

# Survey and Diagnostics

*Subcommittee  
Update*  
Q TAC Meeting  
St Louis, MO  
April 3, 2006



Cindy McKenzie and Frank Byrne

# Monitoring guidelines

- **Grower-submitted vs State samples:**
  - Keeping growers anonymous ensured successful implementation of this component of the survey.
  - report at state level.
- **State samples:**
  - A-list 30 sample locations, B-list 10 sample locations.
  - Min # insects per sample = 10.
  - Proportion of samples obtained from GH = 60-80%, other = 20-40%.
  - report at county level.

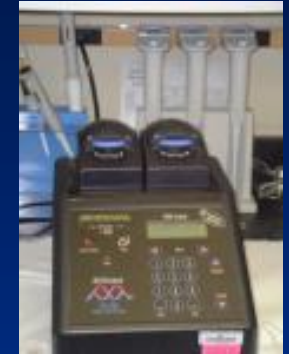
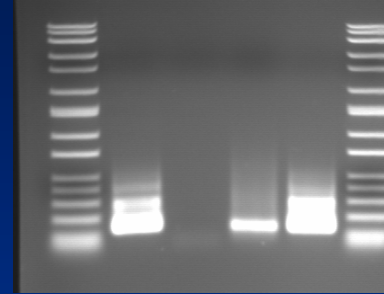


# Detection Techniques

- Based on Genetic differences

- Electrophoresis
- PCR
- Gene sequencing

- COI
- Microsatellites



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181      19c      20c      21c      22c      23c      24c
181      CGAGCTTATTTCACTTCAGCCACTATAAATLATTGCTGTTCCACAGGAATFAAAATTTT   B_Biotype
181      CGAGCTTATTTCACTTCAGCTACTATGATTATTGCCGTTCTACAGGAATFAAAATTTT   Q_Biotype
143      CGGGCTTATTTTACTTCAGCTACTATAATTATTGCTGTTCCAGAGGAATFAAAATCTTT   A_Biotype

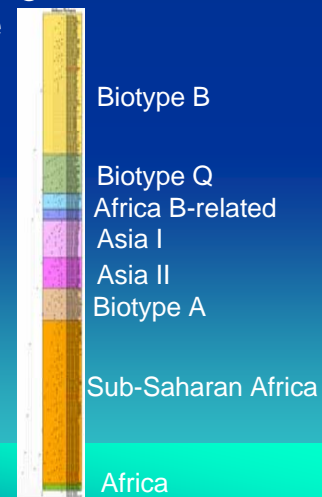
241      26c      28c      27c      29c      30c
241      AGTGGCTTGCTACTTTGGGTGGAAATAAAGTCTAATAAAATTAAGCCCTTTGCGCCTTTGA   B_Biotype
241      AGTGGCTTGCTACTTTGGGTGGAAATAAAGTCCAATAAAATTAAGCCCTTTGCGCCTTTGA   Q_Biotype
203      AGGTTGGCTTGCTACTCTAGGTGGAAATAAAGTCTAATAAAGTTTGACCCCCTAGTTCTCTGTA   A_Biotype
    
