

Horticulture CRSP Project Report

Deployment of Rapid Diagnostic Tools for *Phytophthora* on horticultural crops in Central America

Introducing rapid diagnostic tools to detect Phytophthora diseases on horticultural crops in El Salvador, Guatemala, Honduras, Nicaragua, Costa Rica, and Mexico.

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Project Summary

Plant disease is a limiting factor in agricultural production in Latin America. Plant pathogens cause losses estimated to be as high as \$30 billion per year in the tropics alone. The risk of new introductions of *Phytophthora* species with trade requires continued monitoring and improved diagnostic capabilities. We have produced a platform of tools needed to detect, identify, and ultimately prevent the spread of species of *Phytophthora* (with a major focus on common and high threat species of *Phytophthora*) on horticultural crops from Central America. In this Immediate Impact Project, we deployed a series of diagnostic technologies to 23 diagnosticians from 9 countries at a *Phytophthora* diagnostics workshop held in San Jose Costa Rica in June 2010. These technologies included a protocols book, a computer based Lucid key to the species of *Phytophthora*, molecular and digital diagnostic identification systems to identify *Phytophthora* species and improve the diagnostic capabilities for important plant disease clinics in the region. Our work has had impact in the region and beyond as we trained a network of diagnosticians to survey *Phytophthora* diseases on horticultural crops and expanded the network into South America through the inclusion of participants from Peru and Chile. This workshop also built important connections and relationships as many of the participants had never met one another previously. We plan to continue a survey of *Phytophthora* species on horticultural crops in the region and link diagnosticians via a web-based Latin American *Phytophthora* Diagnostic Network (LAPDN). These funds also allowed us to complete the “Key to the Common *Phytophthora* species” which will soon be available by the American Phytopathological Society Press (APS Press). We presented a poster and demonstration on the diagnostic tool at the APS meeting in Hawaii in August 2011 and expect the tool to be useful for plant disease clinics around the world.



Workshop participants learn to rapidly detect *Phytophthora* species.

Project Objectives

1. Conduct a regional *Phytophthora* diagnostic workshop at the Universidad de Costa Rica and provide training in traditional morphological and molecular identification of *Phytophthora* species.
2. Deploy field based detection methods in Central American plant disease clinics for species identification in the genus *Phytophthora* including a computer based Lucid key for identification of common species of *Phytophthora*, PCR methodologies and Padlock probes and Clonediaq microarrays for common and high threat species of *Phytophthora*.
3. Use the morphological and molecular tools in conducting field surveys at NGOs, industry, and small farms managed by both women and men to identify the major *Phytophthora* species responsible for significant losses on horticultural crops including cacao, potato, root crops, and floricultural crops in Honduras and Costa Rica.
4. Provide digital diagnosis and identification system training (DDIS) for plant disease diagnosis to clinics in Central America and computer access for identification and archiving of data on the International Plant Disease Network (IPDN) and the Southern Plant Disease Network (SPDN).

Project Report Narrative

--Submitted by Jean Beagle Ristaino

The overall objective of this project was to produce a platform of tools needed to detect, identify, and ultimately prevent spread of species of *Phytophthora* with a major focus on common and high threat species of *Phytophthora* on horticultural crops from Central America. During the second quarter of the project, we held a *Phytophthora* diagnostics workshop and have deployed a series of technologies including: a protocols book, a *Phytophthora* Lucid key and molecular tools for identification for use in the diagnostic labs throughout the region. Two digital diagnostic camera systems were given to the hub laboratories at Laboratorio de Técnicas Moleculares Aplicadas a la Fitoprotección, Fundación Hondureña de Investigación Agrícola (FHIA) and Centro de Investigaciones en Protección de Cultivos, Escuela de Agronomía, Universidad de Costa Rica (CIPROC-UCR). These cameras will be used to send diseased plant and pathogen images to North Carolina's Plant Disease and Insect Clinic to improve identification of *Phytophthora* species on important crops in Central America.

The major activity within this project was to conduct a regional workshop. This workshop on the "Deployment of rapid diagnostic tools for *Phytophthora* on agricultural crops in Central America " was held June 28-July 2. The workshop organized by Jean Beagle Ristaino and Monica Blanco was a joint initiative of North Carolina State University, University of Costa Rica, Plant Research International, Wageningen and the Honduran Foundation for Research. Centro Agronómico Tropical de Investigación y Enseñanza (CATIE, Wilberth Phillips and Muriela Leandro) assisted with sample collection for the workshop .

World Cocoa Foundation, the Global Plant Clinic and CABI provided names of prospective students. Dole Foods also sent an employee who was recently hired to work on *Phytophthora* on pineapples.

