Deployment of Disease Resistant or Tolerant Citrus Rootstocks and Scions

Project Organization Update
October, 27th 2016
Introduction: Goals for CRDF related to HLB

- Support accelerated development and deployment of HLB-tolerant/resistant rootstocks and scions
- CRDF has committed funding to research for solutions
- Investment in research also comes from gov’t programs, industry organizations, private companies and individuals
- There is need to understand the output from this investment
Outcomes from NAS Strategic planning HLB

• Support development of transgenic HLB-resistant and ACP-resistant citrus
• Develop a funding program with a guidance board
• Assemble team to develop and evaluate transgenic HLB-resistant citrus
• Develop strategies to support freedom to operate
Outcomes from Knowledge Mapping II

• Collaboration among CRDF, researchers, growers and industry partners
• Pipeline for potential HLB-Resistant candidates
• Plan combined side by side field trials with grower involvement
• Regulatory and IP considerations and approvals
• Timely delivery of varieties to growers
Program manager goals

• Past: Citrus research and production pre-HLB
• Recent Past: Strategic planning for the Florida Citrus Industry addressing HLB and Knowledge mapping II outcomes
• Present:
  • Short and long term HLB solutions
  • Project proposals and progress reports
Program Manager activities

- Meetings with UF and USDA/ARS breeders
- Reading proposals and progress reports
- Meeting faculty to learn about research activities
- Breeders and statisticians in other systems
- Visits to CRDF, USDA-ARS, UF, and grower field trials
- Transformation facility visits
- Extension outreach events, Citrus Expo
- Commercial nursery production
- Meeting growers and production managers
Citrus conventional and genetic engineering

• Difficulties generating genetic diversity, long juvenile periods and strict standards for traits of interest
• Biotechnology can present a quicker path to disease resistance
• Conventional and genetic engineering should work in concert
• Many organizations and individuals involved
Conventional Breeding (UF, USDA/ARS)

- Meetings with Researchers to understand programs
- Program pipelines
- Important traits and evaluation criteria
- On-going and planned field trial goals
- Potential candidates for advanced CRDF field trials
- Evaluation of candidates in CRDF trials to speed up release of potential varieties
Conventional Breeding (Outcomes)

• Discussions reveal biological challenges of citrus
• Different philosophies of breeding, research, and program pipelines
• Complexity - multiple programs with overlapping goals, working independently
• Selection criteria discussed reveal prioritization differences
• Selection criteria evaluated differently among individuals
Conventional Breeding (Outcomes)

- Many existing field trials with mixed goals
- Definition of later stage field trials varies
- Resources and planning for data collection – unclear
  - Grower trials
  - MAC trials
New Field Trials

- Grower trial
  - Randomized, replicated, 2 sites
  - < 2 years old, Hamlin and Valencias on many rootstocks
  - Requires resources for data collection

- MAC funding covers planning and tree propagation

- Rootstocks (MAC)
  - 2 trials, planned over 2 years, different experimental rootstocks
  - 6 Locations
  - Requested CRDF support for data collection

- Scion Trial 1 (MAC)
  - Fresh fruit Scions
  - 12 Diverse rootstocks (TBD)
  - Small trial: 3 sites, 7 reps, 3 trees per plot
  - Growers (TBD)
New Field Trials

- Scion Trial 2 (MAC)
  - 30 Experimental SO and SO-Like
  - 10 Mandarin
  - 1 rootstock, 3 sites, 3 reps, 70 trees/plot
  - Growers (TBD)
- Assumes grower cooperator operation cost
- Request CRDF assistance with planting logistics and data collection
- Define criteria for MAC trial candidates
- Define requested CRDF support
- Define grower involvement (CRDF Goal)
Conventional Breeding (Outcomes)

- Define criteria for MAC trial candidates
- Define requested CRDF support for trial management
- Define grower involvement (CRDF Goal)
- Recently planned or planted field trials with most promising rootstocks and scions appear to lack planning and resources for data collection
- Mixed thoughts from researchers about establishing CRDF advanced field trials at this time
- Unclear if at present we can/should proceed with CRDF large-scale field trials
Genetic Engineering (Various Researchers)

• Read project proposals and progress reports Determine resources available to researchers
• Current pipeline (?) in the Core (Juvenile) and Mature Citrus transformation facilities
• Discussion of evaluation of transgenic materials with some researchers
• Molecular and greenhouse characterization
• Preliminary and advanced field trials
• Pipeline for transgenics for development and deployment, including regulatory concerns, consumer education and IP
Genetic Engineering (Outcomes)

• Project proposals reveal some overlap of project goals
• Characterization protocols not well defined
• Regulatory guidelines from USDA-BRS, FDA and EPA should inform protocols
• Molecular and phenotypic characterization protocols should be standardized
• Data collection at the all stages of development critical to deregulation
• Stage of testing of current transgenic materials unclear
Genetic Engineering (Outcomes)

• Provide researchers with information about resources available
  • Contacts for permits and general regulatory procedures
  • Transformation laboratories
  • Permitted sites
Gene candidate submission and transformation
CTF and MCTF

Molecular characterization

Greenhouse characterization

Preliminary field trial and characterization

Large scale field trial

Work with regulatory agencies for release

Release and commercialization of transgenic variety

Collection of Data to facilitate deregulation, IP, Release

Consumer relations, advertising
Summary

- Information on research findings will be curated and organized
- Quantify stage and number of field trials
- Develop standardized evaluation protocols for citrus
- Collaboration should be facilitated and encouraged across groups
- Decisions on allocation of resources to collect data on field trials are critical
- Stewardship of projects has the best chance of success in a complex environment
Thank you!

CRDF is proud to provide support to the Florida citrus industry.