Olive Fly- Current Situation

Bill Krueger – UCCE Farm Advisor
Glenn and Tehama Counties

Monitoring -Placement in Trees

- Place on north side of tree in spring / summer
- Place on south side of tree in fall / winter
- Place in upper one third of tree
- Allow clear space around trap
- At least one trap per 5 - 10 acres of olives
- At least 2 traps per olive block; use more if possible
- Traps should be placed in trees no later than March 1

McPhail Trap

Torula Yeast & Borax

Simple Yellow Panel Trap

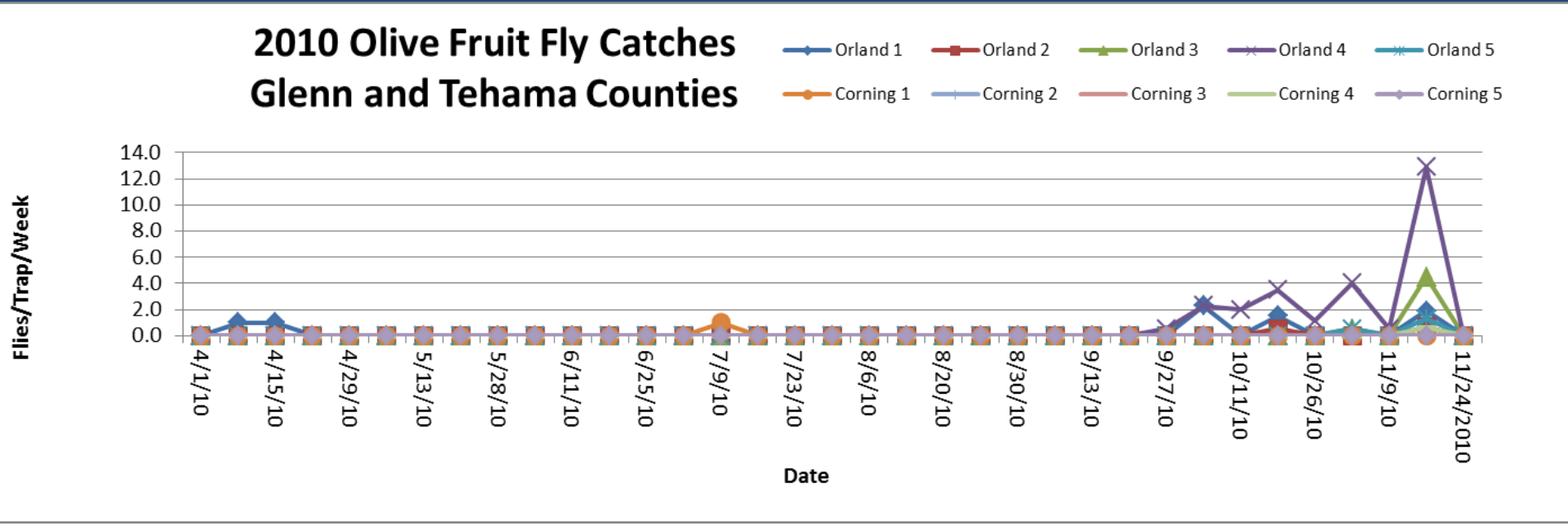
- Easy to assemble
- Commercially available

