

International Citrus Canker Research Workshop  
Ft. Pierce, 20-22 June 2000

Mission Statement: develop a prioritized list of research recommendations for consideration by the Citrus Canker Technical Advisory Task Force

## Research Recommendations for Citrus Canker

### 1 Chemical

- 1.1 Evaluation of ISR Related to ccA
- 1.2 Application Methods for Chemicals – Aircraft et al
- 1.3 Investigation of Curative and Preventative Properties of Microbicides
- 1.4 Combinations of Chemical Controls with Copper – IPM
- 1.5 Asian Citrus Leaf Miner

### 2 Cultural Control

- 2.1 Effect of Irrigation and Spray Practices on Disease Increase

### 3 Biological Control

- 3.1 Xanthomonas Control with Bacteriophages to Decrease Inoculum
- 3.2 Use of Antagonistic or Site-competitive Microorganisms
- 3.3 Interaction of A and B Strains of Citrus Canker and Their Competition

### 4 Remote Sensing and Spectral Analysis

- 4.1 Proof of Concept of Spectral Analysis to Citrus Canker
- 4.2 Low Level Spectral Characteristics
- 4.3 Application to Finding Citrus Canker / Citrus Trees
- 4.4 Focus on Aircraft-based Hyperspectral Analysis

### 5 Detection Technology

- 5.1 Prove Canines can Differentiate Citrus Canker
- 5.2 Visual Detection – Sensitivity & Reliability
- 5.3 Electronic Noses - Pathways for Citrus Entry
- 5.4 Electronic Noses - Application to Citrus Canker Detection
- 5.5 Quantitative PCR to Detect Non-culturable Citrus Canker
- 5.6 Microarrays to Detect Host Response prior to Lesion Development
- 5.7 High Throughput of PCR for Citrus Canker Detection
- 5.8 Improved Detection Sampling Designs

### 6 Citrus Resistance

- 6.1 Knowledge of Pathogen-based Resistance
- 6.2 Genomic Comparisons - Resistance Responses
- 6.3 Citrus Resistance Triggers and Map-based Cloning
- 6.4 Transgenic Citrus with Resistance Genes from Citrus and other Plants and Organisms
- 6.5 Generation of Resistant Germplasm
- 6.6 Performance of Resistant Cultivars from Worldwide Sources
- 6.7 Genetic Characterizations of Resistance in Citrus
- 6.8 Rutaceae Susceptibility to Citrus Canker

The workshop was an invitational meeting of leading scientists conducting research on citrus canker, scientists and administrators of state and federal regulatory agencies, and key representatives for the commodity groups in the citrus industry. Invited scientists were charged with developing a prioritized list of research recommendations for the Citrus Canker Technical Advisory Task Force. The FCCTATF is a research, regulatory, and industry partnership charged with the ongoing review of the Citrus Canker Eradication Program to recommend the most appropriate course of action to stop the spread, and ultimately eradicate, citrus canker from the State of Florida. This was a vocal vote with Drs. Tim Gottwald, Laurene Levy, and Wayne Dixon abstaining.

International Citrus Canker Research Workshop  
Ft. Pierce, 20-22 June 2000

## 7 Citrus Breeding

- 7.1 Develop Markers for Selection in Breeding Programs Linked to Resistance
- 7.2 Differentially Expressed Genes - ccA EST or cDNA Library
- 7.3 Exploitation of Resistance Gene Candidate Sequences Already Cloned from Citrus

## 8 Differentiation / Characterization of ccA Strains

- 8.1 Standardization and Quality Assurance:
  - Ring test and methods of certification; global web site
- 8.2 Establish International ccA Collections / Repositories
  - Permanent Florida, national (Beltsville), and international locations
  - Funding and collection size
- 8.3 Develop Rapid Strain Differentiation Techniques
- 8.4 Strain Characterization for Origin

## 9 Pathogenesis

- 9.1 Nature of Mesophyll Resistance to ccA
- 9.2 Xanthomonas Genomics and Functional Analysis
  - Identification of genes necessary for 1) infection and
  - 2) induction of resistance expression due to infection

## 10 Survival

- 10.1 Survival of Bacterium in Packing Container
- 10.2 Probability of Transmission from Fruit and or Plant Materials Disinfested
- 10.3 Survival of Bacterium on Lesioned or Lesionless Plant Tissues
- 10.4 Use Dilution Strength, Biodegradable, Bactericide
  - Develop all-purpose disinfectant

## 11 Economics

- 11.1 Economic Analysis
  - Economic losses due to restricted movement
  - Conclusive science to achieve a defensible position related to risk of fruit movement (risk assessment: Florida's white paper, in part)
  - Economic analysis of lost markets (domestic and international)
  - Economic benefit of defoliation vs tree removal
  - Economic analysis of control measures
  - Phytosanitary systems for fruit movement from quarantine areas

## 12 Transgenics

- 12.1 Differentially Expressed Libraries to Identify Promoters

## 13 Genomics

- 13.1 Differentially Expressed Libraries in Response to Asian Citrus Leaf Miner feeding

The workshop was an invitational meeting of leading scientists conducting research on citrus canker, scientists and administrators of state and federal regulatory agencies, and key representatives for the commodity groups in the citrus industry. Invited scientists were charged with developing a prioritized list of research recommendations for the Citrus Canker Technical Advisory Task Force. The FCCTATF is a research, regulatory, and industry partnership charged with the ongoing review of the Citrus Canker Eradication Program to recommend the most appropriate course of action to stop the spread, and ultimately eradicate, citrus canker from the State of Florida. This was a vocal vote with Drs. Tim Gottwald, Laurene Levy, and Wayne Dixon abstaining.

International Citrus Canker Research Workshop  
Ft. Pierce, 20-22 June 2000

## 14 Epidemiology

- 14.1 Dispersal Studies at Field Scale (multinational):
  - Large vs small scale
  - Sampling Methods / Technology
  - Visual survey efficiency
  - Deployment of survey and sampling technologies (coordination)
- 14.2 Meteorological Events and their Distance of Spread
  - Effects on development of disease
  - Evaluation in Different Cultural Settings
  - Local, international, greenhouse / laboratory
- 14.3 Control studies within an Endemic / Epidemic
  - Eradication Campaign – Epidemic
  - Management – Endemic: surrogate organisms, environmental variations
  - Application and impact of windbreaks, defoliation techniques
  - Pre-eradication inoculum suppression techniques – defoliation, tarping
- 14.4 Insecticide / Microbicide / Surfactant Influences
  - Enhance disease expression on trap plants using surfactants
  - Cuticle studies for adjuvants and penetrants for systemic chemical delivery
  - Microbicide as prevention of inoculum transfer using local or systemic compounds

Dixon, W.N., L. Levy, and T.R. Gottwald. 2000. Proceedings of the International Citrus Canker Research Workshop. June 20-22, 2000. Ft. Pierce, FL

The workshop was an invitational meeting of leading scientists conducting research on citrus canker, scientists and administrators of state and federal regulatory agencies, and key representatives for the commodity groups in the citrus industry. Invited scientists were charged with developing a prioritized list of research recommendations for the Citrus Canker Technical Advisory Task Force. The FCCTATF is a research, regulatory, and industry partnership charged with the ongoing review of the Citrus Canker Eradication Program to recommend the most appropriate course of action to stop the spread, and ultimately eradicate, citrus canker from the State of Florida. This was a vocal vote with Drs. Tim Gottwald, Laurene Levy, and Wayne Dixon abstaining.