

## Progress Report for WIPMC Funding

### Grant: Pre- and post-harvest drenches containing essential oils to control eggs of pest slugs and snails in the growing medium of potted plants (Agreement No. 58-5320-0-297)

by Robert G. Hollingsworth, US Pacific Basin Agricultural Research Center, Hilo, HI, December 20, 2010

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The goal of this research is to identify which essential oils are most effective in killing the eggs and neonates of slugs and snails. The budget agreement was executed in June 2010. Before this research could be started, it was necessary to obtain clearance from our PBARC Biosafety Committee to begin the work. Approval to begin the research was given in early August, based on a detailed safety protocol that was submitted to the Committee and approved. The protocol requires that slugs and snails be kept outdoors in a fenced enclosure. Eggs are collected from the rearing containers used for slugs and snails and are brought into the laboratory for exposure to essential oils within Petri dishes. The safety protocol is required because slugs and snails are potential carriers of the rat lungworm, a nematode which causes eosinophilic meningitis in humans (angiostrongyliasis).

The chain-link fenced enclosure is 10 feet by 10 feet in size. Tables within the fence hold containers of slugs and snails. Cuban slugs (*Veronicella cubensis*) and giant African snails (*Achatina fulica*) were collected from papaya plantations and from other locations and put into ventilated plastic containers holding moist soil. They are fed a diet of cabbage, lettuce and carrots. In addition, orchid snails (*Zonitoides arboreus*) were extracted from potted orchid media donated by a cooperating grower and these are held in ventilated plastic containers holding a commercial growing medium (coconut chips or coir). Eggs are collected from containers each week. In the laboratory, these are placed within Petri dishes on top of filter paper which has been treated with a solution of an essential oil (1% concentration).

In initial research, eggs were left in contact with treated filter paper continuously. Egg hatch was monitored each week. We found that all of the essential oils tested performed well and stopped egg hatch under these conditions. We are now testing the efficacy of essential oils when the eggs are left on treated filter paper for only 24 hours and then removed to filter paper moistened with water. Oils tested to date include cedar wood, clover bud, eucalyptus, garlic, bitter orange, peppermint, white pine, lemon grass, rosemary, spearmint and limonene. To date, approximately 1500 eggs of the Cuban slug and giant African snail have been tested within Petri dishes, using about 10-20 eggs per dish. A small number of orchid snail eggs have also been collected, although these eggs are more difficult to obtain. In future research, we will concentrate on the best performing oils, and test these along side several commercial pesticide products containing essential oils or neem extracts in ventilated and unventilated Petri dish arenas. Finally, tests will be carried out using drenches of potted plants media which has been artificially infested with eggs of pest slugs and snails.

The research is progressing well and we expect to be able to successfully complete the research outlined in our proposal. Rory McDonnell, the post-doctoral researcher who plans to carry out this same type of research at UC Riverside using California species of slugs and snails, will begin research in early 2011. He has been carrying out slug and snail research in Ireland this year on a study fellowship, and will be returning to work in Dr. Tim Paine's laboratory in January 2011.