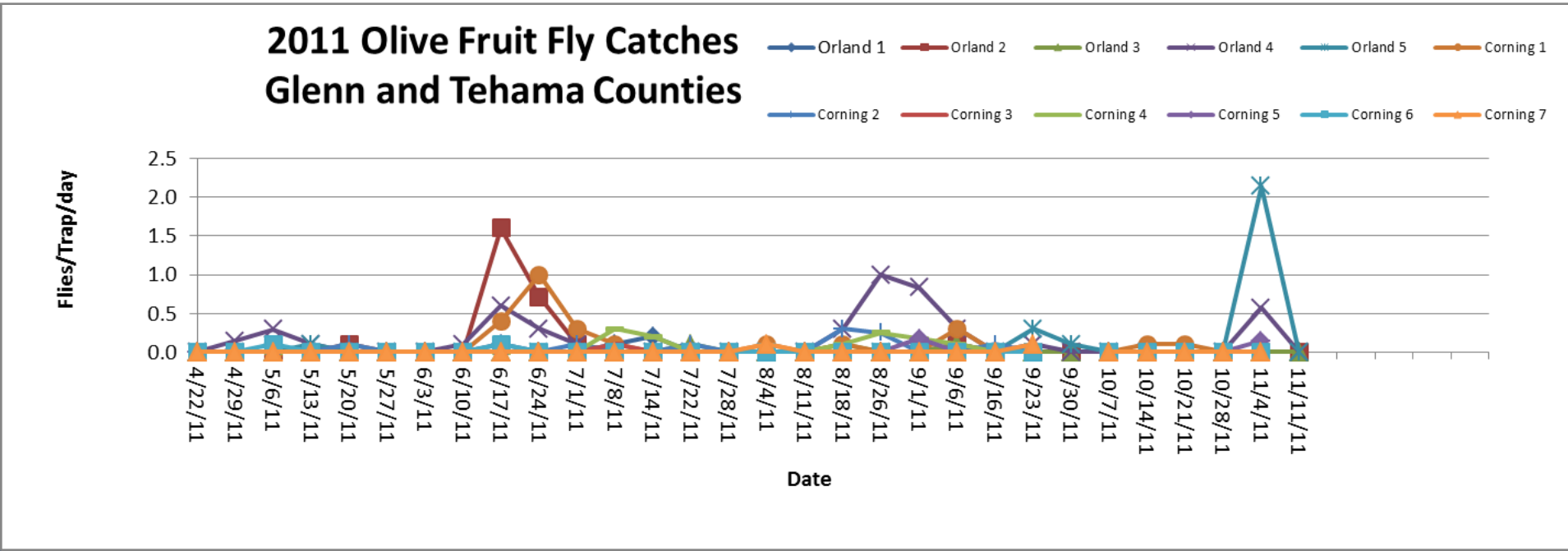
Male

Female

Olive fly on trap

Olive Fly Monitoring Results, Http://ceglenn.ucdavis.edu





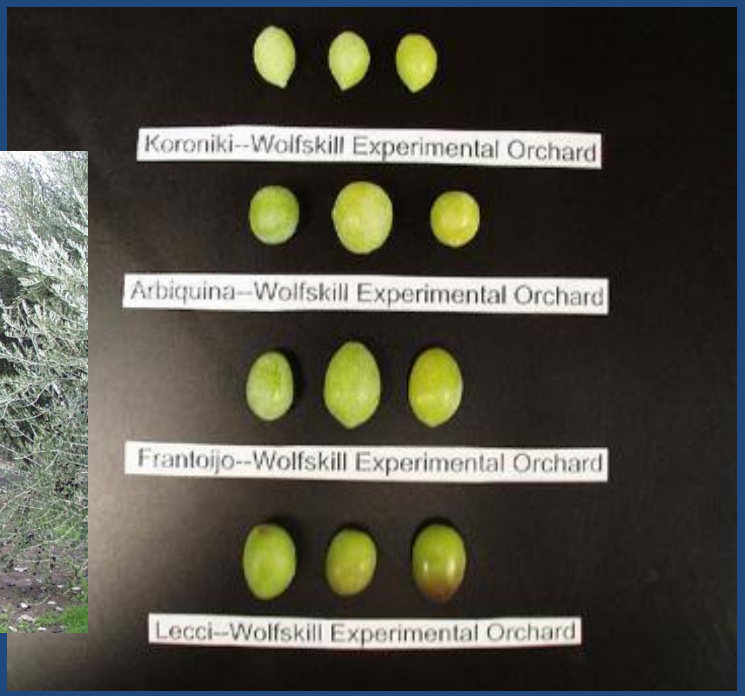
Olive Fruit Fly - Olive Cultivars

Preference and larval performance - Wolfskill

USDA-NCGR - 7 varieties

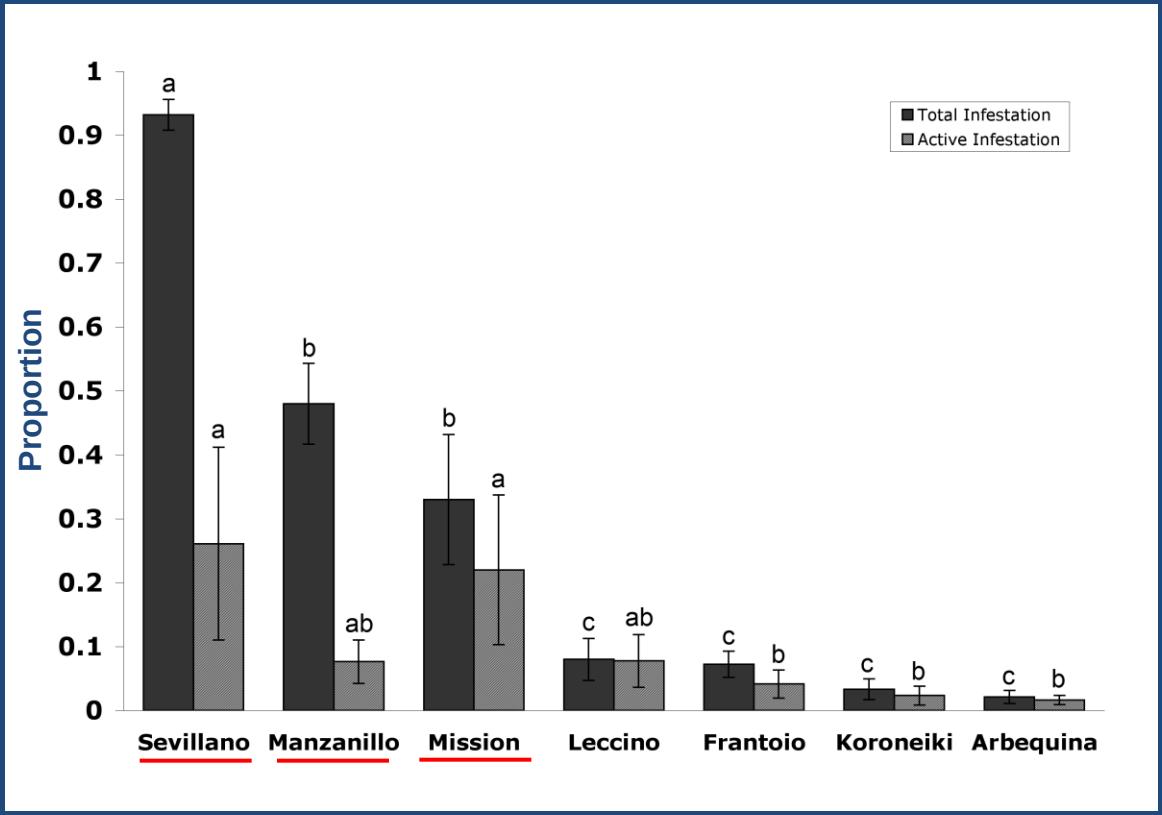
- Koroneiki
- Arbiquina
- Frantoio
- Leccino
- Manzanillo
- Mission
- Sevillano

