

# Collaboration for Plant Pathogen Strain Identification - CPPSI

A science-based, vegetable seed industry initiative to standardize the identification of plant pathogen strains and races based on sets of host differentials and reference plant pathogen strains

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# Vegetable Seed Industry Issues:

- Consistent identification of plant pathogen strains and races is a recognized need for the seed industry, regulatory agencies and academia
- There is no recognized global body that regulates the consistent naming of plant pathogen strains and races
- Gaps in naming of plant pathogen strains in claims of resistance exist between the US and the EU
- Until recently, no North American based organizations existed to address strain identification issues with organizations in Europe



# ISF – APS Initiative for Plant Pathogen Strain Identification

- Develop a US based network of seed industry companies, private, public and government research laboratories that would help standardize the identification of plant pathogen strains used in claims of disease resistance
  - Technical working group
  - Complement existing systems in Europe (IBEB, NAKT, and SNES GEVES)
  - Comply with US and international regulatory requirements for pathogen and seed movement
- Establish guidelines for consistent identification of pathogen strains and races:
  - Encourage global use and acceptance by the scientific community
- August 2007, APS – ISF ad hoc committee was formed to develop, propose and implement this network

# ISF APS Initiative Goals:

- Identify key components of a US-based system that can be accessed by the international community
  - Website for access
  - Administrative management and coordination
  - Host differentials
  - Reference pathogen strains
  - White papers
  - Funding
  - Base of operations
- Research established harmonization programs in Europe
- Establish guidelines for consistent identification of pathogen strains and races
  - APS Focus Groups of recognized disease/pathogen experts
  - Host range, sequence homology, resistance genes
  - Acceptance and use of guidelines by the scientific community
- Pilot program to demonstrate system function

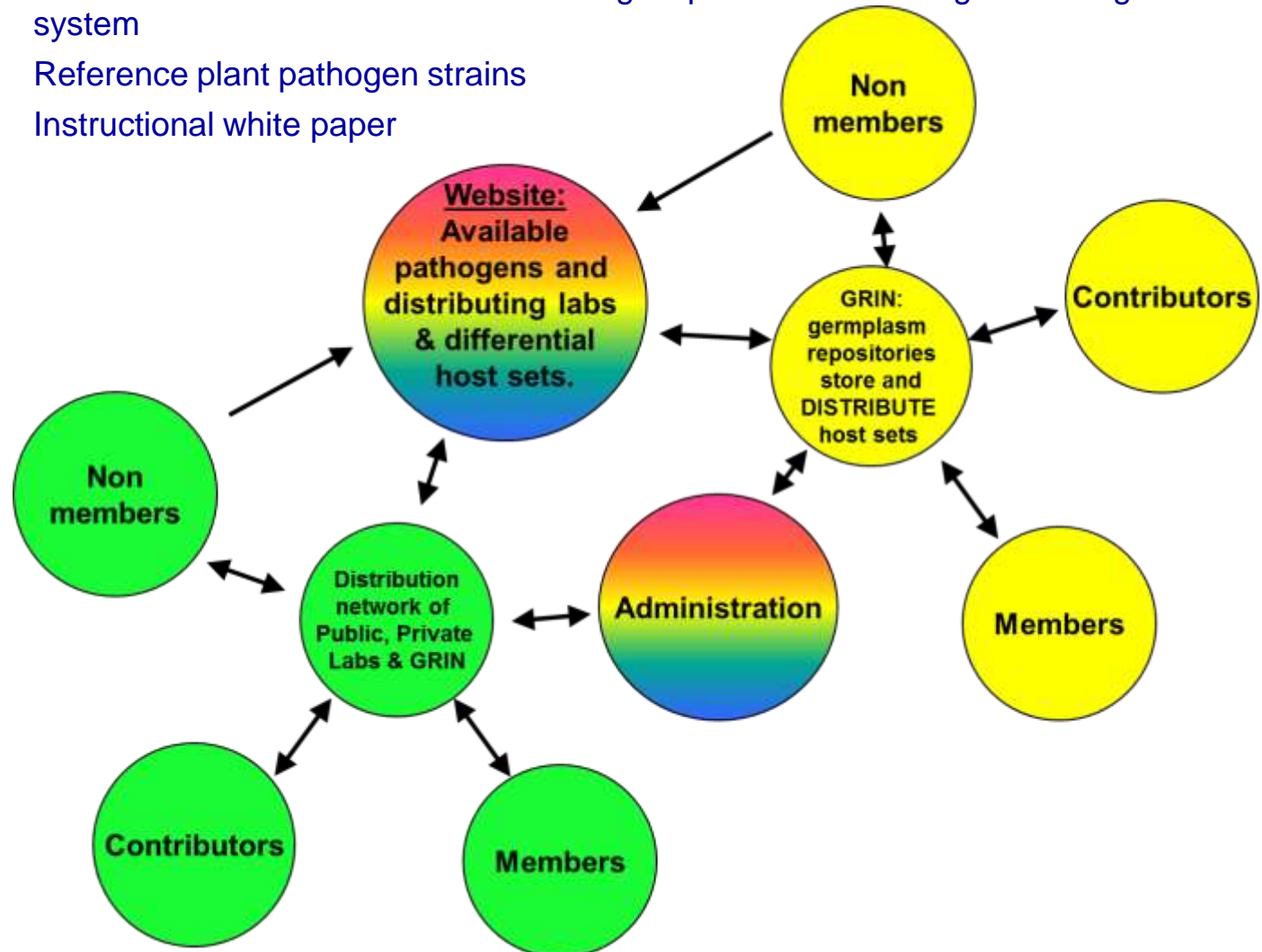
# Value to the Seed Industry, Academia and Registration Associations

