



Current knowledge regarding the Q biotype in the US *--distribution and resistance status*

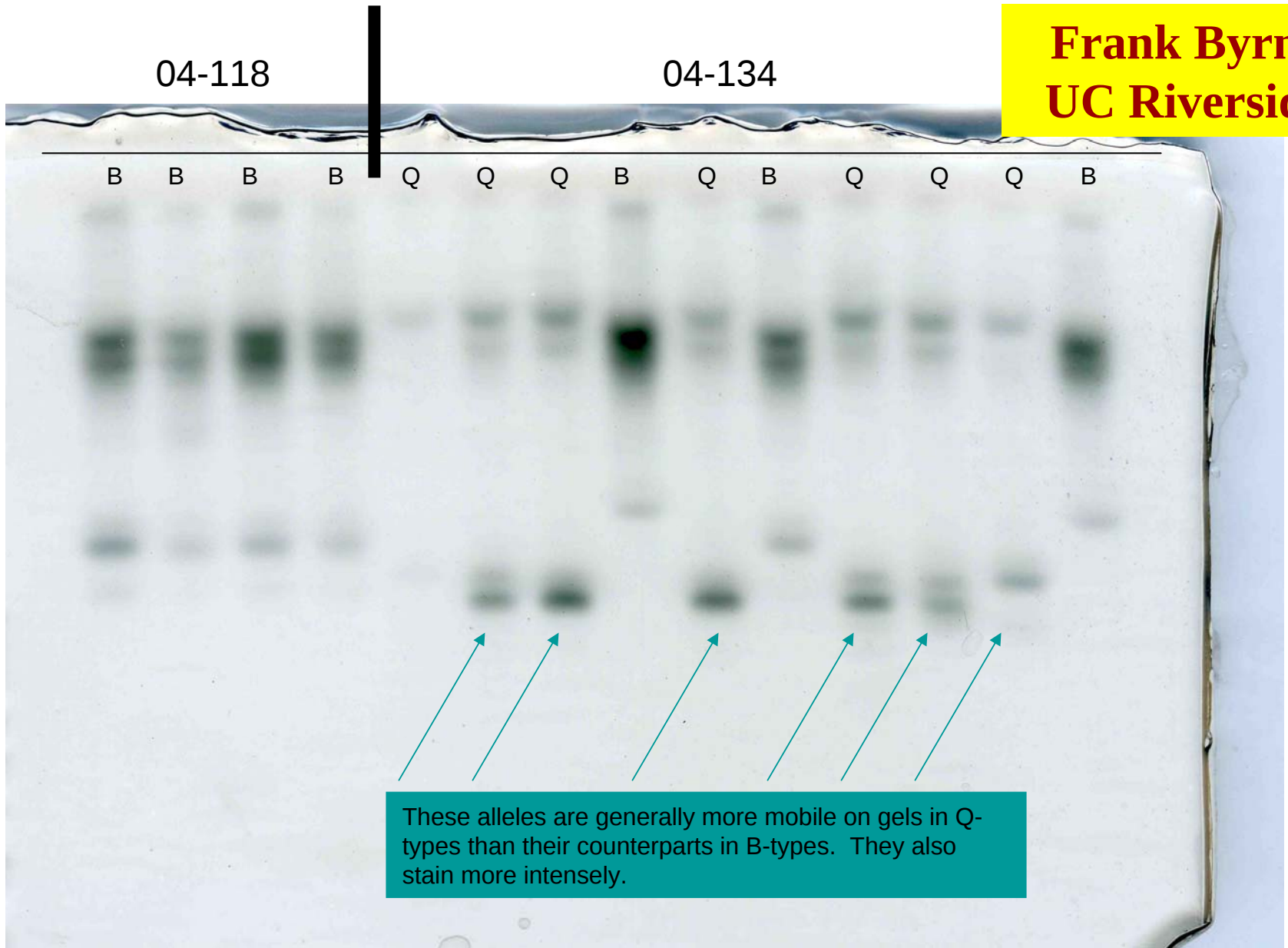
*T. J. Dennehy, Ben DeGain, Virginia Harpold, Robert Nichols
Xianchun Li, Judy Brown, Frank Byrne
Jim Bethke, Cristi Palmer, Lance Osborne, Ron Oetting*

Outline

1. Background and evidence of first detection of Q biotype:
Three labs, two methods
2. Evidence that we caught the problem relatively early:
Arizona Whitefly Biotypes: 2001, 2003, 2004.
3. Evidence that the Q biotype poses a severe threat to whitefly IPM:
Insecticide resistance of the Poinsettia '04 strain.
4. Evidence that the Q biotype is widely distributed throughout the US:
2005 Surveys
5. Evidence of fitness costs of Q biotype.

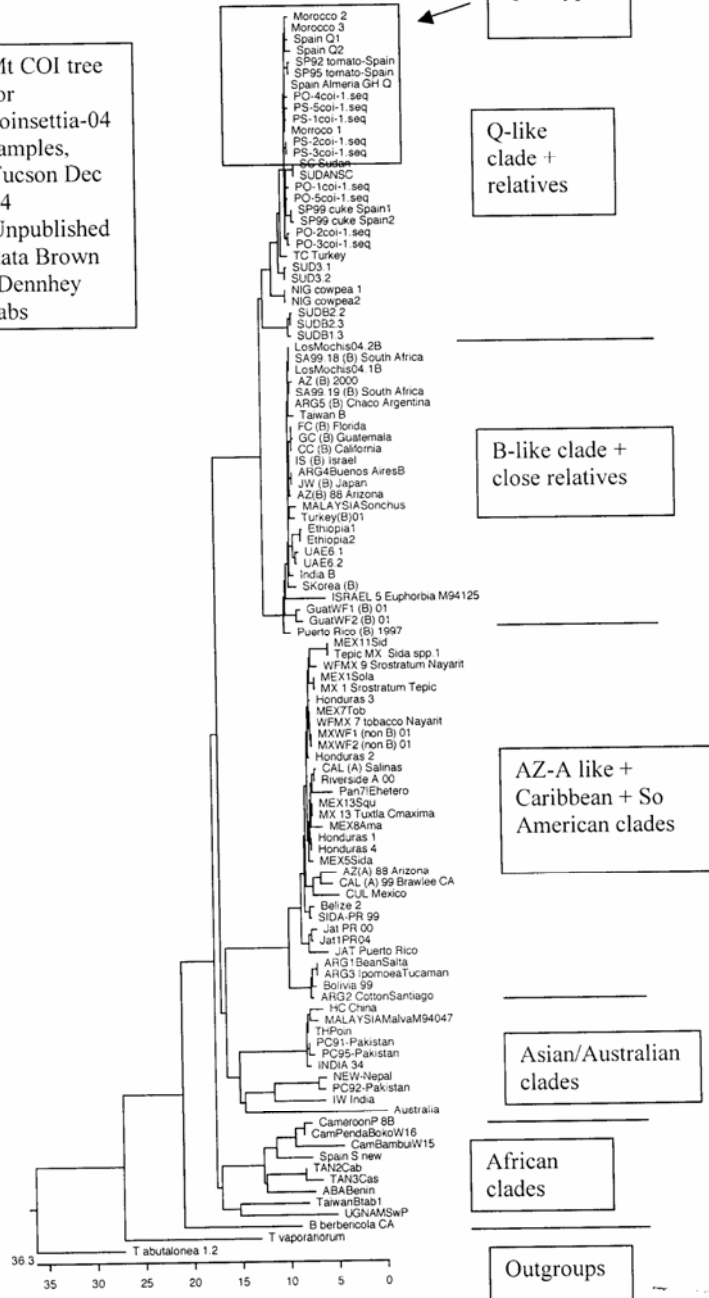


**Frank Byrne
UC Riverside**



Testing of Poinsettia'04 strain by Frank Byrne, UC Riverside, using gell electrophoresis of esterases. The sample we sent Frank contained a mixture of Q and B biotypes.

