

IPM CRSP LAC Planning Meeting: Toward IPM Packages for LAC

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Lead Partner institutions:

- Purdue University
- Penn State University
- Ecuador Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIAP)
- Honduras: Fundación Hondureña de Investigación Agropecuaria (FHIA) and Escuela Agrícola Panamericana (Zamorano)
- Dominican Republic: Instituto Dominicano de Investigaciones Agropecuarias y Forestales (IDIAF)
- Guatemala: Universidad del Valle de Guatemala and AGROEXPERTOS.

LAC Objectives

- Generate and transfer effective farmer-friendly IPM packages in vegetables (solanaceous crops and cucurbits) and Andean fruits;
- Analyze and disseminate IPM information for enhanced profitability of targeted during production, processing and marketing;
- Become a regional center of excellence by building human capacity, generating IPM knowledge, and promoting adoption of IPM packages;
- Develop strong linkages between the Regional IPM project and Global theme projects to foster quicker development and use of effective IPM packages.

Crop focus

- We made a conscious decision following consultations with country partners and stakeholders to focus on crops with export potential, while not ignoring crops with food security implications
- In Central America and the Caribbean, access to export markets (US and regional) helps determine profitability of farming practices and is critical for overall growth in agriculture.

Country sites

- Two relatively mature sites: Ecuador and Honduras
 - Key pests/complexes identified
 - IPM components tested
 - Some solutions available, being tested and disseminated
- Two relatively new sites: Guatemala and Dominican Republic
 - Identified key pests
 - Identified potential IPM solutions and pathways for sharing information from other sites/regions
 - Begun establishment of field trials

Research strategy

- Year one: Continue work on focal crops (Ecuador and Honduras); survey pest complexes and management approaches for information on pest priorities, current practices, and knowledge (Guatemala and Dominican Republic).
- Year two: Testing and validation of IPM practices for Andean fruits (Ecuador), tomato and pepper (Honduras). Identify challenges and components needed for additional research. Establish field trials for key pests in Guatemala and Dominican Republic.
- Year three: Further testing and dissemination of our established IPM packages including testing and validation of newly designed IPM packages with growers (Ecuador and Honduras). Continued research on package components as necessary (All countries).
- Year four: Training in IPM practices, evaluation of impacts in grower fields. Continued refinement of packages.
- Year five: Dissemination and continual refinement of packages coupled with surveys to measure spread and impacts

Research themes: The curse of dimensionality (Honduras)

- Optimized management of potato late blight
- Best management practices for vegetable propagation and production cycles to avoid pest problems, optimize nutritional inputs, use crop residues and biorational approaches
- Variety testing: adaptation to local climates & with resistance
- IPM techniques to address bacterial wilt in solanaceous crops
- Management of root-knot nematodes in solanaceous crops and sweet potatoes
- Evaluate potential of grafting as an IPM strategy for tomatoes
- Use of rotation crops to manage bacterial diseases and root-knot nematode

Research themes: Honduras

- Management of post-harvest fungal problems in vegetables harvested in rainy season.
- Investigate the occurrence and severity of new pest problems such as the Golden nematode and design research to address the issue.
- Research on weeds and associated complexes in aphid-and whitefly-transmitted viruses.
- Extent and causes of pest complexes known to occur in target crops, for example, "zebra chip" a newly appearing bacterium (*Liberobacter sp.*), "purple top" and the link between whiteflies/ begomovirus in highland potato and tomato crops
- Identify biological control organisms (predators or parasites) that reduce vectors and have potential for local industrial production.

Example package: potatoes in Ecuador

Andean Potato Weevil
(*Premnotrypes vorax*)



IPM CRSP Research themes:

1. Evaluation of low-toxicity chemicals (e.g. triflumuron); understand of insect life cycle; biological control and etiological control (traps and bait plants).
2. Biological control (some examples): Creation of a stock of entopathnogenic fungi, identification of the effectiveness of *Beauveria* sp. & *Metarhizium*

Central American Tuber Moth (*Tecia solanivora*)



IPM CRSP Research themes:

1. Understand insect life cycle;
2. Biological control trials using baculovirus and *Bacillus thuringiensis*;
3. Effects of potato seed solarization;
4. Studies of cultural practices (e.g. different spraying pattern) and low-toxicity chemical trials

Potato diseases: late blight



IPM CRSP Research themes:

1. Develop strategies to control *Phytophthora infestans* (e.g., low-toxicity fungicides, alternate spraying regimes)
2. Develop resistant varieties

Pests and diseases: Naranjilla

Main pests: Fusarium oxysporum, Meloidogyne incognita, Phytophthora infestans, anthracnose (Colletotrichum acutatum), bacterial canker (Clavibacter michiganensis) and fruit borer (Neulocinodes elegantalis)

Fusarium oxysporum



Progress to date: Means of controlling all pests known. Outreach material produced.
IPM Tactics: grafting, seed sanitation, field sanitation, low-toxicity pesticides, traps, bio-rational controls

Ongoing research: Naranjilla

- Validation trials for grafted naranjilla
- Trials for low-toxicity control of foliar fungal diseases
- Virus to control naranjilla fruit borer (potential use in other crops)

Pests and diseases: Tree tomato

Root-knot nematode (*Meloidogyne incognita*)



Anthracnosis (*Colletotrichum gloeosporioides*)



Late blight (*Phytophthora infestans*)



Cutworm (*Agrotis* spp.)