```

- Labs Conducting Biotype Analysis

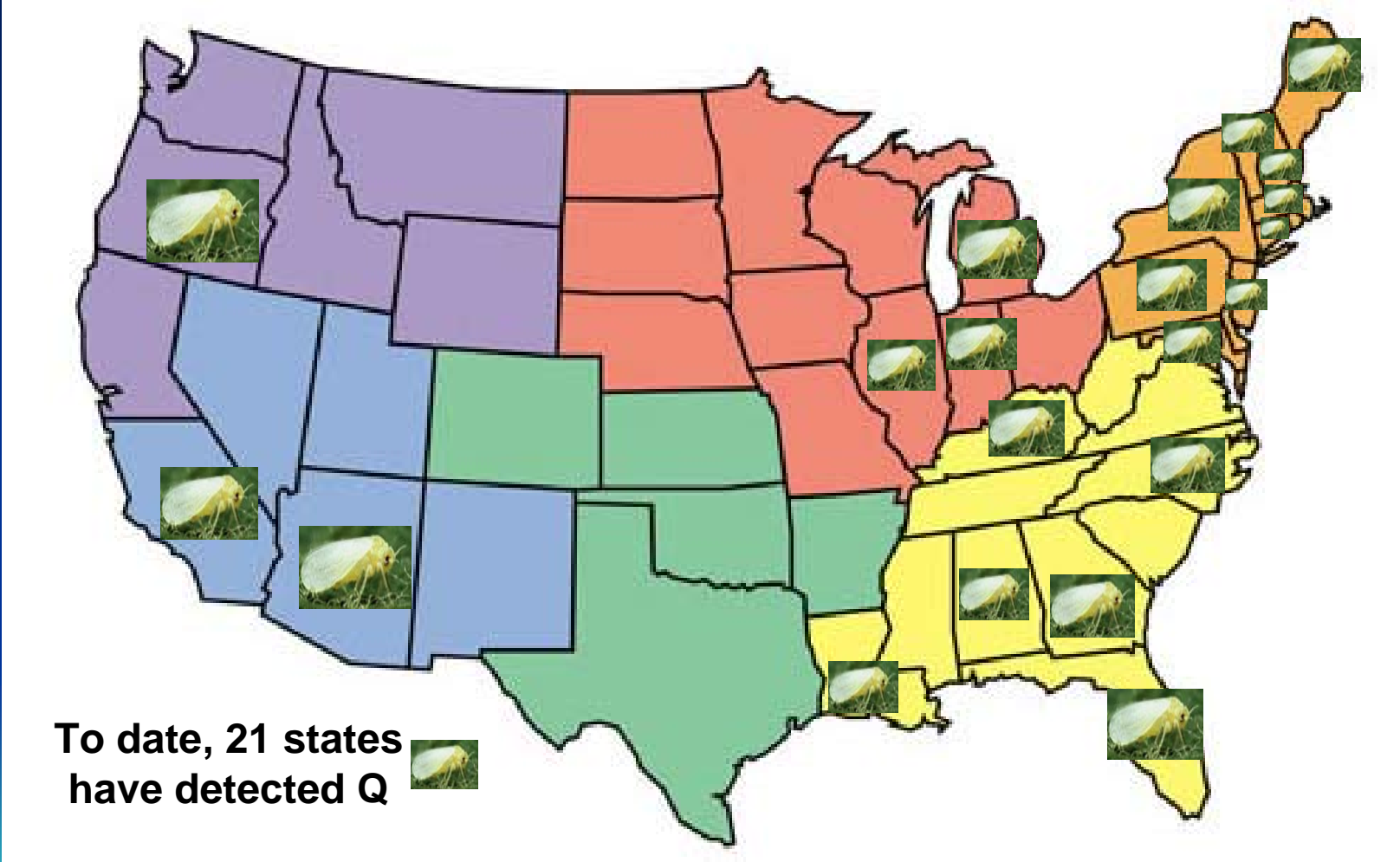
- Judy Brown, U AZ – COI
- Frank Byrne, U CA – Esterase
- Cindy McKenzie/Bob Shatters, ARS

COI and Microsatellites

Phylogenetic Tree



# North American "Q" Biotype Detections

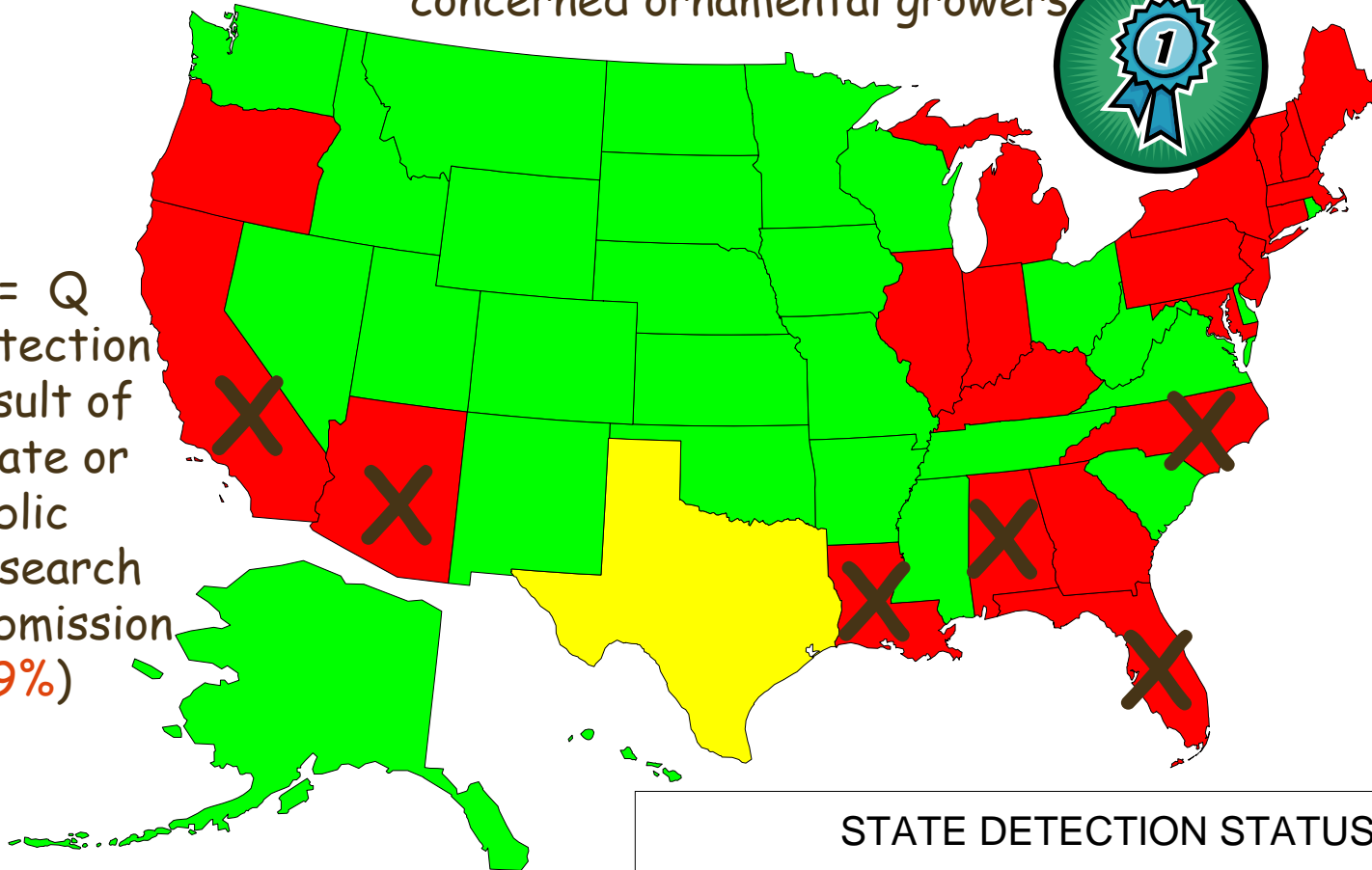


# DETECTION STATUS OF Q BIOTYPE - GREENHOUSE/ NURSERY




71% of states reporting Q are from concerned ornamental growers



X = Q detection result of State or Public Research submission (29%)



## STATE DETECTION STATUS

	NO SAMPLES SUBMITTED	(29)
	Q BIOTYPE DETECTED	(21)
	SAMPLE SUBMITTED, Q BIOTYPE NOT DETECTED	(1)

# Conclusions

- More than one positive Q sample in some states - 21 states and counting.