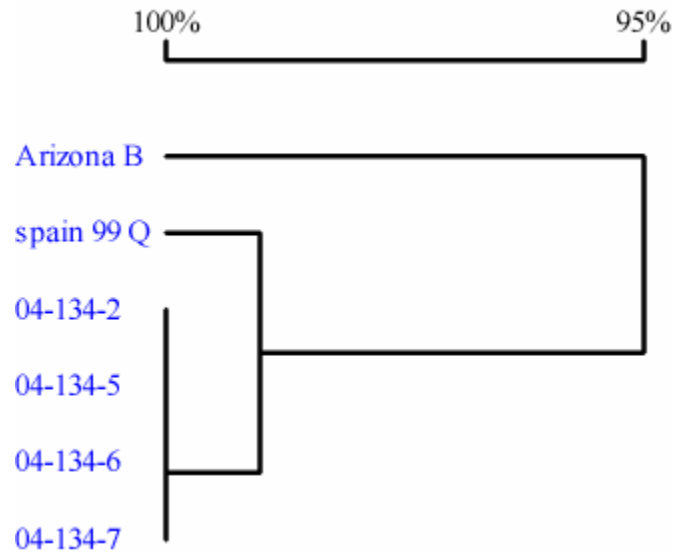
Mt COI tree for poinsettia-04 samples, Tucson Dec 04
 Unpublished data Brown/Dennhey labs



Judy Brown's Lab

Comparative sequence analysis with reference sequences indicated that *Poinsettia*'04 whiteflies were most closely related to haplotypes from southern Spain greenhouses, sharing 98.0-99.7% nucleotide identity.

EARML Analyses



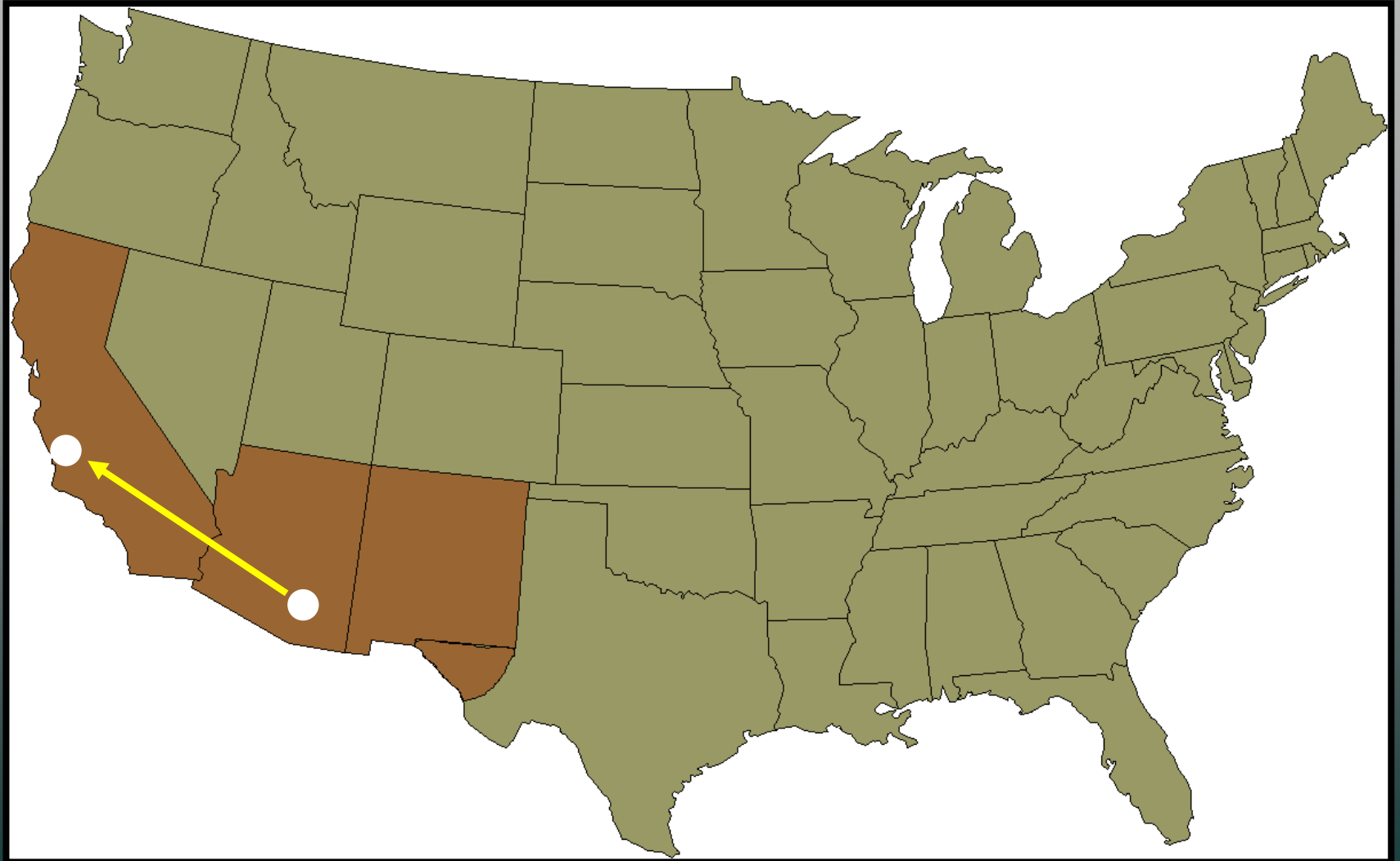
The Poinsettia'04 strain had greater than 99% mCO1 sequence homology with the Spain Q haplotype and less than 95% homology with the Arizona B haplotype

Homology matrix of 6 sequences

Arizona B	100%						
Spain 99 Q	94.2%	100%					
04-134-2	94.9%	99.3%	100%				
04-134-5	94.9%	99.1%	100.0%	100%			
04-134-6	94.9%	99.1%	100.0%	100.0%	100%		
04-134-7	94.8%	99.1%	100.0%	100.0%	100.0%	100%	100%

Tracking Q in 2005

ADA and CDFA



1.5 Million Square Feet of Greenhouse



Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Begonia												
Begonia												
Calendula												
Calla Lily												
Calla Lily												
Mini Carnation												
Chenille												
Cineraria												
Cyclamen												
Daffodil												
Exacum												
Gerbera												
Hibiscus												
Hyacinth												
Hydrangea												
Ivy												
Kalanchoe												
Easter Lily												
Oriental Lily												
Lisianthus												
Mum												
Poinsettia												
Pothos												
Tulip												