Pests and diseases: Tree tomato

Progress to date: Means of controlling pests still being investigated

IPM tactics: Field sanitation, low-toxicity fungicides, traps, bio-rational controls for insects and diseases

Ongoing research: farmer field research on all tactics; resistance research for *Colletotrichum gloeosporioides*

Pests and diseases: Blackberry

Botrytis sp.



Downy Mildew (Oidium)



Verticillium wilt (Verticillium sp)



Pests and diseases: Blackberry

Progress to date: Means of controlling pests still being investigated

IPM tactics: Field sanitation, low-toxicity fungicides, alternative management practices

Ongoing research: farmer field research on all tactics: (i) farmer practices; (ii) INIAP-recommended package with reduced toxicity fungicides; (iii) organic control package

Current status: Guatemala

- Heavy focus on virus identification
- Field research established: challenge is to incorporate entomological research

Regional presence of viruses and fastidious bacterias, Guatemala

PATHOGEN	TOMATO	PEPPER	POTATO	WEEDS
Potyvirus	Occidental, Oriental, North-central	North-central	-----	-----
Begomovirus	-----	Oriental, North -central	-----	-----
Xylella fastidiosa	Oriental	-----	-----	-----
Liberibacter	-----	-----	Occidental	-----
TMV	Occidental, Oriental, North-central	-----	-----	Occidental, Oriental, North- central
TSWV	Occidental, North-central	Occidental, North-central	-----	-----
PLRV	-----	-----	Occidental	-----
PVY	-----	-----	Occidental	-----
PVX	-----	-----	Occidental	-----
PVS	-----	-----	Occidental	-----

Current work with growers: Guatemala

- Visit fields to collect samples
- Talks with growers to find fields for demonstration parcels
- Design of IPM research: 3 plots in each experimental field. 2 fields per locality.
- At Sololá (University site), a replica of IPM strategies will be implemented under greenhouse conditions.
- Baseline survey: pilot testing, data collection, and analysis



Package status: Honduras

Crop	Main Pests	Likely IPM Package Components	Stage of Research
Pepper	Bacterial speck, Bacterial spot, and Septoria leaf spot; viruses	Proper diagnosis	Laboratory work; preparation of field identification tool
Tomato	Bacterial speck, Bacterial spot, and Septoria leaf spot; viruses	Proper diagnosis	Laboratory work; preparation of field identification tool
Solanaceous crops	Bacterial wilt; root-knot nematode	Grafting, biofumigation, solarization; grafting, rotation with cowpeas	Testing in farmer fields
Eggplant	Thrips and mites	Bio-control with <i>Orius</i> sp.	Sunflower refuge for <i>Orius</i> sp. Being tested in farmer fields
Horticultural crops	Purple nutsedge		Several practices being evaluated on farmer fields
Onion	Post-harvest losses (fungi); thrips and mites	Soil solarization; bifumigation (w/brassicas); bio-control with <i>Orius</i> sp. ; improved spraying with low-toxicity pesticides	Ready for diffusion; refuge for <i>Orius</i> sp. tested in farmer fields
Sweet potato	Begomovirus, other viruses	Not known, but proper diagnosis necessary prior to identifying package	Virus diagnosis ongoing; tools for virus detection being refined
Potato	<i>Liberibacter solanacearum</i> vectored by potato psyllid	Improved spraying, lower-toxicity chemicals, use of entomopathogen <i>Metarhizium anisopliae</i> ; variety work	Some package components identified and are being validated; virus diagnosis ongoing; impacts on other crops being assessed, psyllid population dynamics being studied
Potato	Late blight	Lower-toxicity fungicides	Tests of growing resistance to low-toxicity fungicides; spraying guide being prepared



Xanthomonas campestris vesicatoria in pepper



- 3 positive samples

Research

- Cowpea rotation for Root-knot Nematode management in sweet potato.



