

IPM Innovation Lab Trip Reports

Country Visited: Nepal

Dates of Travel: April 3-17, 2015.

Travelers Names and Affiliations: Amer Fayad (IPM IL ME, Virginia Tech) and Naidu Rayapati (Washington State University),

Purpose of Trip: Conduct a survey of virus diseases of vegetable crops for the Nepal Associate Award and conduct a workshop on “Disease diagnosis and basic plant pathological techniques for early career scientists”.

Sites Visited: Banke, Bardya, Dang, Kathmandu, Lalitpur, and Salyan districts

Description of Activities/Observations:

April 3: Travel from U.S. to Nepal

April 5: arrive to Kathmandu

April 6: We traveled to Nepalgunj (Banke district) by air. Upon arrival, we went to the opening ceremony of the “Disease diagnosis and basic plant pathological techniques for early career scientists” workshop organized at the Nepal Agriculture Research Council (NARC) Regional Agricultural Research Station (RARS), Khajura (Banke). There, we met with the deputy director of the station, the chief of plant pathology division of NARC, research scientists, local organizers of the workshop, resource persons, and participants. We delivered opening remarks for the workshop, attended the first session and discussed the major objectives and expectations of the virology section of this workshop.

The participants (29 males; 4 females) of the workshop were drawn from NARC stations across Nepal, faculty and students from the Institute of Agriculture and Animal Sciences/Tribhuvan University, Himalayan College of Agricultural Sciences and Technology, Agriculture and Forestry University (AFU), and field officers from the IPM Innovation Lab-Nepal/ CEAPRD. The participants learnt the principles of identification, isolation, and purification of bacterial and fungal diseases, and investigated extraction and testing of botanicals against fungal diseases.



Workshop participants, Khajura, Banke

We gave an overview of virus disease diagnosis, and visited the labs in preparation of the ELISA and other lab activities. We visited B. Gaun and collected samples from cucumber, pumpkin, eggplant, and bottle gourd plants showing virus-like symptoms.

April 7: We gave lectures on basics of plant virology, and symptomatology and epidemiology of plant viruses. We tested the samples collected on April 6th with Immunostrips and saved them for Immunostrip demonstration and ELISA processing.

April 8: We showed the participants a video on aphid vector “The aphid, a virus vector” and discussed various methods of plant virus transmission and spread. We also did a trial run of ELISA with samples collected on the 6th.

April 9: We brought participants to the lab and demonstrated ELISA including all steps involved (preparing buffers, grinding samples, loading the ELISA plates, incubating, washing, diluting antibodies, adding antibodies, substrates, and reading results). This was a whole day process involving several incubation periods. During those periods, we discussed the theoretical and practical aspects of ELISA and other serological techniques. We also discussed management of plant virus diseases and focused integrating these into IPM programs. We also shared copies of a review article “[Methods for the detection of plant virus diseases](#)” written by *R.A. Naidu and J. d'A. Hughes*.



Setting up ELISA

April 10: We participated in the certificate distribution ceremony in the morning. We also gave closing remarks for the workshop (even though the workshop was still going on for two additional days, the participants and local organizers wanted us to hold these two activities with us being present). We traveled to Sitapur in Banke district and visited a farmer field and an IPM IL demonstration plot with cultural practices and yellow sticky traps used in a bottle gourd crop. We collected bottle gourd, cucumber, and pepper samples showing virus-like symptoms. We processed samples and pressed on FTA cards.

April 11: We visited the Kahjura station in the morning and traveled to Bardya district. We visited a chili field and observed thrips damage. We explained to field staff and farmers that it was not virus damage and explained that heavy use of insecticides and other unidentified pesticides from local agrovets may be aggravating the problem due to thrips feeding damage. We collected an eggplant sample showing little leaf symptoms. We observed high damage on cucumber due to fruit fly. We advised farmers to remove damaged fruits from the field and use cultural methods to minimize damage. We then traveled to Salyan district.

April 12: We visited fields in Bame and collected samples from beans, broadleaf mustard and potato showing virus-like symptoms. We visited a KISAN site and noticed lack of using IPM components like *Trichoderma*, staking cucumbers. We advised farmers to stake cucumber plants to prevent fungal diseases, especially since downy mildew was causing severe damage. We traveled to Dhorchour observed chili and

tomato plants showing severe damping off damage. The farmer had his seedling nursery in the field, unprotected. Tomato plants showed insect damage to the stem.