1 month



Olive Fruit Fly - Olive Cultivars

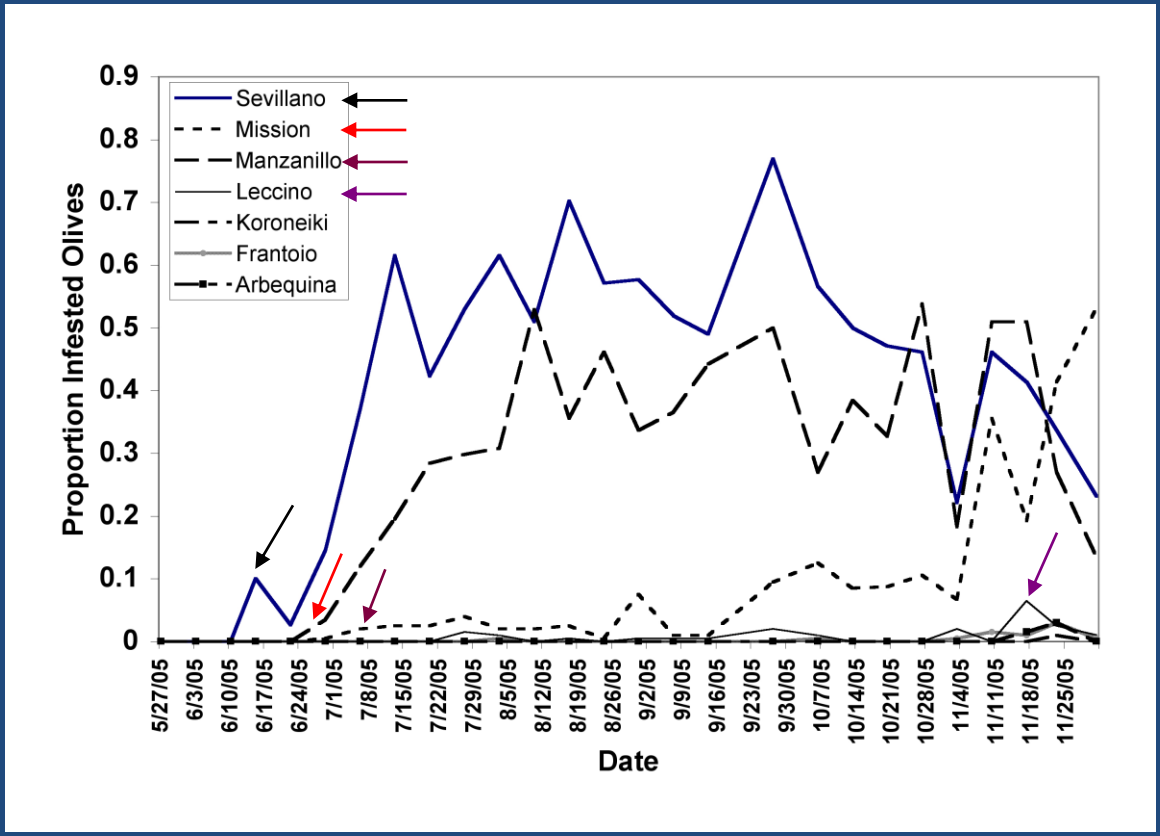
Natural field infestations



Mean±SE proportion of olives with stings and olives with exit holes following one month incubation; collected weekly during the 2003–2004 growing seasons