Resistant Whiteflies Shipped to Tucson on Holiday Poinsettias

Tracking Q in 2005

ADA and CDFA

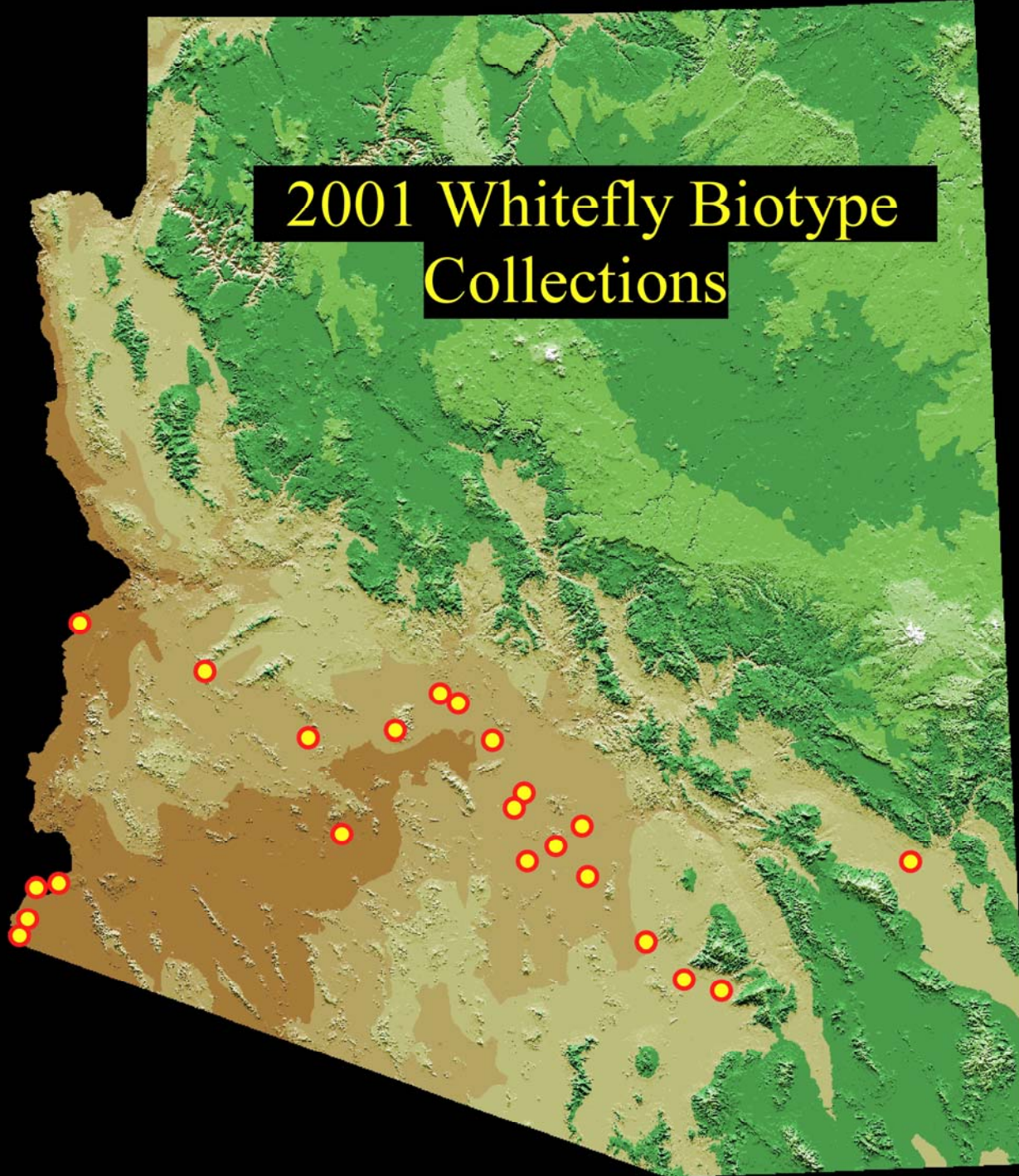


Outline

1. Background and evidence of first detection of Q biotype:
Three labs, two methods
2. Evidence that we caught the problem relatively early:
Arizona Whitefly Biotypes: 2001, 2003, 2004.
3. Evidence that the Q biotype poses a severe threat to whitefly IPM:
Insecticide resistance of the Poinsettia '04 strain.
4. Evidence that the Q biotype is widely distributed throughout the US:
2005 Surveys.
5. Evidence of fitness costs of Q biotype.

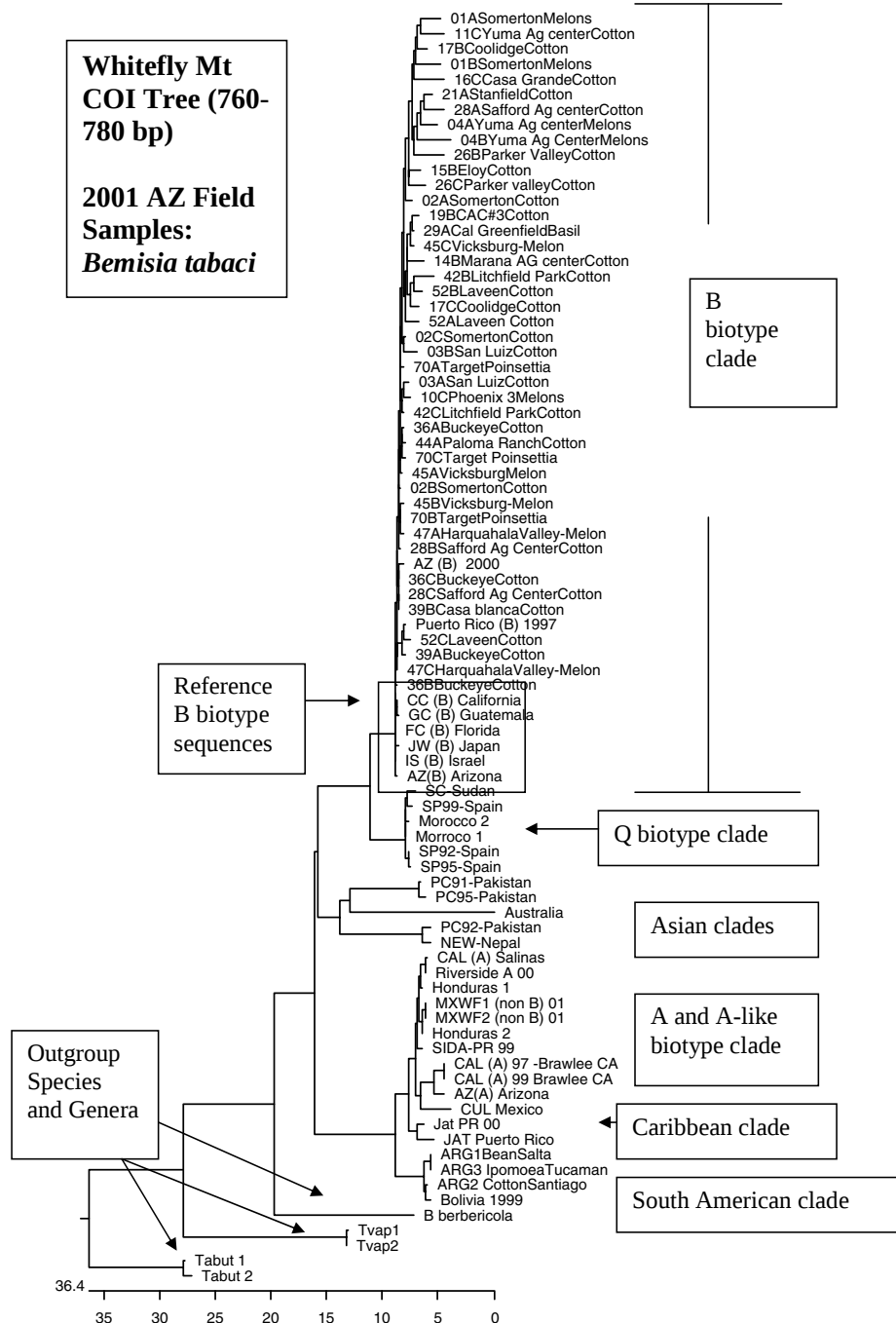


2001 Whitefly Biotype Collections



**Whitefly Mt
COI Tree (760-
780 bp)**

**2001 AZ Field
Samples:
*Bemisia tabaci***



43 different Arizona whiteflies collected in 2001 from 22 different locations (highlighted).

Cultures were reared by EARML and tested jointly by personnel from EARML and Judy Brown's laboratory.

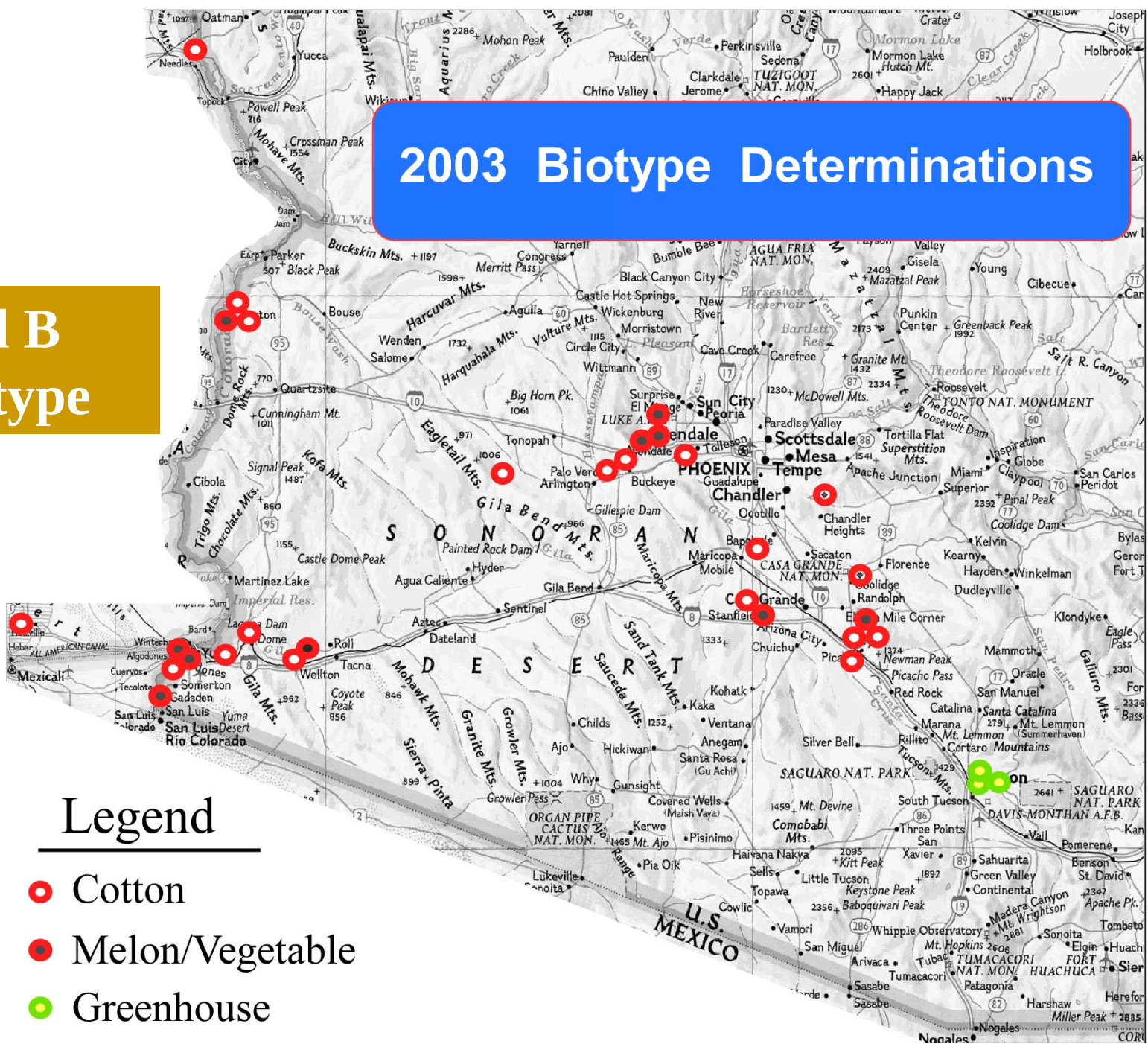
All were the B biotype.

