

**CALIFORNIA APPLE COMMISSION**  
**PROJECT PLAN / RESEARCH GRANT PROPOSAL**

Work group / Department: USDA-ARS-SJVASC, Crop Protection and Quality Unit

Project Year: 1 (2011)                      Anticipated Duration of Project: 2 year

**Mortality and removal of Light Brown Apple Moth, *Epiphyas postvittana* (Walker), and other insect pests, in California apples during packing and export**

Project Leader:

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Current Funding Request: \$21,886

**BACKGROUND/JUSTIFICATION**

Insect pests, such as the Light Brown Apple Moth (LBAM), *Epiphyas postvittana* (Walker), and the codling moth (CM), *Cydia pomonella*, (**others?**) are a economic concern to California (CA) apple growers and shippers when found in production regions. Perhaps more important than losses caused by leaf defoliation/herbivory and superficial damage to fruit, is the economic threat insects pose as trade barriers. At any time, importing countries can confront industry with quarantine and/or treatment requirements with the potential to terminate, or at least inhibit, trade. Research on postharvest insect “control” is needed to retain the ability of CA to continue exporting apples when an importing country raises concerns regarding the potential for insects to enter, establish, and spread via CA imports.

*The overarching goal of this project is to ensure pest-free apples are channeled to markets.*

Research will focus on designing and testing elements of postharvest processes, including: chemical, physical, and non-chemical treatments. This project explores two main strategies for insect “control”:

Systems-based approach: Research is conducted to quantify insect mortality and removal as a function of harvesting, cleaning, packing, and shipping procedures employed by the CA apple industry, particularly export.

Fumigation approach: Research is conducted to quantify insect mortality as a function of fumigation treatment, with specific endpoints being the efficacy of control, particularly with methyl bromide alternatives, and the reducing treatment times in exported product.

## **2011 OBJECTIVES:**

In general, research is planned in compounding phases as indicated below with corresponding objectives.

### Systems-based:

Phase I (Yr. 1, 2011).

Objective 1. A commercial-scale Berlese funnel trap will be constructed. Leaf debris will be collected from 1) the QA-QC inspection stations at the end of export packing lines, and 2) beneath grating/fall-outs as field bins are dumped. Insects that emerge from leaf debris will be identified and reported (to CAC only) relative to the mass of debris collected as related to production levels.

Timeline: Run throughout 2011 apple production season.

Objective 2. Insects will be exposed to elements of postharvest processing individually and in series; statistically robust data will be generated. The pilot packing house at UC Kearney will be used when possible and adapted to meet specifications of commercial systems.

Timeline: Run throughout 2011 apple production season and into winter.

### Fumigation:

Phase I. (Yr. 1). LBAM is reared on “pink bollworm diet”, cultured, handled, and caged for fumigation studies at the USDA-APHIS mass-rearing facility in Moss Landing (CI Simmons). CM is reared on “on a bran and honey diet”, cultured, handled, and caged for fumigation studies at the USDA-APHIS insectary at Parlier (CI Tebbets). Other insects?

Timeline: Work already accomplished.

Phase II (Yr. 1). Evaluate insecticidal efficacy of cold-temperature (~ 35 °F) “Horn” or “Vaporphos<sup>®</sup>” phosphine (100% PH<sub>3</sub>) and warm-temperature (< 70 °F) “ecofume<sup>®</sup>” (98:2%, CO<sub>2</sub>:PH<sub>3</sub>) phosphine, and index relative to methyl bromide to across life stages and establish target life stage of insect species recommended by industry. Laboratory scale in 1ft<sup>3</sup> fumigation chambers.

Timeline: Fumigations will be begin in June-July, 2011

Phase III (Yr. 1). Perform “commercial” fumigations with “Horn” or “Vaporphos<sup>®</sup>” phosphine (100% PH<sub>3</sub>) in 155ft<sup>3</sup> chambers at 35 °F at with target life stage at doses required for complete mortality. Fumigated fruit will be held for phytotoxicological analysis.

Timeline: Fumigations will be begin in October-November, 2011

**OTHER IMPORTANT 2011 INFORMATION:** Confirmatory T104-a-1 methyl bromide fumigations will be conducted in 1ft<sup>3</sup> chambers with 20,000-30,000 brown marmorated stink bug (BMSB) life stages at USDA-ARS in West Virginia by PI Walse.

**2012 OBJECTIVES: Systems-based:** Phase II (Yr. 2, 2012). Objective 1. Continue with the “systems-based” postharvest packinghouse/processing investigation and build on 2011 results. Objective 2. Integrate field trapping, IPM, and pesticide use pattern results with postharvest systems-based approach to generate statistical framework to quantify reduction in risk from an insect pest as product moves through export scenarios. **Fumigation:** Phase III (Yr. 2, 2012). Objective 1. Engineer phosphine fumigations to be efficacious on the shortest timescale possible through the integration of physical (e.g., vacuum) and chemical approaches, such as the use of other physiologically-active gases (e.g., *nitrous oxide and/or oxygen*). Objective 2. Graduate toward commercial scales and scenarios used by the apple industry; included ~15,000 specimens of the most phosphine-tolerant lifestage of LBAM, CM, and other pests recommended by industry.

Timeline: Fumigations will be conducted October, 2011

## BUDGET REQUEST

### Expenses

hotel/travel	2,200
supplies	3,500
rearing	1,000
Vaporphos	3,000
fumigation analysis	5,000
postharvest analysis	5,000
Subtotal:	\$19,700
USDA-ARS overhead (11.1%)	2,187
Total:	<b><u>\$21,886</u></b>