Olive Fruit Fly - Olive Cultivars

Natural field infestations



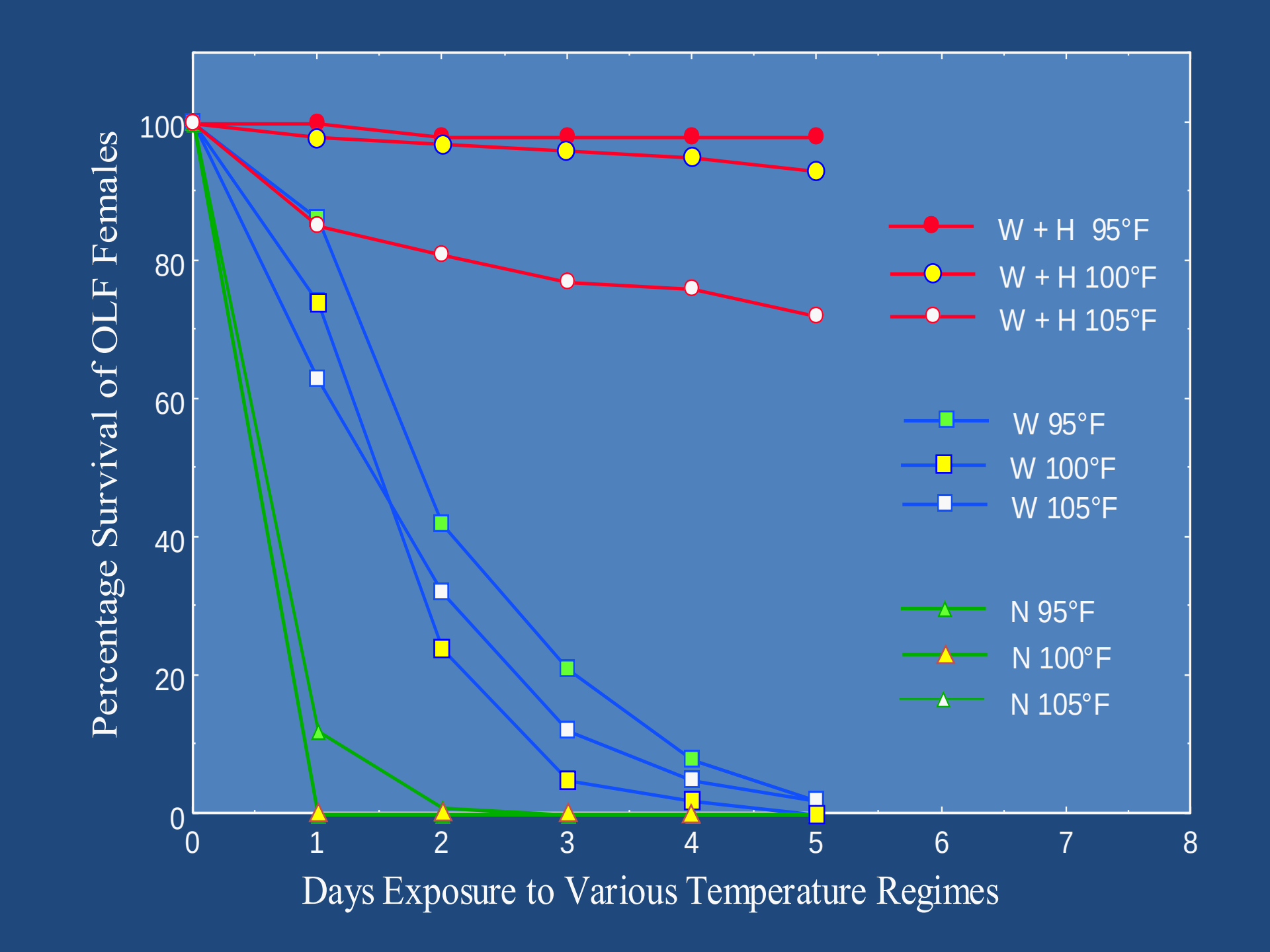
Proportion of olives with stings at USDA-NCGR throughout the 2005 field season.

Conclusion: infestation related to fruit size

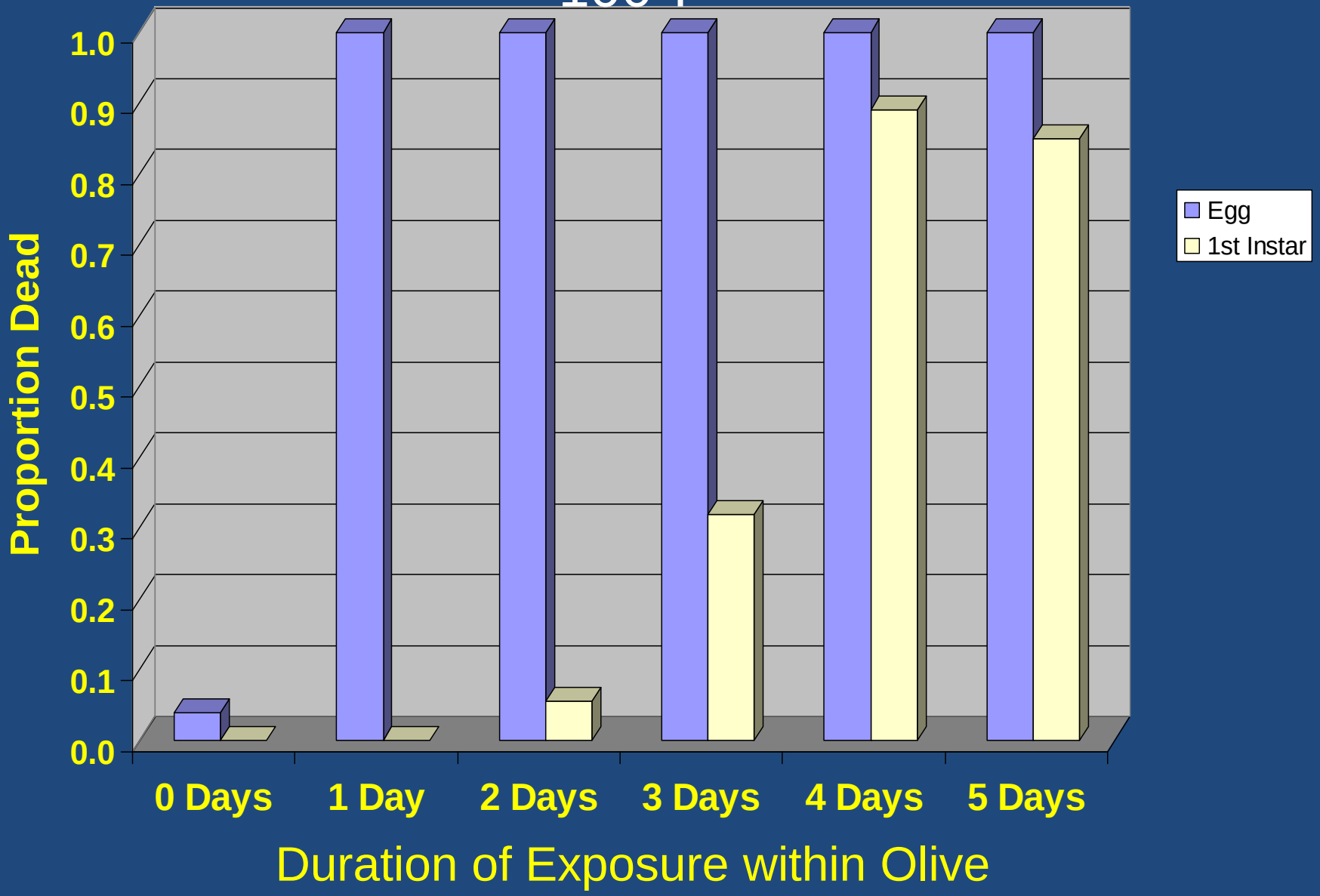
Some factors that potentially influence the impact of summer temperatures on olive fly

