

# Macadamia Integrated Pest Management IPM of Insects and Mites Attacking Macadamia Nuts in Hawaii

by Vincent P. Jones

## Part 1. Introduction to macadamia pest management

Insect growth and development; Types of insect damage  
How insects become pests; Integrated pest management  
Economic thresholds, economic injury levels;  
Natural control vs. biological control; Natural enemies  
Biological control: Types, Success rates for classical biological control, Environmental concerns;  
Monitoring programs: Importance, Definitions, Design of monitoring and methods, Types of samples, Data recording;  
Insecticide and miticide application: Orchard handguns, Backpack mist blowers, Air-blast sprayers, Aerial application, Inspection and calibration, Spray solution pH, Hazard to bees  
Pesticide regulations

## Part 2. Horticultural factors important in integrated pest management

Flowering and fruiting patterns; Nut maturation process  
Normal harvest operations; Modified harvest operations  
Cultivar susceptibility; Fertilizer; Pruning; Pollination  
Alternate hostes, ground covers; Management of pests in nurseries

## Part 3. Major pest insects

Overview of pest status  
Patterns of damage

### Tropical nut borer

History; Life cycle and description; Identification; Alternate hosts;  
Damage; Time of damage; Monitoring; Cultivar susceptibility  
Sticktight nuts; Management strategies: General, Harvest modification, Early season, harvest, Mechanical harvest,  
Use of ethephon, Natural enemies, Use of pesticides  
New orchard management; Economics of pest control  
General trends

### Southern green stinkbug

History; Life cycle and description; Life history in macadamia orchards; Alternate hosts; Damage; Time and location of

damage; Monitoring; Cultivar susceptibility;  
Management strategies;  
Natural enemies; Chemical control

### Koa seedworm, Litchi fruit moth

History; Life history; Identification;  
Alternate host plants; Damage;  
Monitoring: Adult sampling, Distribution of eggs and damage in the canopy, Sampling larvae and damage; Cultivar susceptibility; Management strategies; Behavior-modifying chemicals; Natural enemies; Chemical control

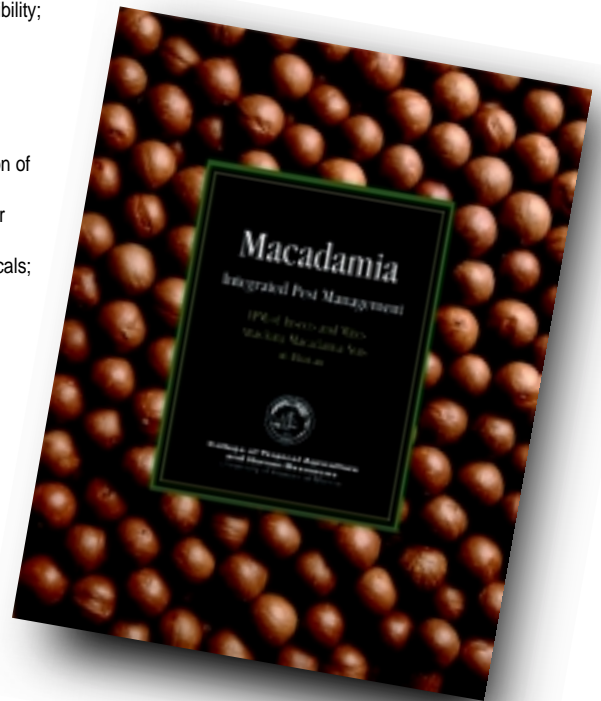
## Part 4. Secondary pests

Broad mite, Red and black flat mite, Katydid, Redbanded thrips, Hawaiian flower thrips, Black citrus aphid

## Part 5. Pests of macadamia not yet found in Hawaii

Macadamia felted coccid, Fruitspotting bug, Banana-spotting bug, Macadamia leafminer, Macadamia flower caterpillar, Macadamia twig girdler, Twospotted bug, Yellowspotted bug, False codling moth, Macadamia nut borer, Leafcutting ants

**Appendixes:** Heat-driven phenology models;  
Sequential sampling examples; Monitoring tools;  
Insect classification;  
Insects identified on macadamia in Hawaii  
Glossary of terms  
Further readings and references



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