

A Brief Introduction to the APS/ISF project:

Initiative to Standardize Identification of Plant Pathogen Strains and Races

While the original charge developed by APS/ISF is captured in the title above, it soon became apparent to the committee that a more fundamental approach was essential to address this question. And from this realization came the following pilot project and proposal which has wide applicability for Industry and Science.

You can find detailed information on the deliverables that have been piloted to date at:
http://www.worldseed.org/isf/strain_identification.html

Project Summary

The goals of this initiative are to develop:

- A system to identify, collect, propagate, store and distribute the basic materials used in addressing the science behind key phytopathological issues of industry and research scientist.
 - A standard toolbox of differential host sets (DHS) composed of seed of identified plant varieties and the complementary reference pathogen strains (RPS):
 - This includes characterizing a plant varieties reaction to disease and the identification of such disease in relation to a plant variety and to each other.
- “White Papers” using the established science which identifies the materials and methodologies based on existing peer-reviewed scientific publications.
 - This information is gathered into a concise methodology for application of the DHS and RPS in identify pathogen races and strains and plants reaction to same.
- A system for maintenance and long-term storage of cultures of known, characterized RPS and seed of known, characterized DHS that can be accessed by the international community
- A US-based network of seed companies, private and public research programs working in a virtual organization for building and distributing DHS and PRS.

The network will complement existing systems in Europe such as the International Bremia Evaluation Board (IBEB), the International Working Group on Peronospora (IWGP), MATREF in France and the Plantum / Naktuinbouw Isolate Group in the Netherlands, and will comply with US regulatory requirements (USDA Animal and Plant Health Inspection Service).

What are Differential Host Sets and Reference Pathogen Strains (Races)?

DHS are sets of plant varieties used to define strains of plant pathogens based on susceptible and resistant reactions. Reference pathogen strains are known, characterized isolates of a given pathogen.

A DHS is defined by varieties from within one or several plant species that are hosts to the pathogen. For example, races of *Bremia lactucae* causing downy mildew in lettuce are determined solely by using lettuce cultivars. But in the case of root knot caused by *Meloidogyne* spp. the set is made up of several host species - tobacco, cotton, watermelon, tomato, pepper and peanut. The hosts utilized within differential sets are often existing varieties or experimental species known as indicator hosts.

Having these identified and available as a “set”, while not a high volume need, has extensive value as is apparent in looking at the cost of independently identifying the material and gathering them into a “known state” for use in testing.

System Background and Inoculation Protocols

To meet the goal of a standardized system of identifying pathogen strains based on differential hosts, this initiative compiles the methodology a “white paper” which describes the pathogen and the reaction of differential hosts to known strains of the pathogen and a . Currently four diseases (see below) have been piloted. For each disease, a protocol to screen for resistance is also provided.

There may be other protocols that differ from those recommended by a White Paper in elements such as the incubation temperatures used, number of days required for incubation after inoculation and plant age at inoculation. The protocols recommended by a White Paper have been demonstrated to be effective at identifying strains/races of the pathogen in question and resistance traits of the host cultivars.

Please visit these links for example of current White Papers: [Melon Fusarium wilt](#); [Pepper bacterial spot](#); [Spinach downy mildew](#); Tomato mosaic virus

Availability of Differential Host Sets and Reference Strains

International cooperation in identifying pathogen strains and races goes hand-in-hand with researchers around the world being able to access differential host sets and reference strains. The Initiative aims to provide seed of differential host sets and reference pathogen strains in the disease background documents listed above.

Seed of the differential hosts for each disease can be ordered online through the USDA Germplasm Resource Information Network (GRIN). Refer to the GRIN links noted in the disease background document.

For some hybrid host differentials, a Material Transfer Agreement (MTA) may be required to order seed. The GRIN order form indicate for which differential hosts an MTA is needed and the name of the person to be contacted for arranging an MTA.

See the ISF web site for information on obtaining reference pathogen strains. It is the responsibility of those requesting pathogen strains to ensure they have the necessary permits to receive the strains. Contact USDA-APHIS for additional information on permit needs.

Feedback

Researchers from all over the world are invited to join this initiative and use the differential host sets provided to identify new pathogen races and strains. If you have used any of the information or resources provided by the initiative, your feedback on new strains identified, views on the inoculation protocols, differential hosts, or any related matter is welcomed.

We want to thank these organizations and their staff for their support and direction for this project. We look forward to continued development of this project with their support and the support of others in Industry and the Sciences.