- Intensity of daily maximum temperature*
- Duration of daily highs (e.g., > 100°F for 4 days)*
- Relative humidity*
- Olive fly's access to water (availability of irrigation sources, morning dew, ponds, creeks, etc.)
- Olive fly's access to a carbohydrate source (e.g., honeydew)
- Olive fly's ability to seek refuge from the heat by dispersal
- Stage of insect (egg, larva, adult)

* Highly dependent on location in state

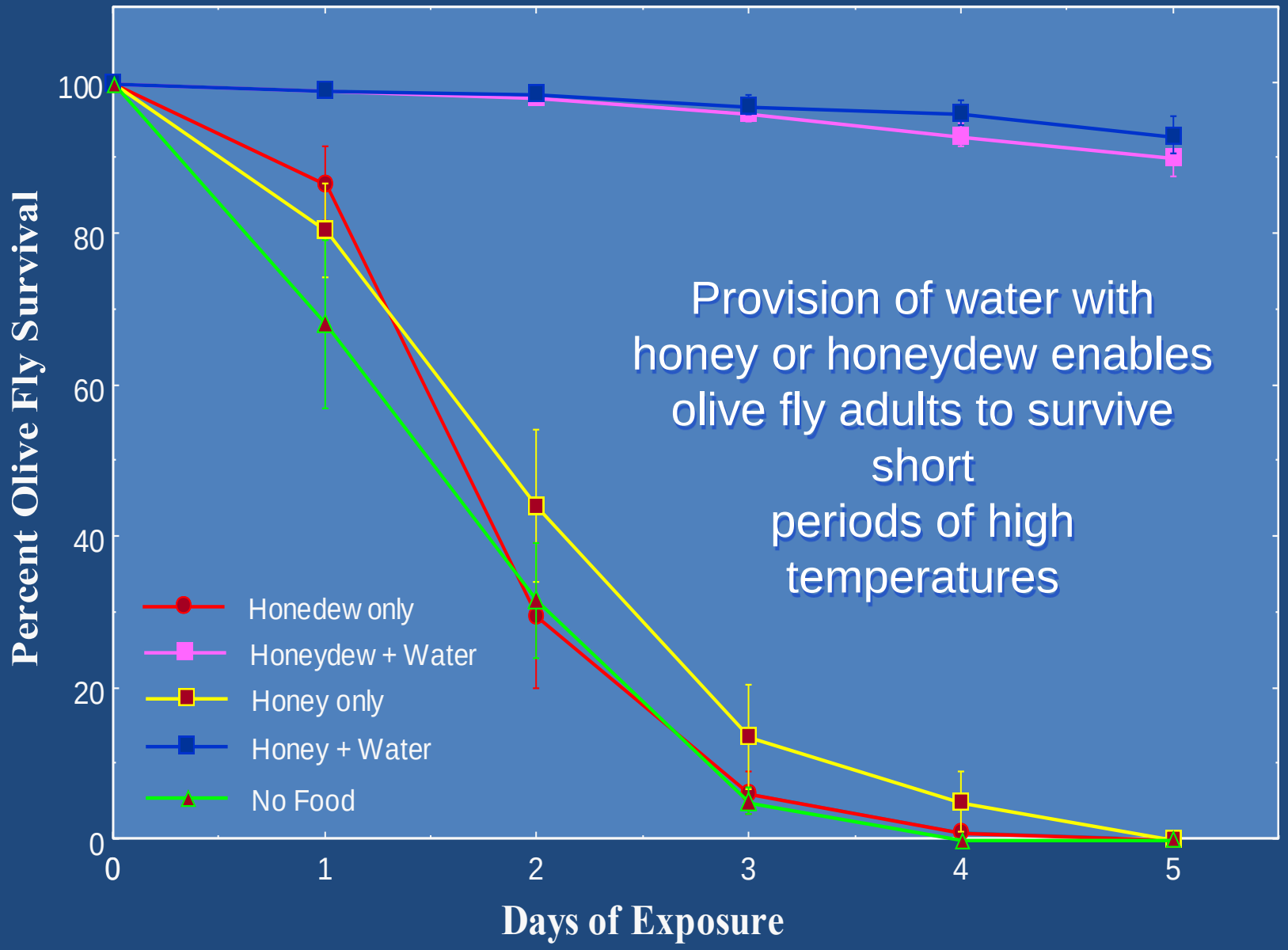

Percentage Survival of OLF Females
100
80
60
40
20
0
0
1
2
3
4
5
6
7
8
Days Exposure to Various Temperature Regimes
W + H 95°F
W + H 100°F
W + H 105°F
W 95°F
W 100°F
W 105°F
N 95°F
N 100°F
N 105°F