Potato plants showing virus-like symptoms

We also traveled to Lanthi Sangramul and visited a KISAN field. We observed severe downy mildew on cucumbers. These plants were not staked. An adjacent tunnel with staked cucumbers showed a much healthier crop and we discussed the benefits of staking with KISAN field officers and farmers. We also observed severe late blight damage on potato, few potato plants showing virus-like symptoms including mosaic and curling. In one field, the farmer was using plastic trays and cocopit for growing seedlings, however no Trichoderma was used. We went to DADO IPM FFS. In that site, DADO officers taught farmers about biopesticides and biofertilizers, and the importance natural enemies. We saw 100 % virus infection in broadleaf mustard, several potato plants showing mosaic and curling symptoms, and other plants showing thrips damage. Several tomato plants showed crown rotting.



Cucumber plants showing severe downy mildew damage

In Luham, we visited 1 year old tomato crop in tunnels. Plants showed mosaic symptoms, yellowing and slight leaf curl. DADO officers had told farmers to spray cow milk to control viruses. We explained that this practice is not effective and discussed alternative methods for managing virus diseases. Samples collected from all locations were processed and pressed on FTA cards.

April 13: We traveled by to Khajura and processed several samples and pressed on FTA cards. We met with the NARC staff and briefed them about our field visits. We collected a sample from country bean showing virus-like symptoms. We traveled back to Kathmandu in the evening.

April 14: We visited a tomato commercial growing facility in Dahachowk. We collected samples from symptomatic tomato plants and broadleaf mustard. Tomato plants were showing severe leaf curl, some with yellowing, and others with necrosis. We also visited a potato field by the roadside and collected samples. All samples were processed and pressed on FTA cards.



Broadleaf mustard showing virus-like symptoms

April 15: We visited the USAID mission in Kathmandu and briefed about our workshop and field visits. We also made a PowerPoint presentation describing results from previous field visits and discussed future plans. We also visited the iDE office and assessed the visit and future plans.

April 16: we traveled back to the U.S.

Training Activities Conducted:

Training	District	Location	Male	Female
Workshop for early career scientists	Banke	NARC-RARS Khajura	29	4



Workshop participants practicing use of immunostrips in the field

Suggestions, Recommendations, and/or Follow-up Items:

Based on our previous field visits and discussions with plant pathologists at NARC headquarters and NARC Regional Agricultural Research Stations, it was apparent that virus diseases are emerging constraints to vegetable crops such as cucurbits, leafy vegetables, peppers, okra, potato, and tomato. Almost all plant virus diagnostics/ identification in Nepal is based on symptoms only. There are no trained virologists at the NARC stations or CEAPRD, KISAN offices, who can carry on project activities related to IPM strategies for management of virus diseases.

One recommendation we presented to USAID mission in Kathmandu, iDE, and NARC during our previous visit in July 2014 was to train early career scientists at NARC, especially those in the regional stations in Surkhet, Khajura, Banke, and Pokhara, in virus diagnostics/ identification. This was materialized by our collaboration with iDE and NARC with support by USAID in conducting the workshop in Khajura during this visit.

There is a still a need for training young scientists from DADO and NARC in virology and production and use of biocontrol agents. One of the observations we made was that KISAN field officers were not very aware of IPM components and packages and the transfer to farmers could use more training and effort. We learned that some possible reasons for lack of this technology transfer could be due to high turnover

rate in field officers. There is also a need for improving the supply chain of quality seed and biopesticides and biofertilizers.

We propose visiting Nepal toward the end of 2015 and conducting an additional virus survey in Banke district of Nepal in order to survey dry season tomato. We should also plan for a follow up training workshop in virus diagnostics at NARC, specifically for early career scientists in NARC system.

Summary Recommendations:

- Continue virus survey for dry season vegetable crops with a focus on tomato and cucurbits.
- Follow up on molecular characterization of virus samples collected to identify specific viruses.
- Survey weeds and other plants to identify potential alternate hosts for viruses.
- Similar to our previous year’s recommendation, iDE IPM IL staff, KISAN, and CEAPRED should advise farmers on virus disease management. IPM components include the following:
 - resistant varieties
 - healthy seedlings (growing seedlings in plastic trays with coco pith, *Trichoderma* under net covers, rouging infected plants in the first 30-40 days after transplanting)
 - using appropriate crop density
 - controlling virus vectors
 - removing infected crop residues
 - removing alternate weed hosts
 - crop rotation
- iDE/KISAN work with private companies such as Agricare and NAFSEED to improve the availability of IPM components (pheromone traps, plastic trays, coco pith or other alternative, *Trichoderma*, biopesticides, and biofertilizers) through Agrovets and local service providers.
- Advocate for commercial nurseries that can sell healthy seedlings at more affordable prices to farmers
- iDE/ IPM IL conduct training to KISAN staff and farmers in IPM field demonstration plots.
- Printing fact sheets and pest identification catalogues on IPM technologies and important diseases and insects

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