



What is next for the APS – ISF Collaboration to Standardize the Identification of Pathogen Races and Strains using Differential Hosts?

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Today:

- ▶ The ISF – APS Initiative & Goals
- ▶ Pathogen Strains & Claims of Resistance
- ▶ The Host Differential System
- ▶ Benefits
- ▶ Progress to Date & Next Steps
- ▶ Why Support is Needed

The ISF – APS Initiative:

- ▶ A US based network of seed companies, private and public research laboratories for distribution of seeds of differential host sets and reference pathogen cultures to facilitate standardization of the identification of plant pathogen races and strains
 - Complement existing systems in Europe (IBEB, NAKT, and SNES/GEVES)
 - Comply with US regulatory requirements
- ▶ Establish guidelines for consistent identification of pathogen strains and races
 - Encourage global use and acceptance by the scientific community
 - APS Focus Group of recognized disease/pathogen experts
- ▶ August 2007, APS – ISF ad hoc committee was formed to develop, propose and implement this network

Initiative goals:

- ▶ Establish a system of host differentials and reference pathogen strains that the seed industry and all researchers would use to identify pathogen races and strains
- ▶ Develop a US-based network of seed companies, private and public research programs for the maintenance, storage and distribution of reference pathogen strains and seeds of differential hosts that can be accessed by the international community
- ▶ The network will complement existing systems based in Europe:
 - International Bremia Evaluation Board (IBEB)
 - International Working Group on Peronospora (IWGP)
 - MATREF in France
 - Plantum / Naktuinbouw Isolate Group in the Netherlands
- ▶ The network complies with US regulatory requirements (USDA Animal and Plant Health Inspection Service).

Strain ID & naming practices in use today

- ▶ There is no internationally recognized authority for naming new pathogen races and strains
 - Most pathogen races and strains are named independently
- ▶ Until 1998, pathotype naming of lettuce *Bremia lactucae* and spinach *Peronospora farinosa* proceeded independently
 - International Bremia Evaluation Board – lettuce *Bremia* pathotypes
- ▶ Naktuinbouw (NAKT)
 - Spinach *P. farinosa* races
 - Variety registration; reference pathogens
- ▶ French National Seed Station/Group for Control and Testing Varieties and Seeds (SNES / GEVES)
 - Vegetable variety identification and registration
 - Reference pathogens and differential host sets
- ▶ ISF posts sets of differential hosts on its website
 - http://www.worldseed.org/en-us/international_seed/pathogen_coding_3.html
 - Contacts for seed inquiries are posted
 - Unable to guarantee seed availability

Strains and Claims of Resistance:

- ▶ Disease resistance can play a key role in vegetable crop production and integrated pest management practices
- ▶ Stacked resistance traits are also an effective sales tool between competing seed companies
- ▶ Resistance genes may be effective against all or some strains of a pathogen
- ▶ Consistent naming of pathogen strains builds stakeholder confidence in product performance under disease pressure
- ▶ Members of the seed industry, ASTA, APS, ISF and the USDA /ARS determined that a US based system to facilitate consistent identification of pathogen strains and races was needed

Critical Components

- ▶ **Web based access to differential host sets and reference pathogens**
 - What is available, how to order hosts and pathogens
 - Forum for feedback on function
 - Linked to ISF, ASTA and APS websites
- ▶ **Differential host sets**
 - Free distribution through USDA / ARS germplasm centers
 - GRIN with key descriptor = ISF
 - Seed companies contribute subsets of differential hosts to germplasm centers
 - Seed increases
 - Phytosanitary inspections and SBD assays
 - Functional traits verified
- ▶ **Reference pathogen strains and races**
 - Network of public and private laboratories supplying reference pathogen strains for a fee.
 - Purity
 - Virulence
 - Expedited ISF ePermits

Critical Components

- ▶ **Administrative and Financial Support**
 - Website updates
 - System oversight and expansion
 - Seed inventory management
 - Develop and distribute reference pathogens
 - Feedback & follow up on issues/questions
 - Link host and pathogen distribution systems

- ▶ **Similar Systems Currently in Place**
 - Leafy Greens Marketing Agreement Advisory Board & Members
 - National Seed Health System
 - International Seed Health Initiative – Vegetables

How will it work?