Mortality of OLF stages after 0 to 5 Days Exposure to 100ºF



- Black scale is common throughout the Central Valley and produces honeydew that flies may potentially use as a carbohydrate source
- Honeydew consumption enables flies to survive periods of extreme heat

Laboratory Data: High = 97.5 ºF; Low = 65 ºF



Application of Bait Spray

- Aerial applications not recommended
- Use alternate row coverage
- Treat north or east sides of trees

- Direct spray into upper half of tree
- For low OLF numbers use dilutions from 1: 1.5 to 1: 4 parts GF-120 to water
- 4 - 5 mm droplets are best

Field Efficacy of Two Timings of GF-120 - Methods

- Three treatments replicated 4 times
- GF-120 (1:4) at 20 oz/ac applied weekly and every other week from 26 June to 30 Oct.
- Treatments applied with super soaker squirt gun

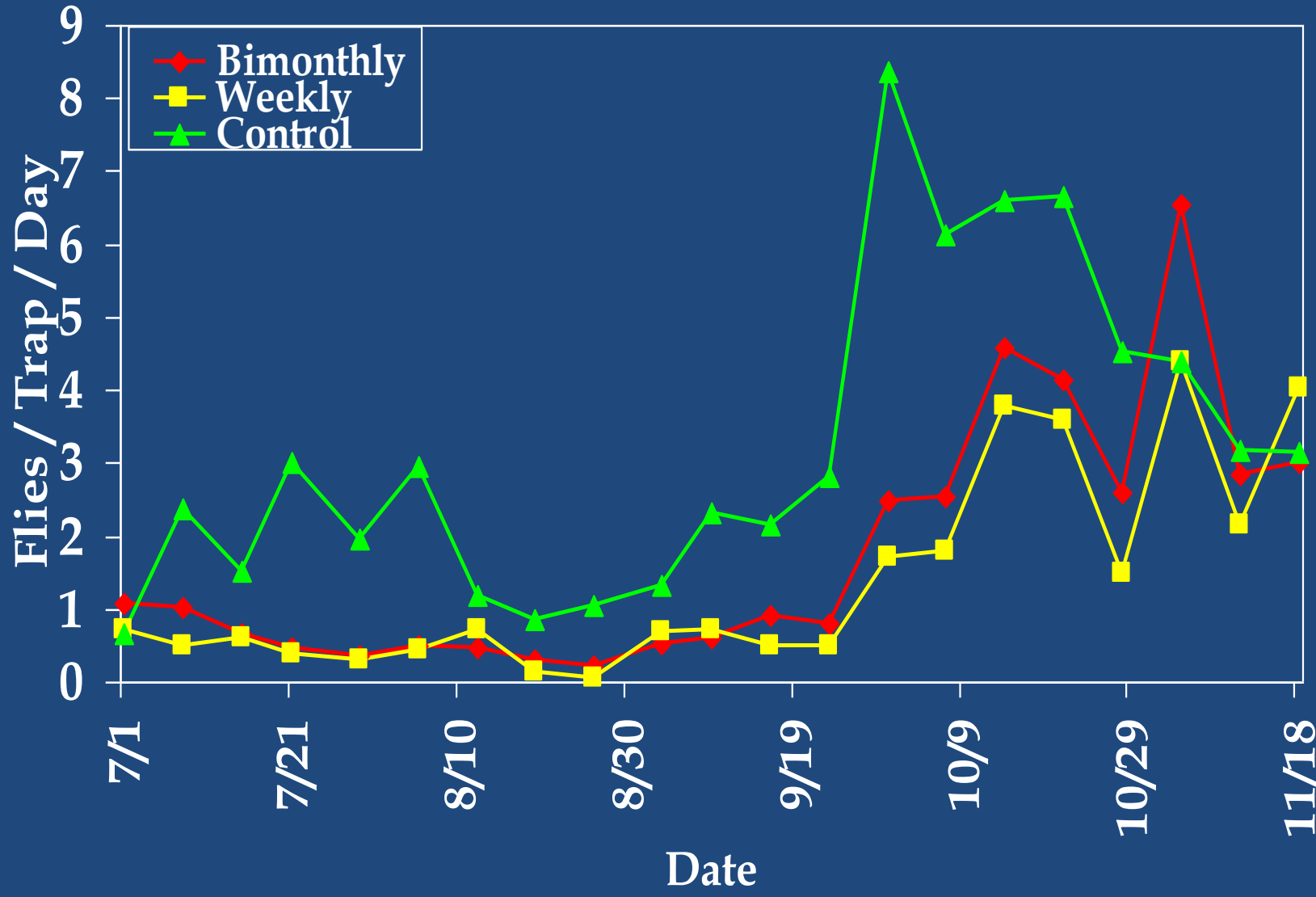
OLFF Infested Fruit-Mission San Jose-2002