- States identified as positive not overrun with Q; all populations were managed.
- Microsatellite data confirms multiple introductions.
- No positive ids in anything other than ornamentals and herbs; unofficial report on tomato transplants from retail outlet in AZ.
- Ornamentals includes a lot of hosts, not just poinsettias.



# Survey and Diagnostics

## Top Research Priorities

### “Grower Friendly Diagnostics”

#### Short Term (12 months)

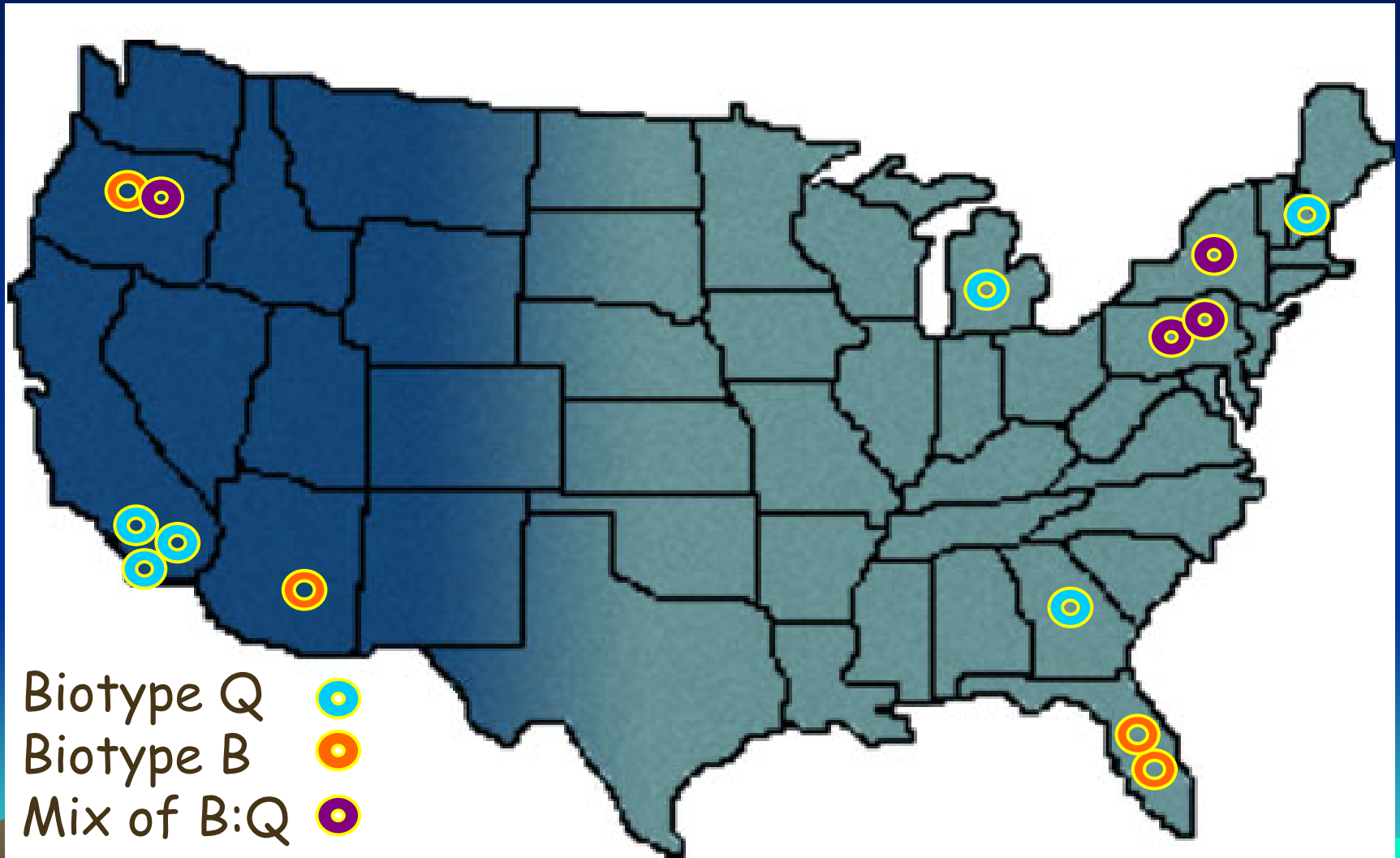
1. Training → more Labs doing Diagnostics.
2. In-Depth Microsatellite Study with more locations and more alleles.

#### Long Term (5 year plan)

1. Correlate markers w/insecticide profiles.
2. Identification of B & Q specific protein and genetic markers (ELISA).



# Microsatellite Study



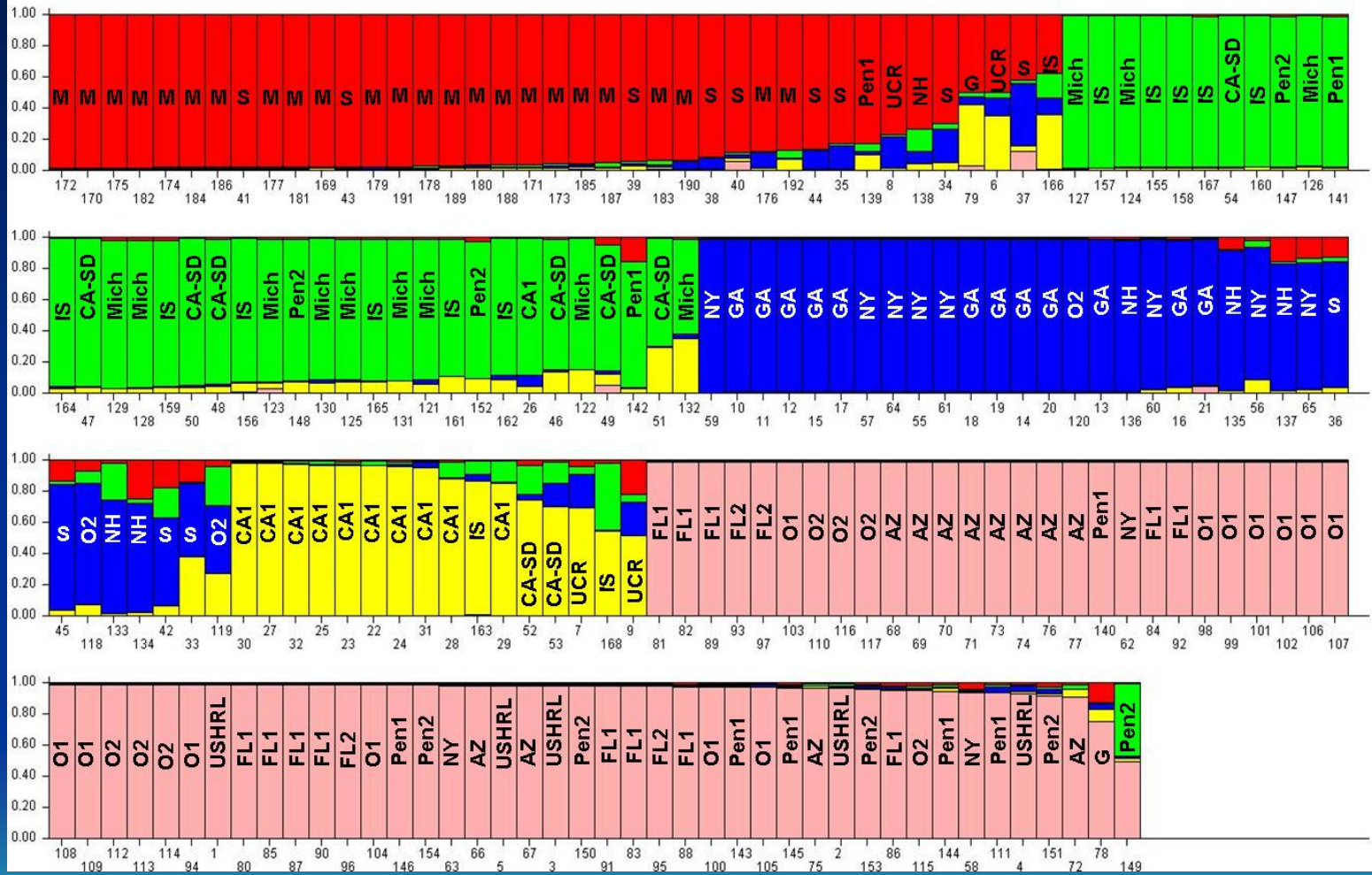