The course brought together 24 plant pathologists (14 female and 10 male) from government agencies, private companies, public and private universities in 9 countries in Central and South America including El Salvador, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Mexico, Peru, and Chile. During the week, participants learned a number of "rapid" technologies to analyze and identify species of *Phytophthora* using morphological and molecular methods. In addition, the workshop participants are now part of a diagnostic network in the region called "The Latin American *Phytophthora* Diagnostic Network". Our goal "to improve and build scientific capacity in plant disease diagnostics between the

We have deployed a series of technologies including a protocol book, Lucid key, and molecular tools throughout the region. Also, we have created a regional diagnostic network that supports technicians throughout Central America.

laboratories of Central America and Mexico and improve communications with laboratories in the United States” has been achieved.

The ambitious agenda for the workshop spanned from isolation of *Phytophthora* from plant samples and water to morphological and molecular diagnostics. A detailed protocols workbook was developed and distributed to students. Pairs of students were given an “unknown species” which they ran through the series of experiments during the week to make a correct species identification. Each student was given a USB drive containing resources needed to set up their individual laboratories for *Phytophthora* diagnosis. Many of the students had not met each other prior to the workshop and are working in similar diagnostics clinics in their respective countries.

This project has allowed us to become more familiar with diseases caused by *Phytophthora* in different crops. The project collaborators have collected plant samples throughout the region and are isolating the pathogen for identification. *Phytophthora* was isolated from cacao and potato samples. *Phytophthora palmivora* was found on cacao in both Honduras and Costa Rica. A new genotype of *P. infestans* was found in Costa Rica on potato. *Phytophthora* was not identified on pineapple but further sampling is needed to confirm this. We are planning to continue collecting samples to identify *Phytophthora* species in different crops especially those like citrus and ornamentals from which we were not successful in isolating the pathogen during this project. Because of the importance of late blight (*Phytophthora*) on potatoes we will also keep working with this problem.

About Horticulture CRSP

Horticulture CRSP (funded by USAID under Award EPP-A-00-09-00004) provides funding to realize the opportunities of horticultural development, improve food security, improve nutrition and human health, provide opportunities for diversification of income, and advance economic and social conditions of the rural poor, particularly women. Horticulture CRSP is managed by the University of California, Davis and has nearly 30 projects in over 20 countries. For more information, visit: <http://hortcrsp.ucdavis.edu/>.

Project Performance Indicators

4.5.1 Agriculture Enabling Environment	Project Achievements
Number of policies/regulations/administrative procedures analyzed as a result of USG assistance.	0
Number of policy reforms, regulations, administrative procedures prepared with USG assistance passed/approved	0
Number of individuals who have received USG supported short-term agricultural enabling environment training - Female	25
Number of individuals who have received USG supported short-term agricultural enabling environment training - Male	25
4.5.2 Agriculture Sector Productivity	Project Achievements
Number of new technologies or management practices under research as a result of USG assistance.	5
Number of new technologies or management practices made available for transfer as a result of USG assistance.	5
Number of new technologies or management practices being field tested as a result of USG assistance.	5
Number of additional hectares under improved technologies or management practices as a result of USG assistance.	10,000
Number of farmers, processors, and others who have adopted new technologies or management practices as a result of USG assistance - Female	1
Number of farmers, processors, and others who have adopted new technologies or management practices as a result of USG assistance - Male	53
Number of rural households benefiting directly from USG interventions - Male Headed Household	53
Number of producers organizations receiving USG assistance.	12
Number of trade and business associations receiving USG assistance.	4
Number of trade and business associations who have adopted new technologies or management practices as a result of USG assistance.	2
Number of community-based organizations (CBO) who have adopted new technologies or management practices as a result of USG assistance.	10
Number of agriculture-related firms benefiting directly from USG supported interventions.	2
Number of women's organizations/associations assisted as a result of USG interventions.	2
Number of public-private partnerships formed as a result of USG assistance.	13
Number of individuals who have received USG supported short-term agricultural sector productivity or food security training - Female	25
Number of individuals who have received USG supported short-term agricultural sector productivity or food security training - Male	25

Capacity Building (Horticulture CRSP Indicators)	Project Achievements
Number of host country institutions, agencies and organizations in direct cooperation or collaboration	16
Number of workshops conducted for host country institution, agency, and organization personnel	1
Number of host country professionals attending workshops, training conferences, or similar - Female	25
Number of host country professionals attending workshops, training conferences, or similar - Male	22
Number of graduate degrees earned by host country as a result of Hort CRSP project - Female	2
Number of graduate degrees earned by host country as a result of Hort CRSP project - Male	2
Number of certificates earned by host country professionals - Female	14
Number of certificates earned by host country professionals - Male	10
Number of U.S. faculty providing training or instruction in host country - Female	2
Number of U.S. faculty providing training or instruction in host country - Male	3
Number of host country extension workers, university faculty or other host country professionals involved in providing training to other host country professionals - Female	5
Number of host country extension workers, university faculty or other host country professionals involved in providing training to other host country professionals - Male	12
Number of host country professionals directly involved in conduction Hort CRSP research activities - Female	3
Number of host country professionals directly involved in conduction Hort CRSP research activities - Male	5