	Mean Percent Infested Fruit		
Date	Weekly	Bimonthly	Control
12-Aug	0.0 a	0.4 a	2.0 b
26- Aug	0.4 a	3.6 a	2.5 a
9-Sept	0.4 a	1.2 a	4.0 b
23- Sept	0.8 a	2.8 a	9.5 b
7-Oct	2.8 a	4.8 a	28.0 b
21-Oct	7.2 a	12.4 a	42.5 b
4-Nov	6.8 a	8.0 a	30.5 b
18-Nov*	6.0 a	12.3 ab	24.3 b

Means followed by the same letter within a row are not significantly different (Fisher's protected LSD, $P \leq 0.05$)

*1000 fruit per treatment counted at harvest

Field Efficacy Trial - Seasonal Catch



Field Efficacy of two timings of GF-120 - Conclusions

- Weekly and every other week applications captured fewer flies and had lower infestation than untreated control
- Weekly applications were superior to every other week applications

OLFF Infested Fruit-Mission San Jose-2003

	Mean Percent Infested Fruit			
Date	1:9	1:4	1:1.5	Control*
12-Aug	7.0 a	11.5 a	12.0 a	87.0 b
8-Sep	33.5 a	47.5 ab	66.5 bc	82.0 c
	66.0 a	64.0 a	71.0 a	95.5 a
	67.5 a	80.5 ab	76.0 ab	98.0 b
	43.5 a	50.9 ab	56.4 ab	90.6 b

Means followed by the same letter within a row are not significantly different (Fisher's protected LSD, $P \leq 0.05$)

*Control was an untreated control

Timing and Use of Bait Sprays

As recommended by the Olive Advisory Group / 2006

- A safe guideline is to initiate treatments near June 1 or two weeks before olive pit hardening
- If spring conditions are warm, a couple of early sprays may be warranted in March or April to knock down the population.
- If populations are high, use a dilution ratio of 1 part GF-120 to 9 parts water to bring high populations down.
- Low populations consider higher concentration due to extended mortality
- GF-120 is the only sprayable bait legally available for use
- It cannot be applied more than once every 7 days
- Use rates vary from 10 oz. to 20 oz. active ingredient per acre
- 14 oz. a.i. per acre is currently being recommended

Olive Fruit Fly - Spinosad resistance

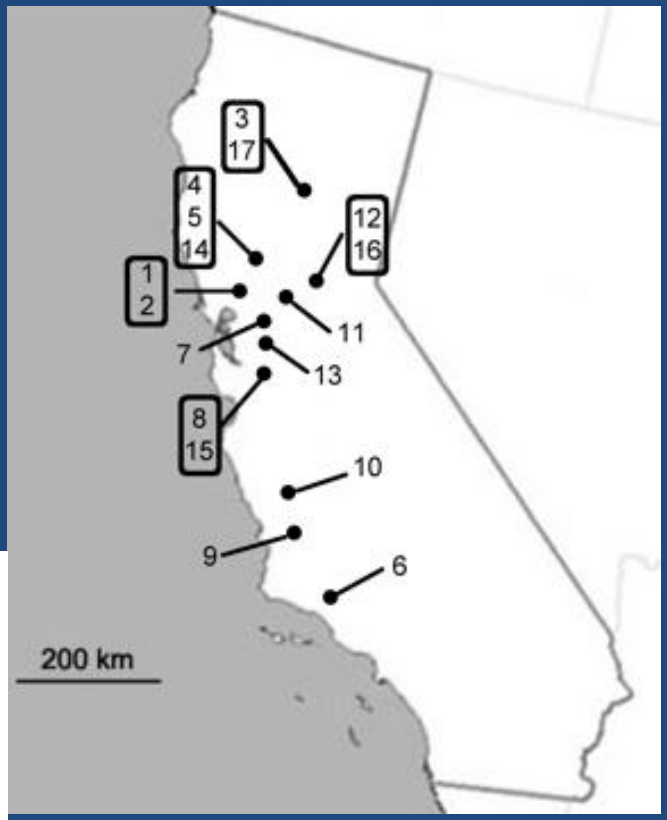
Topical Bioassay - 2007
Ingestion bioassay - 2008

