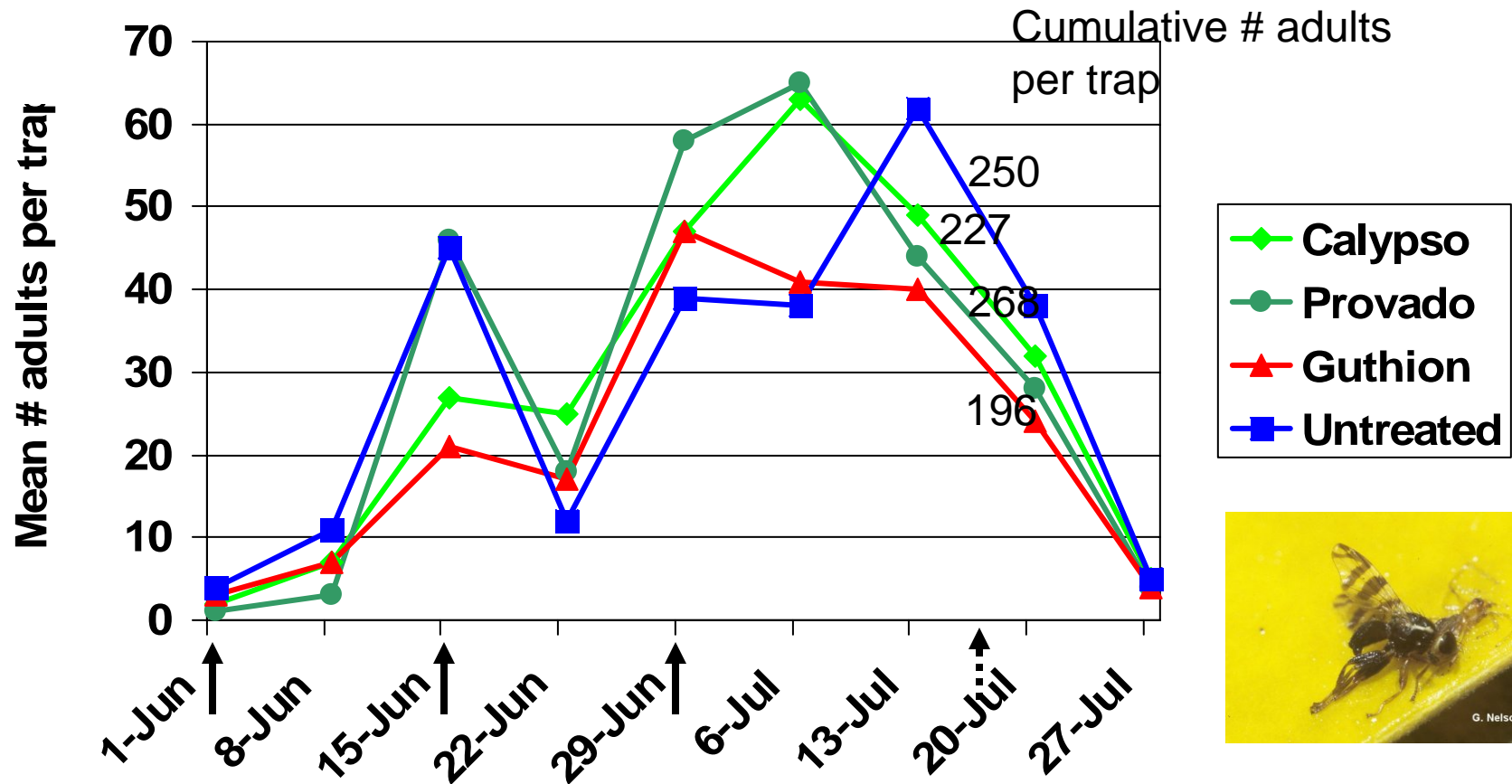
- Spinosad performed better when applied weekly than every 2 weeks
- Provado (14 d) & Spinosad (7 d) were comparable to Guthion (14 d)