2003 Biotype Determinations

All B
Biotype

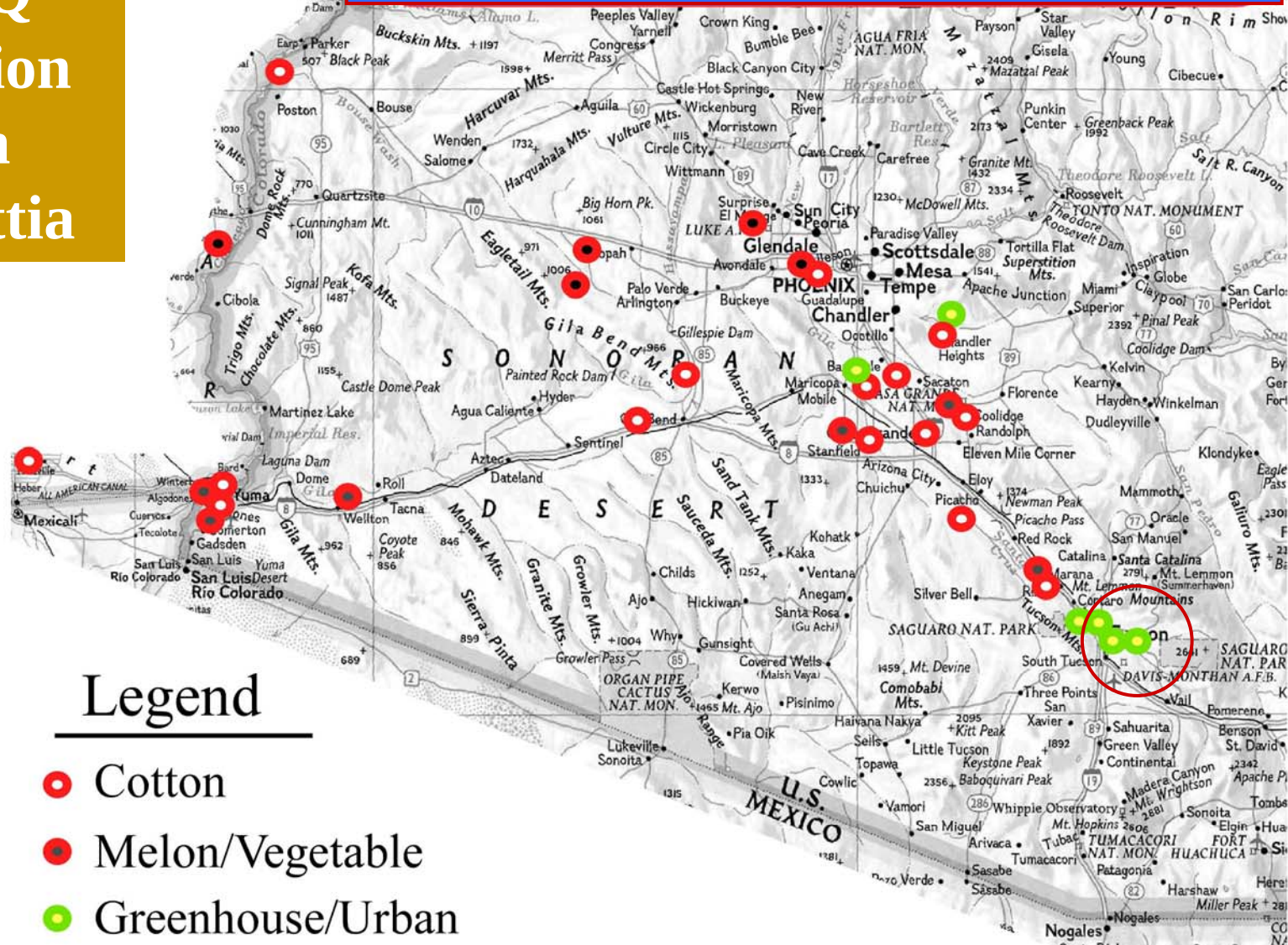
Legend

- Cotton
- Melon/Vegetable
- Greenhouse



One Q
collection
from
poinsettia

2004 Biotype Determinations



2005 Biotype Determinations (in progress)

Field samples

05-19	South Gila valley	cotton	5	B
05-106	Paloma	cotton	10	B
05-09	Cotton Center	cotton	7	B
05-10	Stanfield	cotton	8	B
05-103	Goodyear	cotton	9	B
05-06	Somerton	cotton	3	B
05-08	Queen Creek	cotton	6	B
05-17	Holtville	cotton	6	B
05-03	Maricopa Ag. Center	cotton	4	B

2005 Biotype Determinations

Retain Nursery Samples

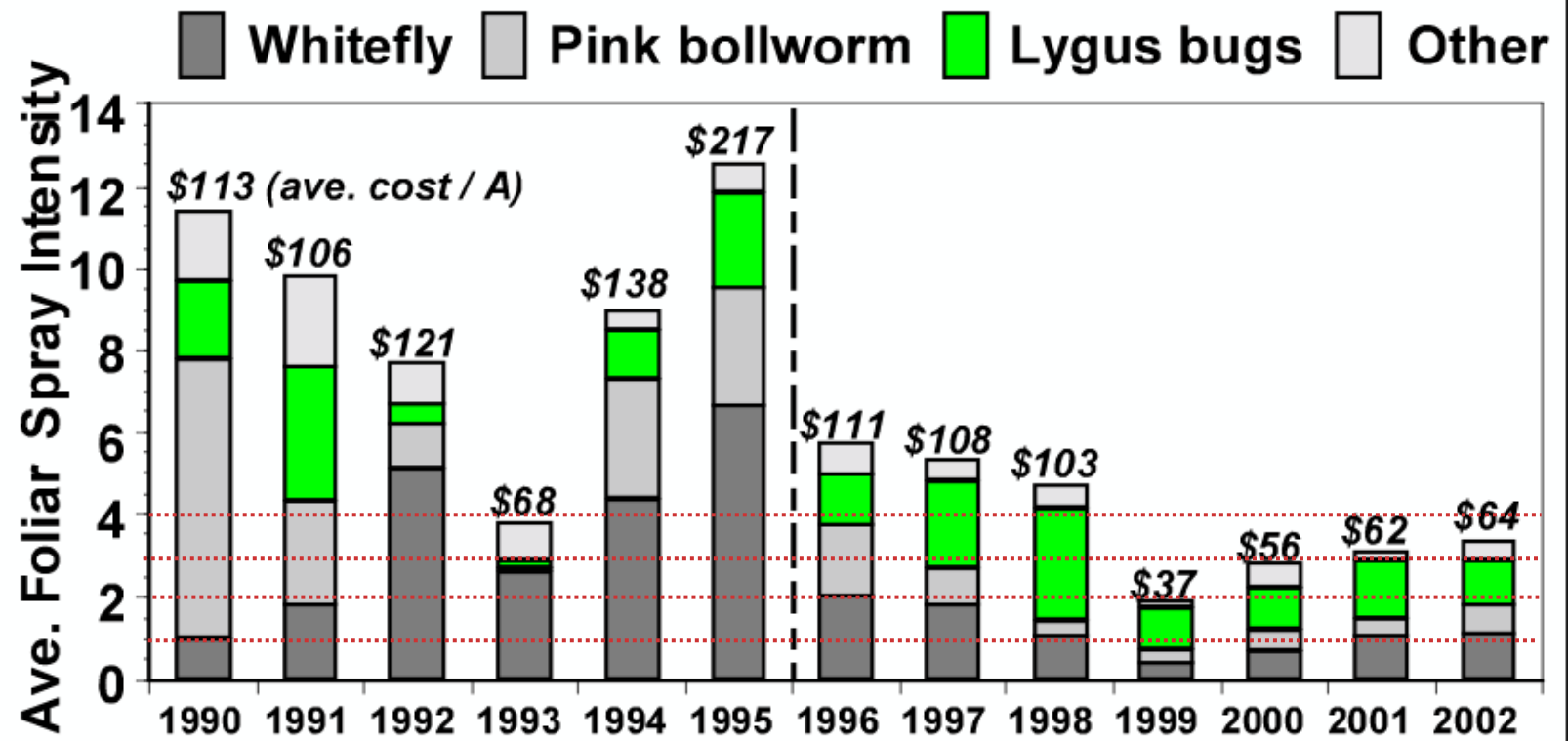
<u>GPS ID</u>	<u>Location</u>	<u>Host</u>	<i>N</i>	Biotype
05-111	Wild Oats-Tucson	poinsettia	7	Q
05-115	Trader Joes-Tucson	poinsettia	7	Q
05-114	Fry's-Tucson	poinsettia	6	Q
05-38	Fry's-Phoenix	poinsettia	9	Q
05-112	Home Depot 2-Tucson	poinsettia	10	Q
05-116	Lowes-Tucson	poinsettia	8	Q
05-109	Green Things A	poinsettia	8	B
05-110	Green Things B	poinsettia	10	B
05-29	Home Depot 1-Tucson	poinsettia	6	B
05-113	Target 2- Tucson	poinsettia	7	B
05-39	Walgreens-Phoenix	poinsettia	11	B
05-40	Home Depot 3-Phoenix	poinsettia	7	B
05-28	Target 1-Tucson	poinsettia	9	B