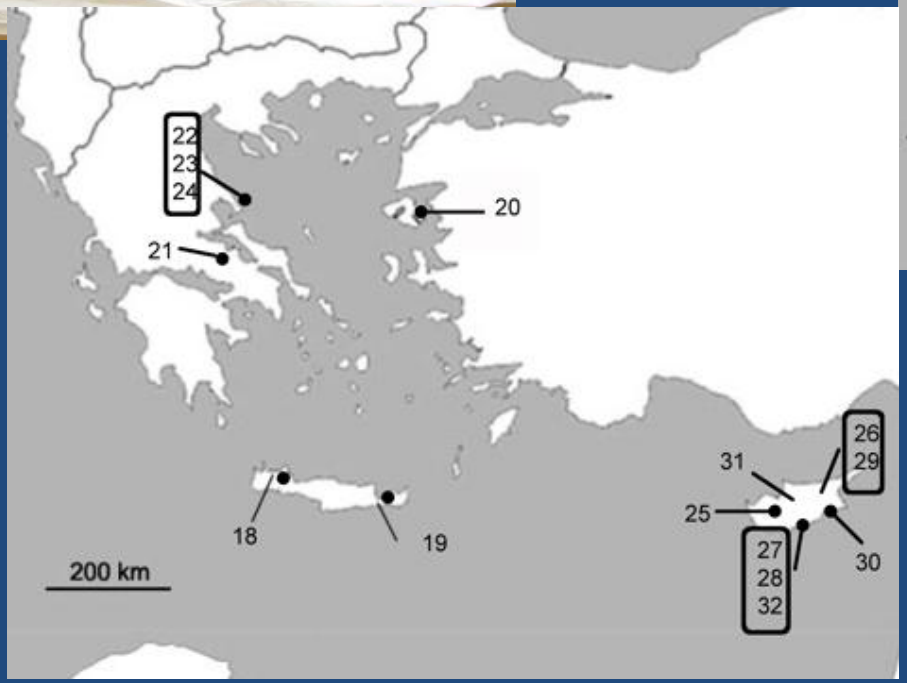
Comparison of flies reared from field infested olives from sites in Greece, Cyprus and California to a susceptible control = Demokritos laboratory strain (has not been exposed to insecticides for 40 years)

* Probit analysis with 4 to 7 doses.

Kakani, E.G. , N.E. Zygouridis, K.T. Tsoumani, N. Seraphides, F.G. Zalom and K.D. Mathiopoulos. 2010. Spinosad resistance development in wild olive fly populations in California. Pest Management Science. 66(4): 447-453.

Olive Fruit Fly - Spinosad resistance





Collection sites

Olive Fruit Fly - Spinosad resistance

California Location	# of apps	RR
Sonoma 1-CA	69	13.28
Ohlone-CA	49	11.44
Sonoma 2-CA	60	10.69
Butte-CA	69	10.09
Stags Leap-CA	66	9.13
Silverado-CA	66	5.69
Ventura-CA*	43	5.50
Tux-CA	34	4.47
Chania-GR*	25	4.34
Solano-CA	16	4.31
Livermore-CA	0	4.03
Hudson-CA	0	3.78
Paso Robles-CA	13	3.69
San Luis Obispo-CA	17	3.16
San Jose-CA*	0	2.78
Davis-CA	0	2.47
UC Davis-CA	3	1.81
Oroville-CA	0	1.47

Greece Location	# of apps	RR
Aghios Nicolaos-GR*	8	3.09
Promiri-GR*	0	3.06
Livadia-GR	3	1.47
Drakia-GR	0	1.13
Argalasti-GR	0	0.94
Mytilini-GR	2	0.38

Cyprus Location	# of apps	RR
Nicosia-CY*	0	1.31
Pafos-CY*	3	1.28
Limassol-CY*	0	1.19
Katokopia-CY*	0	1.16
Mazotos-CY*	0	1.00
Dromolaxia-CY*	0	0.69
Evrychou-CY	0	0.19
Zygi-CY	0	0.16

LAB STRAIN	0	1.00

RR- resistance ratio highly correlated with number of sprays R squared = .84

When Will GF 120 Fail?

- What level of resistance in necessary?
- Using the relationship between number of sprays and resistance development it can be deduced in 40 years from the start of spraying flies would aquire approximately 60 fold resistance. This is what happened with OP resistance in Europe, 40 years of spraying resulted in a 64 fold increase in resistance.

Alternatives?

OP and Carbamate Insecticides-OLFF

Treatment*	Rate/ 100 gal	Mean % Corr. Mortality 1/2 DOE	1 DOE
Sevin	9.4 lbs	1.9 a	8.6 a
Supracide	32.0 oz	6.8 a	19.7 a
Malathion	48.0 oz	80.2 b	88.2 b

* All treatments contained 3 pints NuLure/100 gal.

Pyrethroid Insecticides-OLFF

Treatment*	Rate/ 100 gal	Mean % Corr. Mortality 1/2 DOE	1 DOE
Baythroid Low	1.6 oz	16.4 a	48.4 a
Baythroid High	3.2 oz	55.4 cd	74.9 cd
Warrior Low	1.9 oz	21.0 a	53.1 a
Warrior High	3.8 oz	33.1 b	75.4 cd
Danitol Low	10.6 oz	47.4 c	60.4 ab
Danitol High	21.3 oz	54.1 cd	78.9 cd
Asana Low	2.9 oz	54.5 cd	68.5 bc
Asana High	9.6 oz	66.2 e	80.6 cd
Brigade Low	3.0 oz	63.4 de	76.9 cd
Brigade High	16.0 oz	81.3 f	89.0 d

* All treatments contained 3 pints NuLure/100 gal.

Using Danitol

- Great knock down
- Residual believed to be 2-3 weeks
- Use against high olive fly populations
- To combat GF 120 resistance?
- Use late season or post harvest
- High label rate 16 oz/ac
- Full Cover Spray- 50 to100 gpa
- Combined with Nulure @ 3 to 4 pts/ac
- Apply when weather is warm but less than 90 degrees F
- Use only once or twice per year
  - Limited to 42.66 oz/ac/yr
- Concerns
  - Secondary pest outbreaks
    - Scales- Black, Oleander, Parlatoria
    - Olive Bud Mite

Future Research

- Document and follow resistance development
- Develop baited sprays similar to GF 120 using different active ingredients to avoid disruption of beneficials and follow IPM