One integrated web based network under administration by APS, ISF and/or ASTA



Anticipated Benefits

- ▶ Reliable access to differential hosts and reference pathogen strains for calibration of local pathogen isolates.
- ▶ Consistency in naming of pathogen strains facilitates realistic expectations of performance under disease pressure
- ▶ Reliable claims of disease resistance builds grower and customer confidence in these resistance claims

Progress from 2007 - 2012:

- ▶ APS-ISF Differential Host System developed 2009 and implemented in 2011
- ▶ Met with APS focus groups of disease / pathogen experts
- ▶ Met with APHIS, State Regulatory Agencies
- ▶ Differential host access system set up in GRIN 2010
- ▶ Spinach, pepper and melon seed deposited at the USDA germplasm center in Griffith, GA and listed in GRIN.
 - Tomato almost completed
- ▶ Reference pathogen sources secured via partnerships 2011
 - Pepper Bacterial spot Spinach Downy mildew
 - Melon Fusarium wilt Tomato Tobamoviruses almost completed
- ▶ ISF supported Web Site developed and implemented 2011
- ▶ Requests coming in – 2011 - 2012

Why Support is Needed

▶ **Crossroads**

- 100% volunteer effort dependent on in kind support from the seed industry
- Slow but steady progress
- Expansion to other hosts cannot be supported by existing volunteer structure

▶ **Administrative and Financial Support**

- Website updates
- System oversight and expansion
- Seed inventory management
- Develop and distribute reference pathogens
- Feedback & follow up on issues/questions
- Link host and pathogen distribution systems
- Initiate next round of differential host sets and reference strains

Actions needed:

- ▶ **Permanent home for website**
- ▶ **Administrative Support**
- ▶ **Financial backing to support reference strain development**

Members* of the APS-ISF Ad Hoc Committee

- ▶ Phyllis Himmel (Chair) – Marrone Bio Innovations
- ▶ Elisabetta Vivoda – Harris Moran
- ▶ Radha Ranganathan – International Seed Federation
- ▶ Craig Sandlin – Syngenta
- ▶ William Dolezal – Pioneer Hi-Bred, Inc.
- ▶ Lindsey du Toit – Washing State University
- ▶ Kimberly Webb – USDA ARS
- ▶ Narceo Bajet– Eurofins labs, Inc.
- ▶ Kees van Ettehoven** – Naktuinbouw
- ▶ Valerie Grimault** – GEVES / Valerie Cadot – GEVES
- ▶ Gary Pederson – USDA ARS, Plant Genetic Resources Conservation Unit
- ▶ David Ellis – USDA ARS, Culture Collection, Ft Collins, CO
- ▶ Ric Dunkle – American Seed Trade Association
- ▶ Staci Rosenberger – Monsanto Vegetable Seeds

* Members represent the interests of APS, ASTA and ISF

** Consulting members



THANK YOU

QUESTIONS?

Extra Slides

Supporting organizations

- ▶ **APS** American Phytopathological Society: a non-profit, professional scientific organization dedicated to the study and control of plant diseases
- ▶ **USDA / ARS** US department of Agriculture/ Agricultural Research Service
- ▶ **ASTA** American Seed Trade Association; 850 company members involved in seed production and distribution, breeding and related industries in North America. Advocate of science and policy issues of industry-wide importance.
- ▶ **ISF** The International Seed Federation represents the global seed trade in over 70 countries and serves as an international forum for issues of interest to the global seed industry.
- ▶ **NAKT** In the Netherlands, the Naktuinbouw verifies, stores and distributes 'standard' pathogens to seed companies.
- ▶ **SNES / GEVES** The French National Seed Station and the Group for Control and Testing Varieties and Seeds cooperate to store, verify and distribute pathogens and sets of pathogen differentiating hosts

Existing Systems

- ▶ **NAKT** In the Netherlands, the Naktuinbouw verifies, stores and distributes ‘standard’ pathogens to seed companies (Dutch seed companies declined to participate in distribution of differential hosts).
 - Seed company members pay an annual fee for this service
 - Members share the responsibilities of maintaining and increasing pathogen cultures held in the NAKT collection
 - Members are not charged for pathogen cultures, non members are charged for pathogen cultures
 - NAKT runs internal tests across differentiating hosts to verify pathogen strain activity. No distribution of differential hosts
 - NAKT maintains a database of requests, payments and delivery

Existing Systems

- ▶ **SNES / GEVES** The French National Seed Station and the Group for Control and Testing Varieties and Seeds cooperate to store, verify and distribute pathogens and sets of pathogen differentiating hosts
 - ▶ Seed company members pay an annual fee for this service
 - ▶ Members share the responsibilities of maintaining and increasing pathogen cultures and differential hosts held in the GEVES collection
 - ▶ Members responsible for phytosanitary testing
 - ▶ Members are not charged for pathogen cultures and differential hosts, non-members are charged for pathogen cultures
 - ▶ GEVES runs internal tests across differentiating hosts to verify pathogen strain activity
 - ▶ GEVES maintains a database of requests, payments and delivery