Outline

1. Background and evidence of first detection of Q biotype:
Three labs, two methods
2. Evidence that we caught the problem relatively early:
Arizona Whitefly Biotypes: 2001, 2003, 2004.
3. Evidence that the Q biotype poses a severe threat to whitefly IPM:
Insecticide resistance of the Poinsettia '04 strain.
4. Evidence that the Q biotype is widely distributed throughout the US:
2005 Surveys.
5. Evidence of fitness costs of Q biotype.



Insecticide Use in Arizona Cotton—Data Based on Polling



Ellsworth/UA

Arizona's IGR-based resistance management strategy

COOPERATIVE EXTENSION 196008
The University of Arizona • College of Agriculture • Tucson, Arizona 85721

THE 1996 WHITEFLY RESISTANCE MANAGEMENT PROGRAM FOR ARIZONA COTTON

A Strategy Formulated and Revised Annually by the Southwest Whitefly Resistance Working Group

T. J. Dennehy
Working Group Coordinator
Department of Entomology
The University of Arizona

P. C. Ellsworth
Assistant IPM Specialist
Department of Entomology
The University of Arizona

R. L. Nichols
Director
Agricultural Research
Cotton Incorporated

IPM Series • Number 8
June 1996

Stage I: Insect Growth Regulators

Threshold: 0.5–1 large nymph per leaf disk
AND 3–5 adults per leaf
Use IGR of choice when whitefly counts exceed threshold

IGR	Use Rate	Restrictions	Mode of Action
Applaud (70WP)	8 oz./A	Use only once per season. Apply no sooner than 21 days after Knack	Chitin synthesis inhibitor; effective against nymphs.
Knack (0.86EC)	8 fl. oz./A	Use only once per season. Apply no sooner than 14 days after Applaud	Juvenoid; sterilizes adults and eggs; prevents adult emergence.

Stage II: Non-Pyrethroids

Threshold: 5 adults per leaf

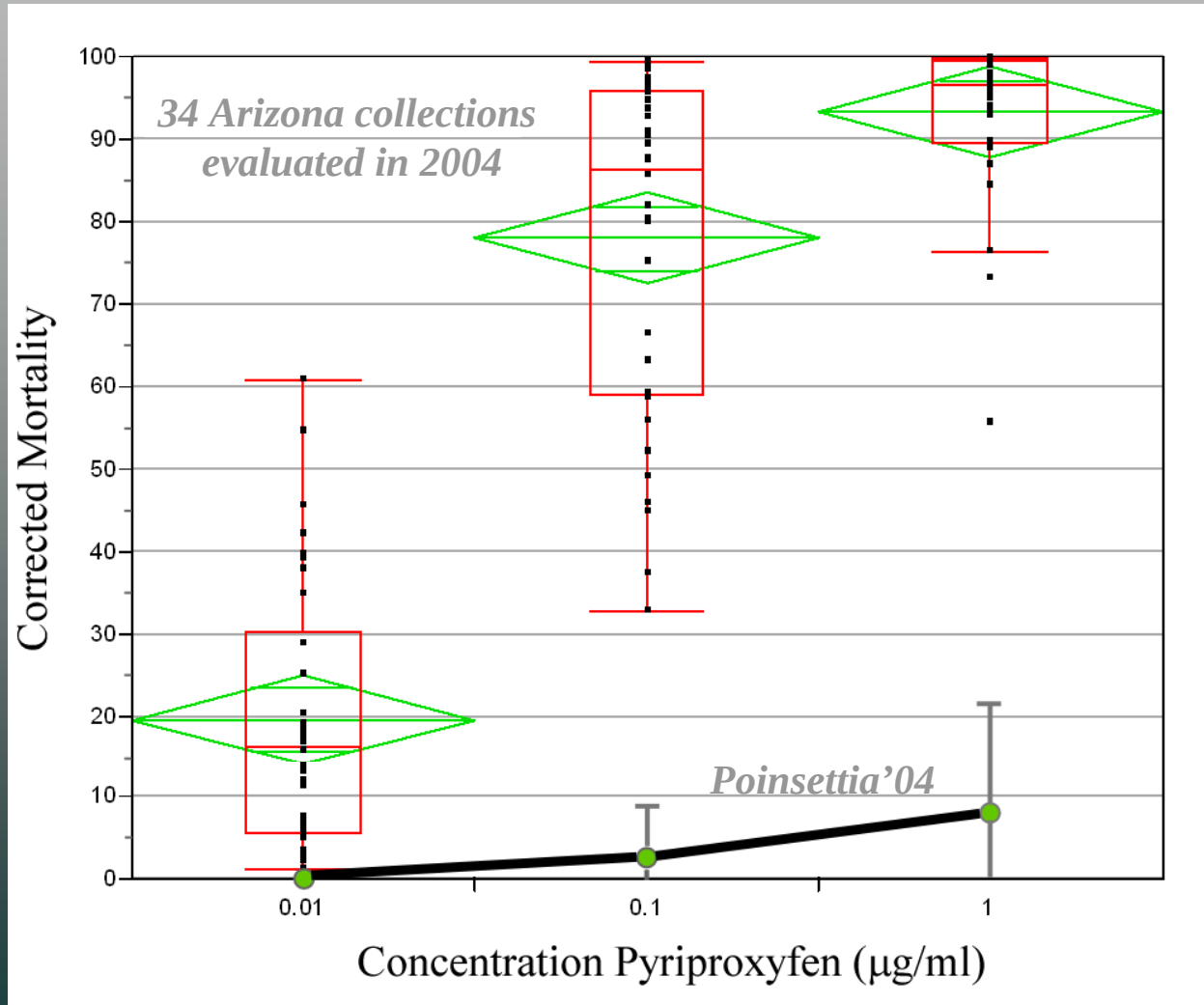
1. When populations average more than five adults per leaf, use Stage II materials at least once before using Stage III materials, in order to delay the need for pyrethroids.
2. Rotate among classes of insecticides and among different insecticides within classes.
3. Do not use mixtures of more than two compounds.
4. Use no active ingredient more than twice per season.