II. Suppression of Adult Populations

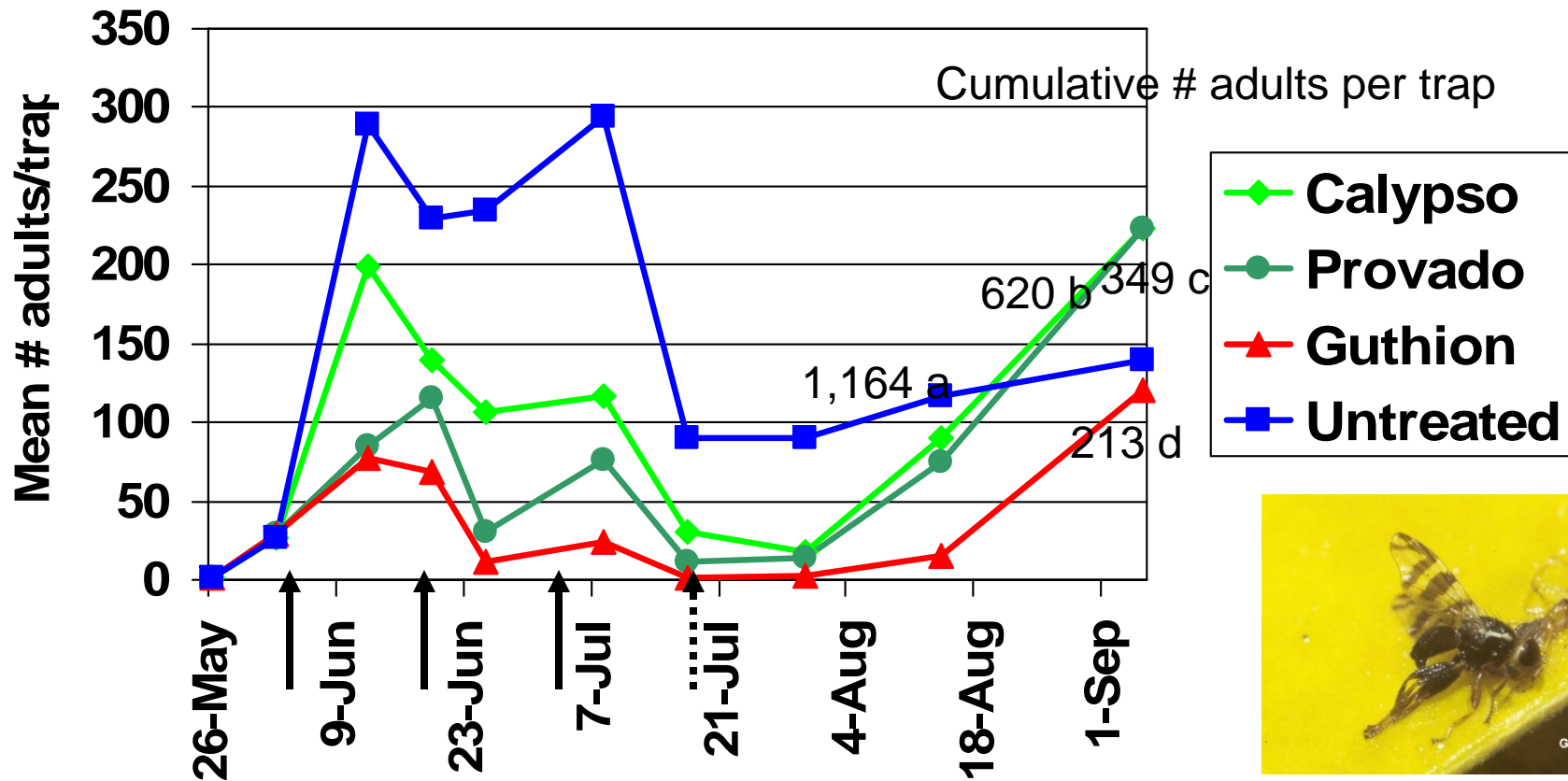


Influence of Neonicotinoids on Adult Populations in Small Plots - 2001



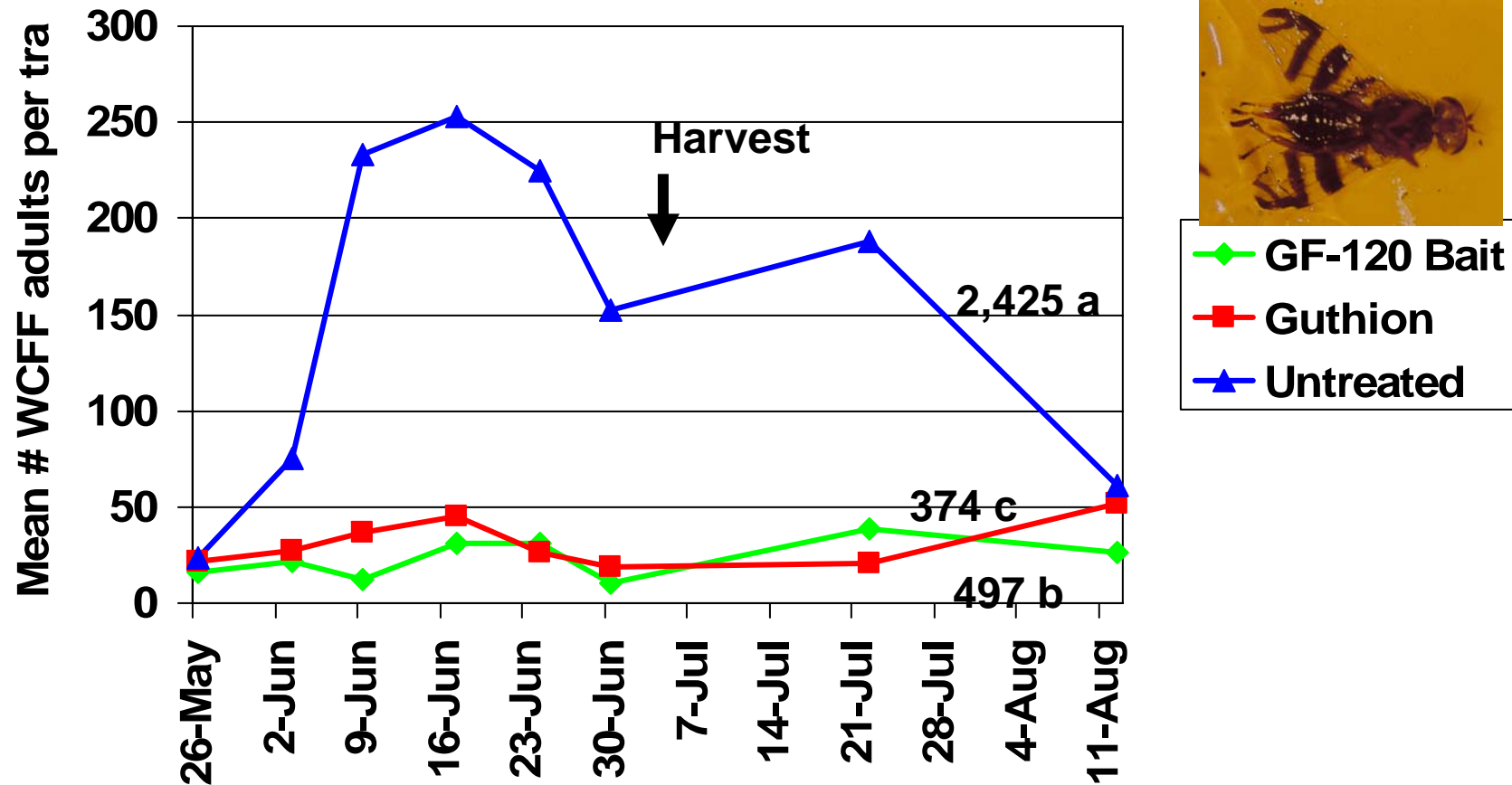
Solid arrows indicate cover spray application dates; broken arrow indicates cherry harvest date

Influence of Neonicotinoids on Adult Populations in Large Plots - 2003



Solid arrows indicate insecticide spray timings; broken arrow indicates cherry harvest date

Influence of Spinosad on Adult Populations in Large Plots - 2004



GF-120 Bait and Guthion dramatically suppressed WCFF pops.
Guthion: 76% flies caught next to Untreated
GF-120 Bait & Guthion suppressed populations post-harvest

Conclusions – Adult Suppression



- **Neonicotinoids: poor to moderate adulticide activity with high WCFF populations**
 - Ovicidal and/or larvicidal activity, and/or inhibition of oviposition must be more important than adulticidal activity
- **Spinosad (GF-120 NF Bait): good adulticide (only 1 year data)**
- **GF-120 NF Bait & Guthion suppressed adult populations for up to 1 month post-harvest (only 1 year data)**

III. Stimulation of Spider Mite Populations



Multiple applications of Neonicotinoids can stimulate spider mites – Large plots, 2003