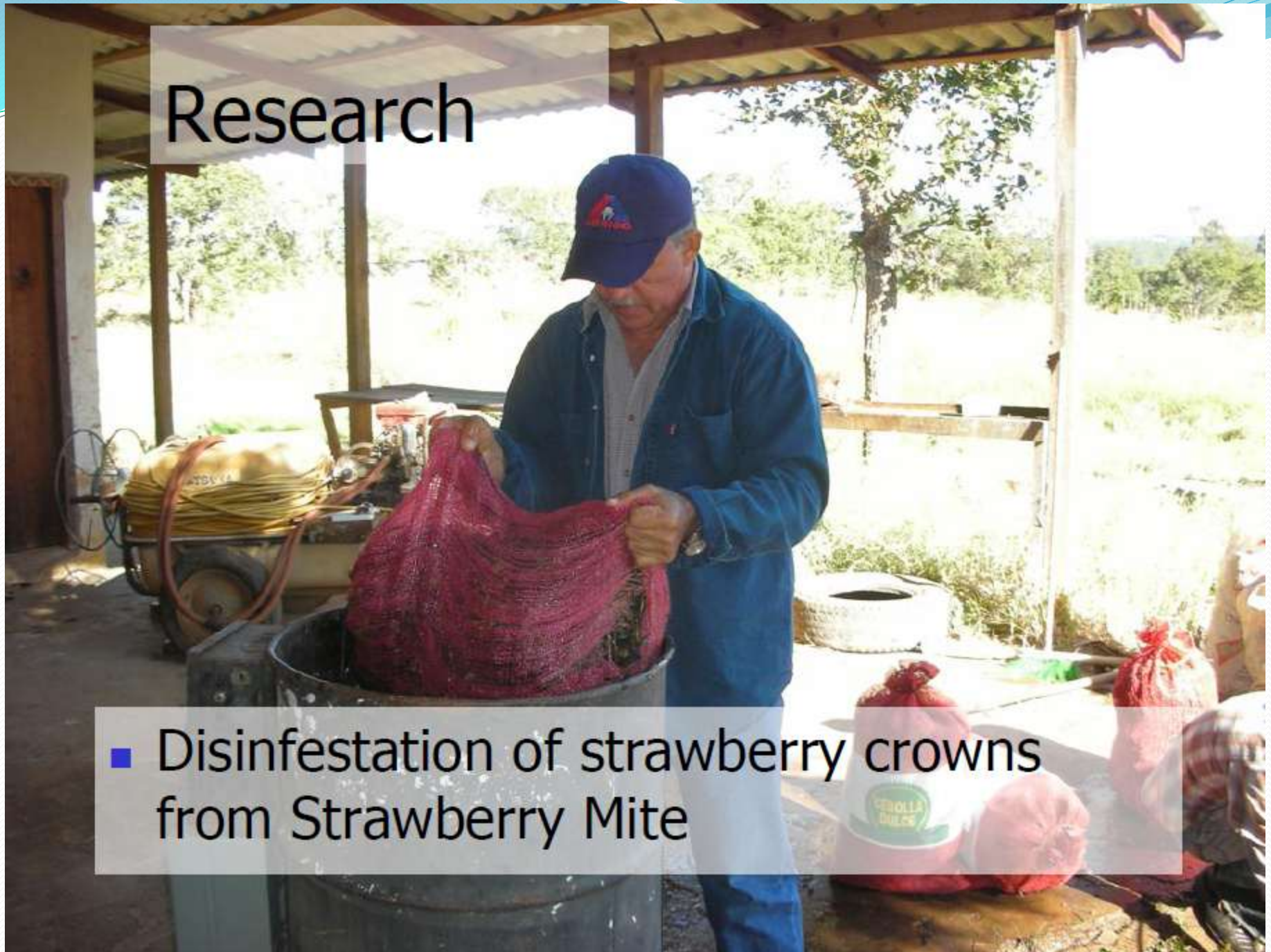
Onions

- Onion production during rainy season
 - Solarization and biofumigation included
 - Promising results



Research

- Disinfestation of strawberry crowns from Strawberry Mite



Package status: Dominican Republic

Crop	Main Pests	Likely IPM Package Components	Stage of Research
Pepper	Whitefly, afids, thrips; fusarium; assorted soil-borne pathogens	Traps, protective mulches, trap plants (basil and cilantro), entomopathogenic fungi, neem oil and insecticidal soap, modified agronomic techniques; soil treatment with <i>Trichoderma</i> and <i>Bacillus</i> ; solarization	Testing in farmer fields; laboratory experiments; testing in farmer fields
Tomato	<i>Ralstonia solanacearum</i> , <i>Lycopersicon esculentum</i> ; <i>fusarium</i>	Soil treatment using <i>Pseudomonas fluorescens</i> and <i>Bacillus subtilis</i> ; grafting; soil treatments using <i>Trichoderma</i> spp. and <i>Bacillus</i> spp.	Laboratory experiments; laboratory and field experiments; laboratory experiments
Oriental vegetables	Insect pests	Attractant plants for natural enemies	Testing in farmer fields
Oriental vegetables	Nematodes	Organic mulch	Testing in farmer fields

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