Stage III: Pyrethroid Mixtures

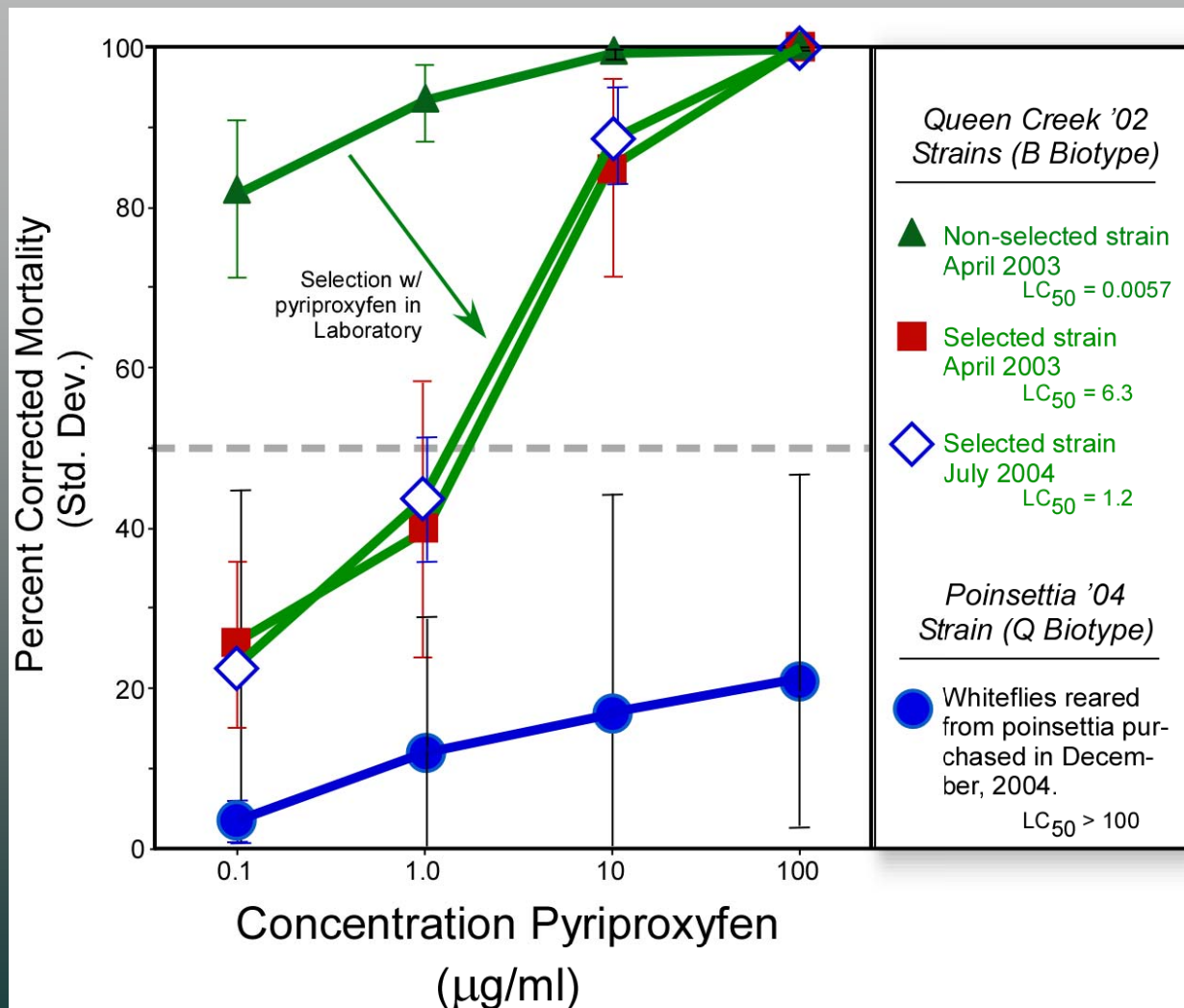
Threshold: 5 adults per leaf

1. Delay pyrethroid use until the end of the control season approaches (for example, September – October).
2. Plan to use the pyrethroid class no more than twice per season.
3. Rotate the classes of the compounds tank-mixed with the pyrethroid and rotate among pyrethroids.

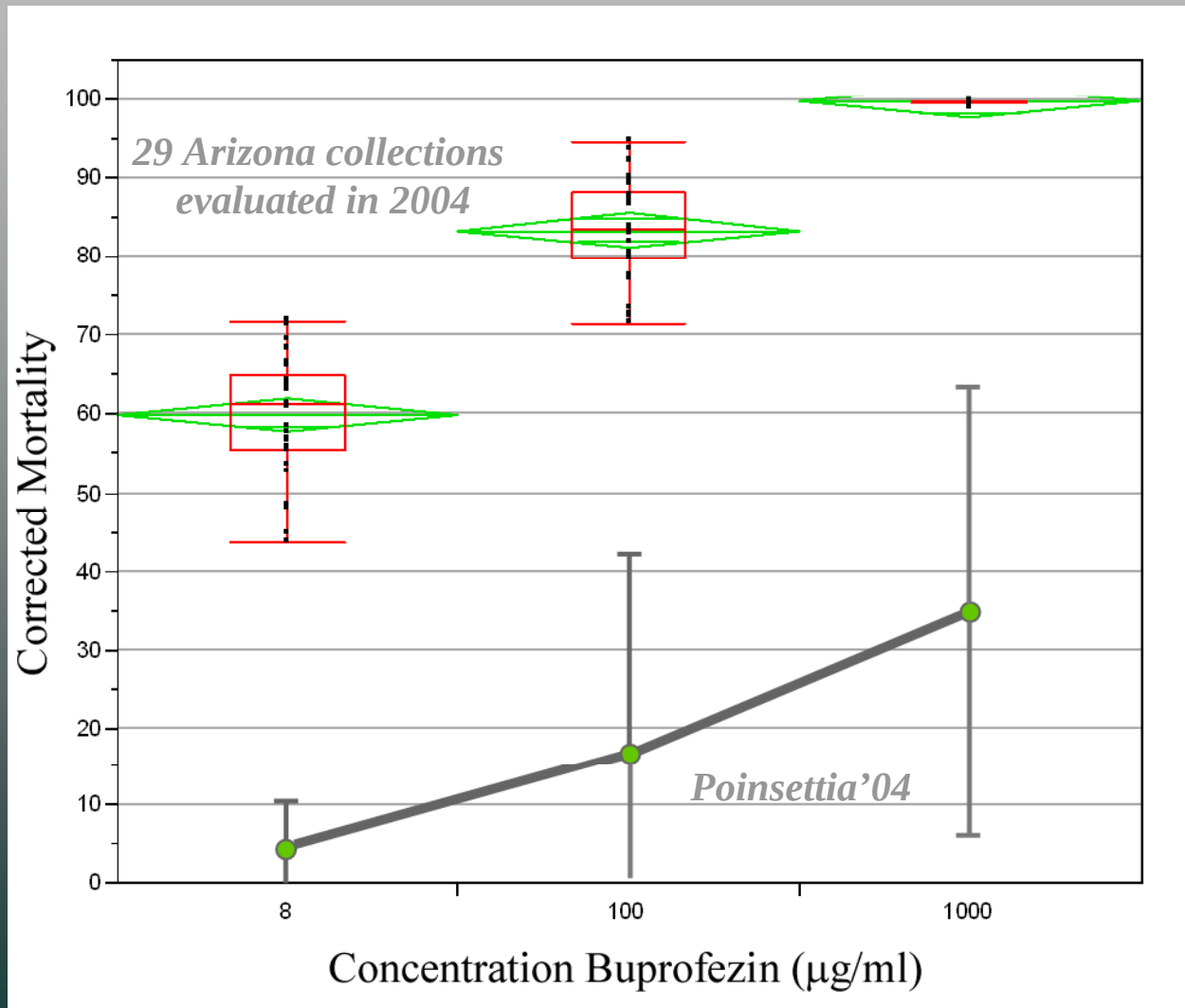
Pyriproxyfen (Knack®)