**TABLE 2. Description of *Bemisia tabaci* populations used in this study.**

Population Number	Abreviation	Location	COI Biotype Determination	Individual Numbers
1	USHRL	USHRL Lab Colony	B	1-5
2	UCR	UC Riverside Quarantine	Q	6-9
3	GA	Georgia	Q	10-21
4	CA1	California1	Q	22-32
5	S	Spain	Q	33-45
6	CA-SD	California-SD	Q	46-54
7	NY	New York	B and Q	55-65
8	AZ	Arizona	B	66-77
9	G	Guatemala	???	78-79
10	FL1	Florida1	B	80-92
11	FL2	Florida2	B	93-97
12	O1	Oregon1	B	98-109
13	O2	Oregon2	B and Q	110-120
14	Mich	Michigan	Q	121-132
15	NH	New Hampshire	Q	133-138
16	Pen1	Pennsylvania1	B and Q	139-146
17	Pen2	Pensylvania2	B and Q	147-154
18	IS	Israel1	Q	155-160
19	IS	Isreal2	Q	161-168
20	M	Morocco1	Q	169-180
21	M	Morocco2	Q	181-192

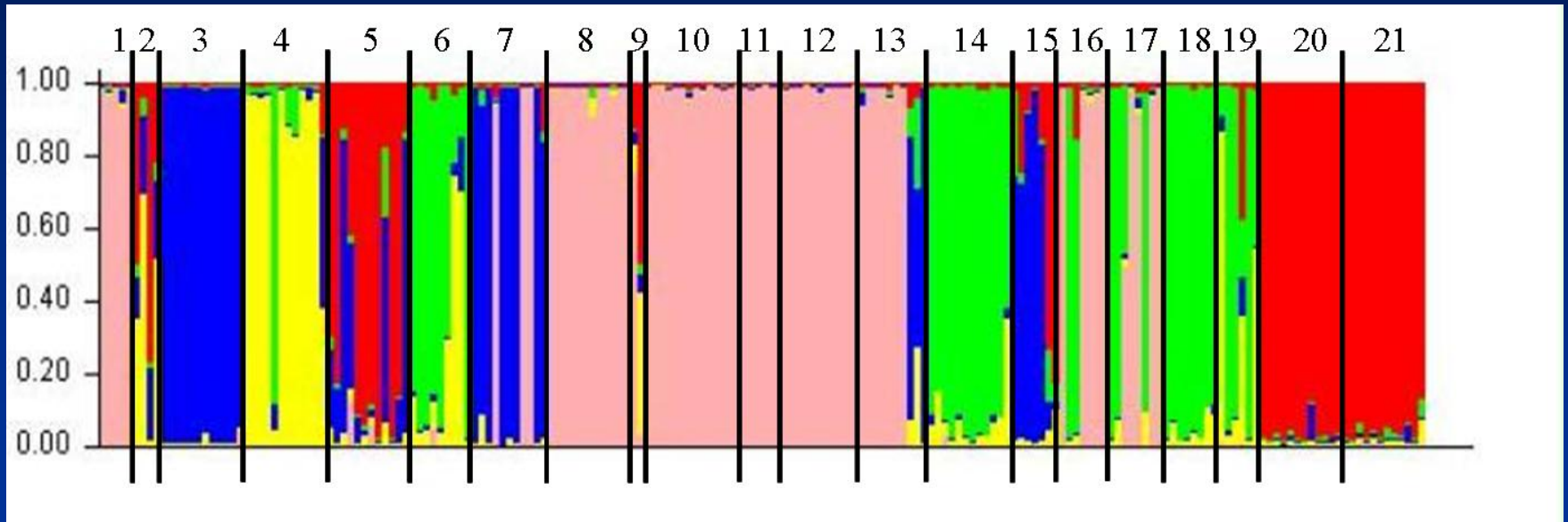
# Microsatellite Study

Probability a Specific Population (Represented by a Unique Color)  
Will produce the Individual Genotype Observed



Numbers Correspond to Individual Whiteflies

# Microsatellite Study (Individuals Grouped by Population)



# Table 3. Description of Q Biotype Subgroups

Q Subgroup	Old World Representation	U.S. Representation
Subgroup 1 (Red)	Morocco/Spain	Pennsylvania, New Hampshire, UCR-quarantine colony
Subgroup 2 (Green)	Israel	California, Michigan, Pennsylvania,
Subgroup 3 (Blue)	Spain	Georgia, New Hampshire, New York, Oregon
Subgroup 4 (Yellow)	Israel	California, UCR-quarantine colony (???)



# Summary

- All Q biotype whiteflies analyzed to date (from the U.S., Spain, Morocco, and Israel) can be subdivided into four separate subgroups, all of which are in the United States.
- The Four U.S. Q Biotype Subtypes Suggest Multiple Introductions of Biotype Q into the U.S.
- The Q biotype has much greater microsatellite diversity than observed for the B biotype in the U.S. The genetic diversity of the Q biotype is similar to that reported for the indigenous Asia-Pacific genotypes (De Barro, 2005).
- Our data show that microsatellite genotyping is powerful enough to distinguish among subtypes of the Q biotype. Future work coordinating the microsatellite genotyping with insecticide resistance profiles will be conducted to determine if this genotyping method can be used as a predictor of insecticide resistance profiles.