INTERNATIONAL PLANT DIAGNOSTIC NETWORK (IPDN): gateway to IPM implementation and enhanced trade

global program

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International Plant Diagnostic Network (IPDN)

program summary

Surveys of *Ralstonia solanacearum* conducted in Bangladesh and Nepal resulted in confirmation of Phylotype I and biovar III or IV. A survey of plant diseases was done in Chittagong and Rangamathi districts in Bangladesh. Fruit flies attacking melons in southern India were collected and identified as *Bactrocera cucurbitae*, *B. caudata* and *B. tau*. *Clavibactor michiganensis* subsp. *michiganensis* (bacterial canker), *Ralstonia solanacearum* (bacterial wilt), *Candidatus Liberibactor solanacearum* (zebra chip), and *Phytophthora* spp. (root rots and blights) are important diseases of solanaceous crops in Latin America and the Caribbean. Regional meetings in Asia, Africa and LAC were conducted.

SOUTH ASIA

Expansion of networks and implementation of digital diagnostics

A list of plant pathologists in Nepal and Bangladesh was developed. One hundred digital images of various insect pests, diseases, and nematodes were documented in India. More than 150 samples from different crops from Tamil Nadu state were diagnosed. These included viral, bacterial, and fungal disease agents and various insect pests. Users from India were added to the DDIS-CIMS Network.

Development of diagnostic assays and protocols

Nagendra Subedi, a student funded by the South Asia Regional Program, modified the biovar assay for *Ralstonia solanacearum*. Using small amounts of media amended with one of three sugars or three alcohols dispensed in 96-well microtiter plates, the biovar can be determined in a few days as opposed to weeks using traditional methods.

Molecular and serological assays related to Ilarvirus, tospovirus, cucumovirus, potyvirus, and geminivirus diagnostics were standardized. Around 60 plant samples received/collected from different regions of India were diagnosed for specific viruses. Molecular assays were standardized for the identification of *Ralstonia solanacearum*. Biochemical and molecular assays were standardized for the identification of *Bacillus subtilis* and *Pseudomonas fluorescens* as biocontrol agents for the crop disease management.

Trap catches of fruit flies revealed the dominance of *Bactrocera cucurbitae*. Higher trap catches were recorded in pumpkin and ash gourd, whereas *B. caudata* was only collected from traps kept in watermelon and bitter gourd. The identification keys for the different species of *Bactrocera* are as follows.

Taxonomic keys

B. cucurbitae	*B. caudata*	*B. tau*
Forewing is with fuscous markings on cross veins	Forewing is without fuscous markings on cross veins	Forewing is without fuscous markings on cross veins
Forewing with costal band overlapping vein R 2+3 and expanded apically to form a large spot	Forewing with costal band confluent with R 2+3 and expanded slightly at apex	Forewing with costal band overlapping vein R 2+3 and expanded apically to form a large spot
Mesopleural stripe is not present	Mesopleural stripe is normal and not inverted	Mesopleural stripe is not present

Figure 1. Forewings with fuscous markings on cross veins - *Bactrocera cucurbitae*

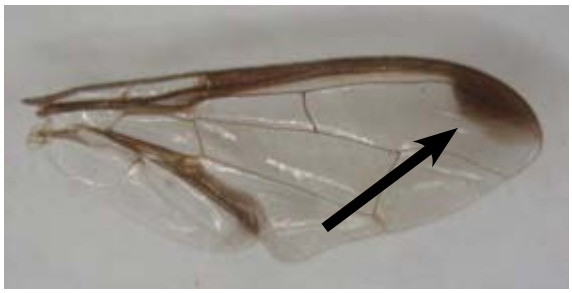

Figure 2. Wing with costal band overlapping vein R 2+3 and expanded apically to form a large spot – *B. tau*

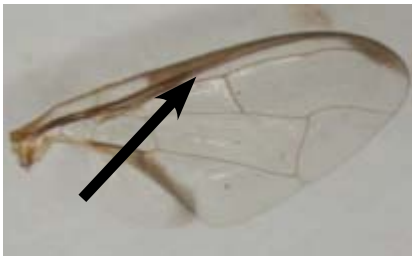

Figure 3. Wing with costal band confluent with R 2+3, and expanded slightly at apex - *B. caudata*

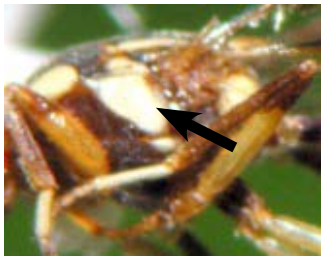

Figure 4. Mesopleural stripe not L-shaped, normal and not inverted - *B. caudata*

Figure 5. *B. cucurbitae*. Fuscous markings marked by arrow.