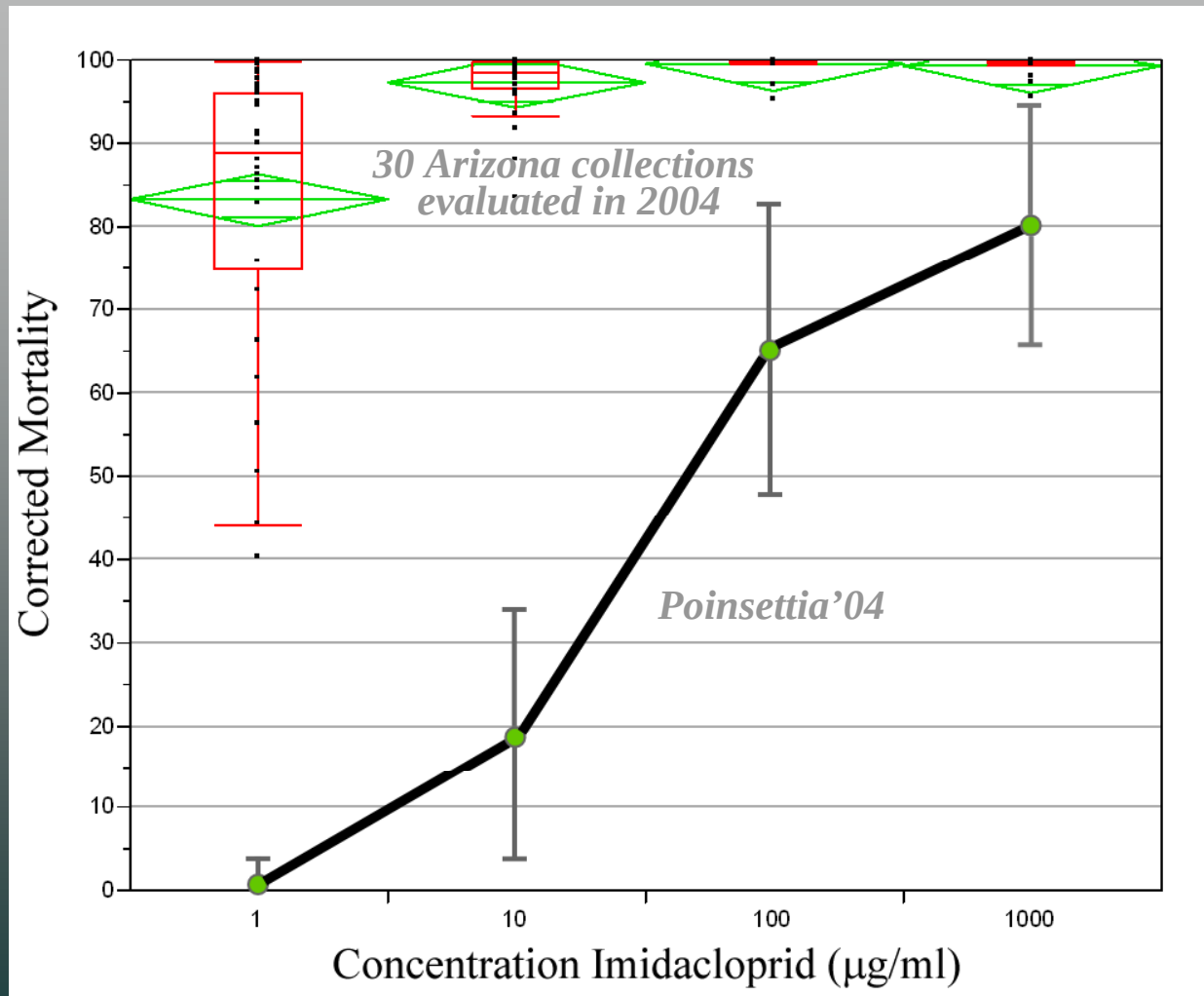
B vs. Q Biotype Resistance



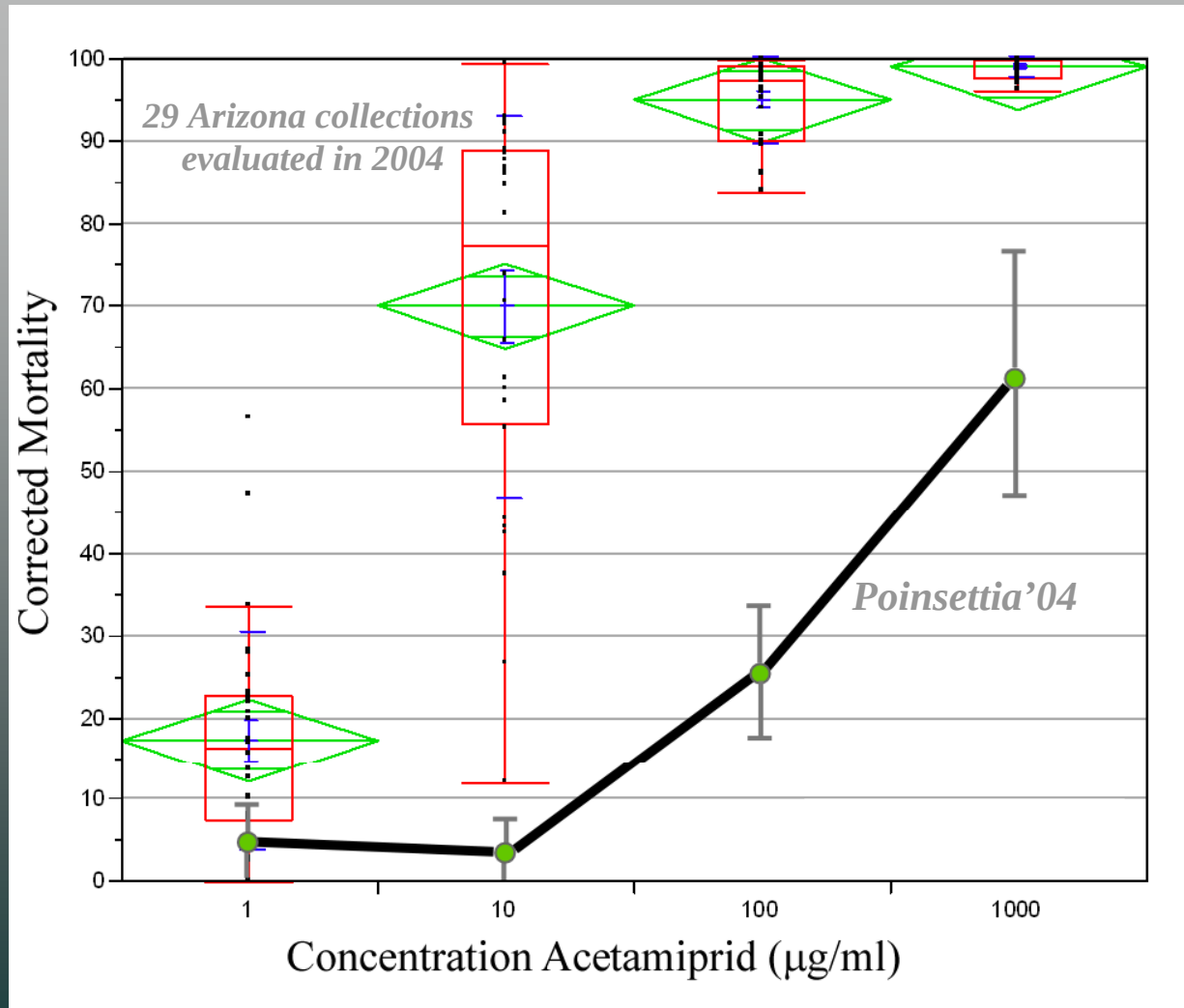
Buprofezin (Courier®)



