United States Department of Agriculture

Phytosanitary Irradiation Research Needs

Woodward D. Bailey

Laboratory Director CPHST Miami, Raleigh, and Biloxi

Science and Technology Plant Protection and Quarantine Animal and Plant Inspection Services United States Department of Agriculture



Plant Protection and Quarantine Organizational Structure

Current as of September 2015

Field Operations Rebecca Bech, Associate Deputy Administrator Matthew Royer, Executive Director

Associate Executive Director – Aircraft and Equipment
Operations; Outreach Coordinator – States: AR, AZ, LA, NM, OK
Associate Executive Director – Predeparture, Permitting,
Biotech, Export, Accreditation & Trade – States: FL, GA, HI,
MS/AL, NC/SC, PR, TN/KY, VA & WV

 Associate Executive Director – Safety & Health – States: AK/VA, ID, ME, MI, MN, MT, ND, NH/VT, NY, OR, SD and WI
Associate Executive Director – Pest Management; Pest Detection/Cotton – States: CO, IA, IL, IN, KS, MO, NE, UT/NV & WY

 Associate Executive Director – Exclusion & Import; SITC/Canine; VMO; Beltsville Germplasm Lab – States: DE, MA/CT/RI, MD/DC, NJ, OH & PA

Associate Executive Director – Data Analysis Risk & Targeting;
GIS Information Technology Systems

Management; Information Technology Customer Service Administrative Support

Osama El-Lissy Deputy Administrator

Phytosanitary Issues Management (Alan Dowdy – Assistant Deputy Administrator) International Plant Health Standards (John Greifer – Assistant Deputy Administrator) Analysis and Information Management (Ginger Murphy – Assistant Deputy Administrator)

> Outreach and Communications Chief of Staff

Science and Technology Ron Sequeira, Associate Deputy Administrator Phil Berger, Executive Director

> Center for Plant Health Science and Technology
> National Clean Plant Network
> PPQ Representative on Climate Change; Plant Health Quadrilaterals Science Collaboration Working Group; Coordinating Office for Science and Technology

Assessment; European Phytosanitary Research Coordination

Administrative Support

Policy Management Mike Watson Associate Deputy Administrator Matt Rhoads, Executive Director

Resource Management Services
Professional Development Center
Cooperator Training Unit
Field Operations Training Support
National Detector Dog Training Center
Plant Health Programs
Regulations, Permits, and Manuals
Preclearance & Offshore Programs
Quarantine, Policy, Analysis, and Support
Pest Detection and Emergency Programs
Pest Management
-Select Agent Program
Export Services
Administrative Support

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S&T Irradiation Efforts

- PPQ policy and standard development
- Research proposal review and/or development
- Research (quality, MAP, generic & specific pest doses)
- Cooperator research project management
- International and domestic outreach
- Facility, packaging and process configuration approval (non-routine)
- Facility certification and recertification (nonroutine)



S&T Irradiation Research Efforts



- Process configuration approval
- Modified atmosphere packaging
- Treatment verification tool
- Quality studies
- Odds n ends



Dose Mapping

It is important to know what the absorbed dose range will be throughout the configuration

Dose mapping

- Identify areas of high and low absorbed dose
- Determine R_f (reference dose)





Process Configuration Testing

Packaging approval and process configuration testing and approval has to occur before commodity is shipped to the US from the country of origin

Issues with current process:

- Time consuming
- Cost prohibitive (destructive)
- Overly conservative
- Very difficult for Port of Entry Irradiation Program



Process configuration testing on Thai longan



Process Configuration Testing

Industry requested APHIS to help develop procedures:

- Non-destructive testing •
- Immediate release of commodity ullet

PPQ has validated industry proposals from 3 facilities







Methyl Bromide Alternative

Other

< 1% Condition of entry Quarantine Pest Found treatment 10% Condition of Entry Emergency 90% action at port of entry US Imports: 2014 MB Usage



The Evolution of Pest Proof Packaging









MAP is a process that alters the gas composition surrounding a commodity.

- prolongs the shelf-life of perishable goods
- slows the speed of aerobic microorganisms



In the past few years, requests to use MAP for phytosanitary treatments have dramatically increased.





The generation of free radicals from oxygen and water cause tissue damage.



Most MAP creates a low O_2 environment.

Insect respiration slows, resulting in reduced O_2 concentrations in the hemolymph.



In hypoxic environments, higher absorbed doses may be necessary to achieve same physiological effects.



Anoxic environment reduce efficacy of irradiation treatments

In hypoxic environments, higher absorbed doses may be necessary to achieve same physiological effects

Current policy requires a minimum concentration of $18\% O_2$ in MAP (very conservative)







CPHST is funding University of Florida research to characterize the effects of modified atmospheres on irradiation treatments with Lepidopteran pests







Most fruit can be irradiated with 150-600 Gray with no adverse effects

- Log reductions of pathogen loads
- Increased shelf life
- Improved quality





Joseph Borsa, MDS Nordion



Joint Project (Chapman University, FTSI, and PPQ)

- Peaches irradiated 250, 400, 700, and 1000 Gy
- Analysis performed 1,7,and 14 days after treatment
- Shelf life, pH, Brix, and weight loss





Irradiation positively affected the liking/acceptability of all peach varieties tested



Shelf life, pH, Brix, and weight loss are not negatively affected by irradiation (variety and age play a bigger role)

Effect of phytosanitary irradiation on the quality and shelf-life of citrus

- Determine if phytosanitary irradiation is a feasible treatment for Chinese citrus imports
- Partnering with Chapman University
- Following an irradiation treatment, fruit will be evaluated for changes in quality and shelf-life indicators





Treatment Verification Tool

In the event that CBP intercepts a live pest within the pest proof packaging, PPQ needs a tool to verify that an irradiation treatment has occurred.

Ideally, the treatment verification tool would:

- Provide immediate Y/N answer
- Be inexpensive
- Be easy to use
- Not require hazardous reagents
- Have low-maintenance storage requirements
- Work for multiple insect families



Treatment Verification Tool

CPHST has just initiated a cooperative agreement with the University of Florida to develop a diagnostic assay to confirm phytosanitary irradiation treatment.







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Thank you.

Questions?