Figure 6. *B. caudata*. Slightly expanded coastal band marked on top, mesopleural stripe marked below.

Report of new diseases and pests and develop incidence maps

Infection of *Peanut bud necrosis virus* on eggplant (*Solanum melongena*) was documented.

Over 90 strains of *Ralstonia solanacearum* were collected from Bangladesh and Nepal and characterized. All were phylotype I and biovars III or IV. Six clonal groups were determined using molecular fingerprinting.

The occurrence of various insect pests and diseases of field crops has not been determined in Bangladesh. Due to global climate change, different pest and disease profiles may develop. A study was undertaken to collect and identify new and previously recorded diseases of vegetable crops from Chittagong and Rangamati. In Rangamati, the intensity of vegetable cultivation was low, however yard long bean was found widely cultivated. In Chittagong and Rangamati, the incidence of black leaf mold of yard long bean was 70% and 60%, respectively. The incidence of OYVMV in hybrid okra (Parash from China) was 4%-5% compared to an incidence of 96%-98% in the local cultivar of okra. The incidence of bacterial wilt of eggplant was 20% in Mirersarai, Chittagong.

Development of Standard Operating Procedures (SOPs)

The SOP for PBNV (tospovirus) in tomato is in progress.

LATIN AMERICA

Expansion of networks and implementation of digital diagnostics

Jose Ochoa from INIAP Ecuador participated in the bacterial canker workshop held in Guatemala City, June 28–29, 2012. Issues of confidentiality are important concerns for laboratories to use the DDIS technology. Users from Guatemala were added to the DDIS-CIMS Network.

Prioritization of crops, pathogens and pests

Clavibacter michiganensis subsp. *michiganensis* (bacterial canker), *Ralstonia solanacearum* (bacterial wilt), *Candidatus Liberibacter solanacearum* (zebra chip), and *Phytophthora* spp. (root rots and blights) are by far the most important diseases affecting tomato, potato, and peppers this year. The bacterium *Candidatus Liberibacter solanacearum* and its psyllid vector *Bactericera cockerelli* are becoming a very important concern for Guatemala and Central American region, because of the threat they represent for solanaceous crop production (tomatoes, potatoes, and peppers).

A meeting was held June 25–27, 2012, with the IPM CRSP LAC project in Sololá, Guatemala. The main objective was to overview current activities and progress; presentations were given by each country team (Ecuador, Honduras and Guatemala). Presentations were also made on global themes including viruses, IPDN, and impact assessment. U.S. university collaborators identified and discussed several areas of collaboration across countries and programs. During this trip, members of the IPM CRSP LAC project including J. Alwang, G. Norton, E. Gugino, R. Muniappan, L. Vaughan, S. Tolin, M. Palmieri, M. Arevalo, and S. Miller visited Dr. Adam Silagyi at the USAID mission in Guatemala City. They informed Dr. Silagyi about the IPM CRSP and IPDN activities going on in Guatemala and the region. The team also participated in a workshop organized by FAS and IICA to build linkages between IPM CRSP and local agricultural researchers.

Development of Standard Operating Procedures (SOPs)

Bacterial canker and bacterial wilt SOPs are in progress.

EAST AFRICA

Expansion of networks and implementation of digital diagnostics

Users from Kenya and Uganda were added to the DDIS-CIMS Network.

Development of Standard Operating Procedures (SOPs)

Since only some components of the standard operating procedures (SOPs) were used in the training workshop at Sokoine University of Agriculture, additional training is required for a wide array of diagnostic techniques. The SOPs had been developed on the basis of information collated from various sources, and the techniques are applicable under varying circumstances. Therefore, the practicability and effectiveness of the SOPs in guiding disease management decisions need to be tested more widely with a view to identifying knowledge gaps and improvements that may be required.

WEST AFRICA

Development of diagnostic assays and protocols

Researchers determined the lengths of time that samples (DNA and RNA viruses) would remain viable for detection on Agdia, Inc. absorption strips. For a DNA virus (*Beet curly top virus*), the samples remained detectable up to 4 months, the longest time they were held. For RNA viruses and viroids, the results were more variable. For a viroid and potyviruses, the samples remained viable at least 4 months, whereas for *Tomato spotted wilt virus* and *Cucumber mosaic virus*, the samples remained viable for 2 months. These absorption strips should be a useful tool for processing and transporting samples of suspected plant viruses and viroids for subsequent detection.

Report of new diseases and pests and develop incidence maps

The first report of Taro blight in Ghana was published.

A 2012 physical survey of three fields in Dagana, Senegal, an area with serious losses to bacterial wilt in 2011, indicated that the incidence of the disease was very low. Three suspect samples were tested for bacterial streaming and were negative. Temperatures were much cooler than normal that growing season, which may have contributed to the reduced disease incidence.