- Provides a reference tool for consistent identification of plant pathogen strains
- Builds confidence and clarity in disease resistance claims
- Comparison to an industry standard allows for improved 'due diligence' for resistance claims which may reduce liability
- Early warning of new / re-emerging pathogen strains that overcome resistance
- Provides a reference baseline to determine pathogen strain virulence
- Serves as a repository for differential host and pathogen strain collections of retiring experts



# ISF – APS Progress:

- Double 'Hub and Spokes' system of collaborators developed by 2009
  - Sets of differential hosts each containing a specific resistance gene for a given disease system
  - Reference plant pathogen strains
  - Instructional white paper



# Criteria for differential host sets and reference pathogen strains

- Disease resistance system is important to the seed industry
- Claims of disease resistance are made in commercial varieties
- Resistance genes are characterized
- There were no additional confounding factors in expression of resistance (pesticide resistance)
- MTA possible if targeted gene is in commercial hybrid
- Low hanging fruit that fit the above criteria

# What is a white paper?

- Disease background
- What does the disease look like?
- Genetics of resistance
- How to prepare inoculum & inoculate plants
- Susceptible and resistant responses in a seedling test
- How to order seeds, reference pathogen strains
- Who to contact for more information or questions



# CPPSI Evolution and Progress:

- Four pilot disease sets were developed and launched in 2012 and 2013 – system up and running on the ISF website
  - Tomato Tobamoviruses
  - Pepper Bacterial Spot
  - Melon Fusarium Wilt
  - Spinach Downy Mildew
- Requests for seeds and reference pathogen strains
- Over time CPPSI evolved from an ISF / APS based effort to one supported by seed company members of ASTA.
- 2014 CPPSI was recognized by APS as a subcommittee to the APS Committee on Collections and Germplasm
- 2014 Launched [www.CPPSI.org](http://www.CPPSI.org)
- 2014 Business Plan Developed



# Business Plan Priorities

ASTA Board of Directors approval of Business Plan

- Secure start up funding
- Partner with a public or private entity for a base of operations
- Hire a director to manage and grow CPPSI

# 2014 - 2015: Implement the Business Plan

- Partnered with UC Davis Seed Biotechnology Center to support, manage and help launch the CPPSI program:
  - Tomato Tobamoviruses
  - Pepper Bacterial Spot
  - Melon Fusarium Wilt
  - Spinach Downy Mildew
- Secured funding for three years from ASTA members: Seven vegetable seed company founding supporters
  - Advisory Council established: seed industry sponsors, EU registration colleagues
- Hired a CPPSI director in July, 2015



# Continued Implementation of the Business Plan

- Aggressively develop additional differential host sets
- Secure continued funding through additional memberships (and by extension additional funded projects that the founding members would approve)
- Outreach to inform researchers, regulatory bodies and trade organizations about CPPSI
- Reach out to our EU counterparts to build a strong foundation of collaboration and cooperation.