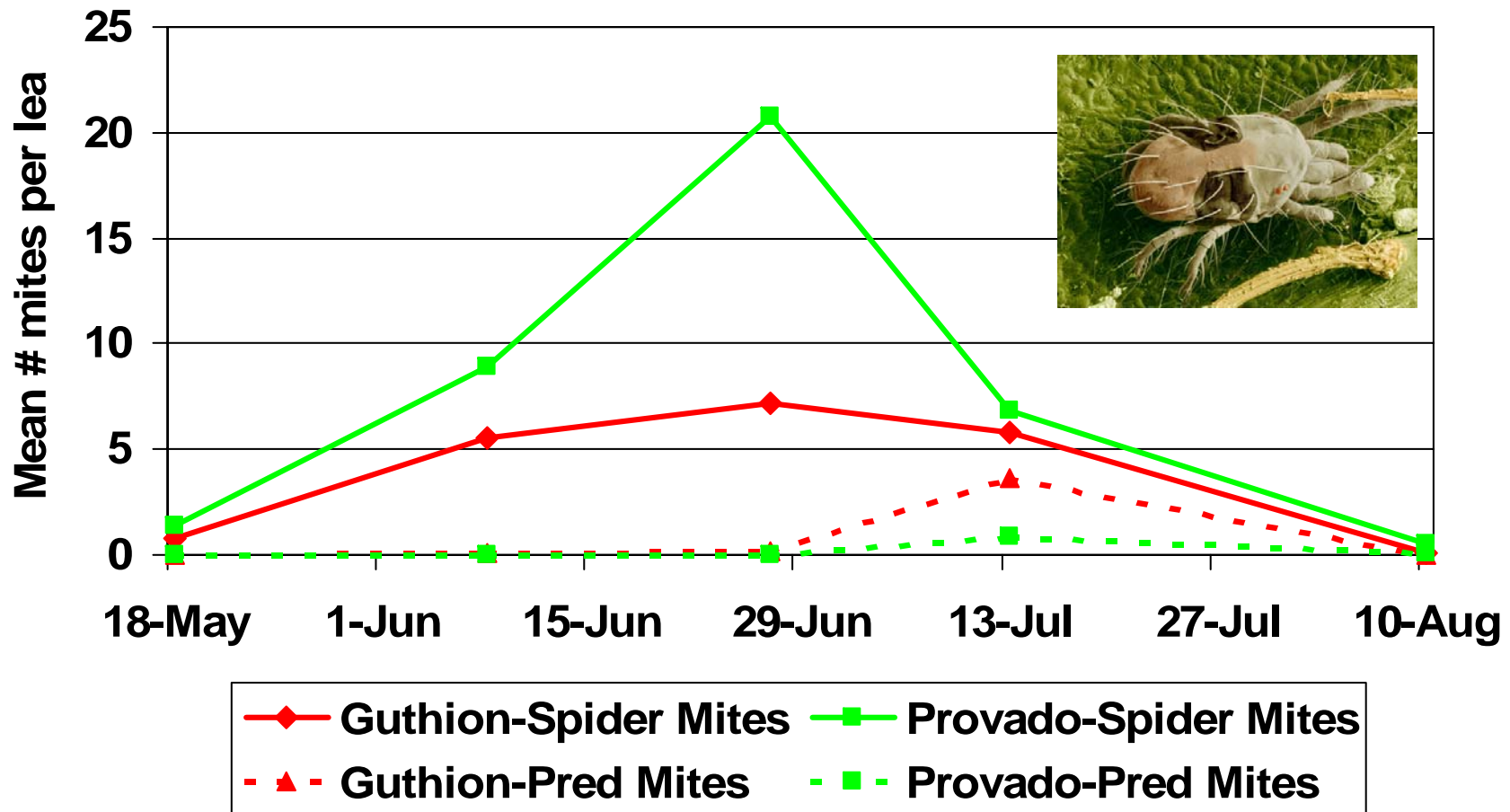


Mean # mites per leaf

Treatment	Spider mite motile stages	Spider mite eggs	Predaceous motile stages	Predaceous eggs
Calypso	16.5 a	78.3 b	3.3 bc	2.0
Provado	5.0 b	350.5 a	8.0 a	3.0
Guthion	0 b	5.8 c	5.8 ab	2.8
Check	1.5 b	16.0 c	2.0 bc	1.5
$P>F$	0.01	<0.01	0.02	0.52

Provado increased spider mite population densities – On-Farm Trial, 2004

Genola – Economic mite populations



Provado increased spider mite densities vs. Guthion
Pred mites increased in mid July – too late

Conclusions – Mite Stimulation

- Multiple applications (2-3) of neonicotinoids (Provado & Calypso) can stimulate phytophagous mite reproduction
- Not caused by toxicity to predaceous mites
- Hormoligosis
- Rotate neonicotinoids with other insecticides to avoid mite flare-ups



Insecticide Economics

- Provado (7 d PHI)
 - Rate: 6 oz/A Price: \$521/gal Cost: \$24/A/appl.
- GF-120 (0 PHI)
 - Rate: 20 oz/A Cost: \$13/A/appl.
- Guthion 50 W solupak (15 d PHI)
 - Rate: 1.5 lb/A Price: \$10.80/lb Cost: \$16/A/appl.
- Imidan 70 W (7 d PHI)
 - Rate: 2.5 lb/A Price: \$6.85/lb Cost: \$17/A/appl.
- Dimethoate 4 EC (28 d PHI)
 - Rate: 2 pt/A Price: \$38.40/gal Cost: \$10/A/appl.
- Diazinon 4 Spray (21 d PHI)
 - Rate: 4 pt/A Price: \$28.81/gal Cost: \$14/A/appl.

Acknowledgements

- Grower Cooperators
 - Allred Orchards
 - Cherry Hill Orchards
 - McMullin Orchards
- Thor Lindstrom, USU Orchard Research Assistant
- USU Student Crew
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