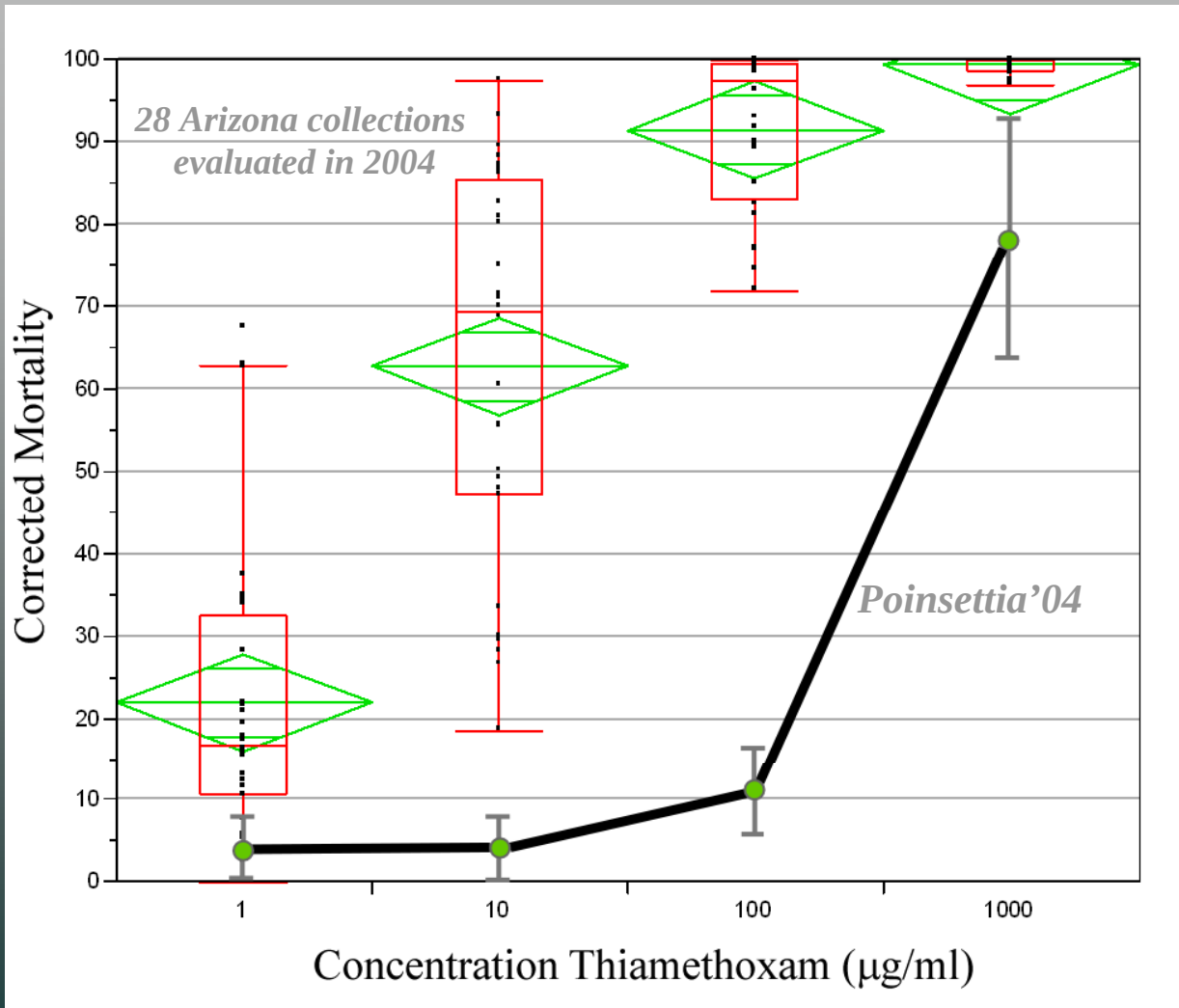
Imidacloprid (Admire[®] etc.)



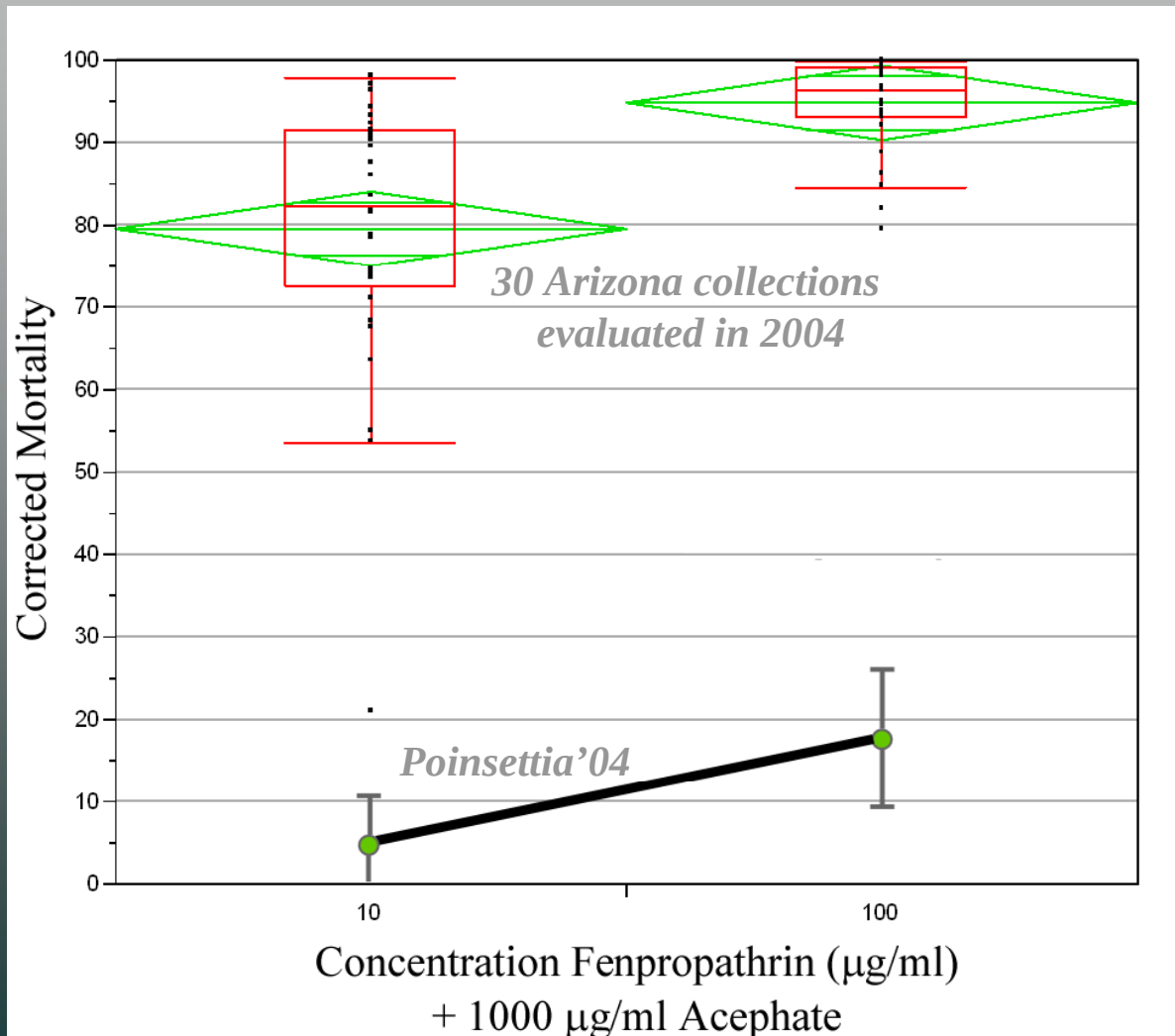
Acetamiprid (Intruder[®] etc.)



Thiamethoxam (Centric[®] etc.)



Fenpropathrin + Acephate (Danitol + Orthene[®] etc.)



Dinotefuran (Safari®)

	<u>Yuma '04</u>	<u>Poinsettia '04</u>	<u>RR</u>
LC ₁₀	2.40	3.46	1.4
LC ₅₀	21.4	87.9	4.1
LC ₉₀	191	2,230	12

Spiromesifen (Oberon®)

	<u>'04</u>	<u>Poinsettia '04</u>	<u>RR</u>
LC ₁₀	_____	_____	_____
LC ₅₀	_____	_____	_____
LC ₉₀	_____	_____	_____

Data being summarized. Conclusion = Oberon was highly toxic to both Yuma '04 and Poinsettia'04. Mortality of Poinsettia'04 was slightly less at the concentrations tested.

Outline

1. Background and evidence of first detection of Q biotype:
Three labs, two methods
2. Evidence that we caught the problem relatively early:
Arizona Whitefly Biotypes: 2001, 2003, 2004.
3. Evidence that the Q biotype poses a severe threat to whitefly IPM:
Insecticide resistance of the Poinsettia '04 strain.
4. Evidence that the Q biotype is widely distributed throughout the US:
2005 Surveys.
5. Evidence of fitness costs of Q biotype.



Outline

1. Background and evidence of first detection of Q biotype:
Three labs, two methods
2. Evidence that we caught the problem relatively early:
Arizona Whitefly Biotypes: 2001, 2003, 2004.
3. Evidence that the Q biotype poses a severe threat to whitefly IPM:
Insecticide resistance of the Poinsettia '04 strain.
4. Evidence that the Q biotype is widely distributed throughout the US:
2005 Surveys.
5. Evidence of fitness costs of Q biotype.

All 8 Isolated Cages of Poinsettia'04 shifted to the B biotype

- Individual cages selected with high concentrations of buprofezin, pyriproxyfen, or imidacloprid.
- Maintained in cages, within isolated room within another basement room. No windows. No other cultures.
- Large reduction in resistance within 6 months.

Evidence of fitness costs

- Insert schematic demonstrating culturing of Poinsettia'04
- Data showing change in susceptibility to pyriproxyfen over time
- Data showing loss of Q biotype over time