## 2015 - Continued Progress

- Aug – Oct met with Seed Industry Sponsors, ESA, NAKT, ISF, GEVES-MATREF, IBEB, IWGP & Plantum
  - Launch of CPPSI as a sustainable entity
  - Build a strong foundation for collaboration & cooperation
- Actions to facilitate cooperation with EU associations and organizations
  - **KEEP LINES OF COMMUNICATION OPEN**
  - **Ring tests:** Tomato ToMV with GEVES MATREF – Equivalent resistance responses
  - **Webinars:** NAKT – Jan 21, 2016; GEVES – March 17, 2016
  - Joint projects around levels of resistance, reference strains
  - Participate in the ISF reorganization of their resistance nomenclature & harmonization project – April 14, 2016

**ISF**  
(Codes, abbreviations, and definitions)

**Characterization**

**IBEB - EU**  
(International Bremia Evaluation Board EU)

**IBEB - US**  
(Bremia Evaluation Board US)

**IWGP**  
(International Working Group on *Pernospora farinosa* f.sp. *spinacia*)

**Plantum**  
(Dutch Association)

**Registration**

**ESA**  
(European Seed Association)

**CPVO**  
(Community Plant Variety Office)

**Other**  
Seed Associations

**Harmonization  
(or Reference Material)**

**MATREF**  
(Material of Reference within GEVES)

**CPPSI**  
(Collaboration for Plant Pathogen Strain Identification)

**NAKT**  
(Naktuinbouw)

## 2015 – 2016 Next Steps

- Developing the next generation of differential host sets and reference pathogen strains and lining up knowledgeable expert partners for white paper development
  - Lettuce Downy mildew – Nicki Philips
  - Watermelon Fusarium wilt – Craig Sandlin
  - Tomato TSWV – Elisabetta Vivoda, Staci Rosenberger, Phyllis Himmel
  - Pepper TSWV - Elisabetta Vivoda, Staci Rosenberger, Phyllis Himmel
- Continued outreach to new and continuing sponsoring members to expand our financial support base
- Developing a pricing structure and strategy for the packages of host sets, reference pathogen strains and white papers that is compatible with the University of California
- Website updates and revisions
- Developed a logo

# WG Members

- Phyllis Himmel (Chair) – UC Davis – Seed Biotechnology Center
- Elisabetta Vivoda – HM Clause
- Craig Sandlin - Syngenta
- **William Dolezal – DuPont / Pioneer Hi-Bred, Inc.**
- Lindsey du Toit – Washing State University
- Kimberly Webb – USDA ARS
- Stephanie Greene - USDA ARS, Plant Genetic Resources Conservation
- Staci Rosenberger– Monsanto Vegetable Seeds
- Nicki Philips – Enza Zaden
- Phil Brown – Sakata
- Mark Ricker – Bayer Crop Sciences Vegetable Seeds





# Advisory Council

- Kees van Ettehoven – Naktuinbouw
- Valerie Grimault - GEVES
- Stephanie Christien – GEVES
- Szabolcs Ruthner – International Seed Federation
- Thierry Jaunet – ESA Phytopathology Committee
- John Schoenecker – HM Clause, American Seed Trade Association
- Pablo Quijada – Monsanto Vegetable Seeds
- Rick Falconer – Rijk Zwaan
- Rob Keene – Enza Zaden
- David Armstrong – Sakata
- Stacy Woodruff - Bayer Crop Sciences Vegetable Seeds
- Teresa Mitzel - Syngenta
- Ric Dunkle - American Seed Trade Association

# Thank you!



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