

**Final Report
Hawaii Invasive Species Council
Research and Technology Program**

Project title:

Evaluation of pathogens in Costa Rica for biocontrol of *Miconia calvescens*

HISC funds: \$7,700

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Summary of project

Building on investigations of *Miconia* pathogens conducted in Brazil in recent years, this project provided preliminary evaluation of three pathogens known to occur in Costa Rica. Because pathogen studies in Brazil indicate that Brazilian pathogens tend not to infect Hawaii's biotype of *Miconia calvescens*, we have turned to Costa Rica for related pathogens that may be better adapted to Hawaii's *Miconia calvescens*, which appears to be a closer match to biotype(s) in Costa Rica. This project was conducted by Anna Dietrich, a student from Leibniz University in Hannover, Germany, as the focus of her thesis.

Two species of *Ditylenchus* nematodes were studied. *D. drepanocercus*, known from detailed studies in Brazil, was biologically similar in Costa Rica. This nematode caused angular yellow spots on the leaves of *M. calvescens* and its host range appeared to be restricted to the genus *Miconia*. Damage from this nematode was never severe, and therefore its potential for biocontrol seems low.

Another *Ditylenchus* sp. caused galls on *Miconia calvescens* and a few other *Miconia* species and *Clidemia* species. Artificial inoculation with this nematode was demonstrated, but not with great consistency. The severity of damage was always low on *M. calvescens*, however this nematode has very high potential as a biocontrol agent for *Clidemia hirta* and was successfully imported to Hawaii where it is under quarantine evaluation at the Hawaii Department of Agriculture.

The fungus *Coccodiella miconiae* from Costa Rica, which forms small pimples on leaves, was proven to infect Hawaiian *M. calvescens* for the first time. Although this pathogen also was imported to quarantine in Hawaii, it continues to be challenging to propagate. Thorough host testing of Hawaiian plants will require some additional efforts to overcome this challenge.

Project Objectives:

- 1) Collect and propagate *Coccodiella* and *Ditylenchus* from field sites in Costa Rica.

Accomplishment: Pathogens were collected from several sites representing a wide ecological range across Costa Rica. Propagation was generally challenging, however a method for maintaining the gall-forming nematode was demonstrated, and this species has now been successfully maintained in quarantine for over 1 year.

- 2) Test pathogenicity of collected pathotypes on plants of the Hawaiian biotype of *miconia*.

Accomplishment: Due to a shortage of Hawaiian plants of useful size in Costa Rica at the time of this study, our work on this objective was limited. The inconsistent success with inoculation also was a problem for testing Hawaiian plants. We were able to demonstrate *Coccodiella* infection of a Hawaiian plant under field conditions, which was a first anywhere and a significant breakthrough after many years of failures with Brazilian strains of this fungus. Also both *Coccodiella* and the gall-forming *Ditylenchus* have since been cultivated at least to some degree on Hawaiian *M. calvescens* by Eloise Killgore at the Hawaii Department of Agriculture.

- 3) Document courses of infection and impacts on greenhouse plants.

Accomplishment: Inoculation of greenhouse plants was not consistently achieved, but observation of the infection and impact was documented closely for the gall-forming nematode. Gall development seemed to originate near vascular tissue. Impact seemed relatively mild on *Miconia calvescens* in contrast with severe stunting on *Clidemia* spp.

- 4) Evaluate specificity of pathogens through field observations and inoculation tests.

Accomplishment: Field observations of a large diversity of plants indicated that all three pathogens have a host range restricted to melastomes, and probably to a few species of *Miconia* and *Clidemia*, two closely related genera. Inoculation tests will need to be repeated under conditions that ensure consistent infection of control plants.

- 5) Obtain export permit and ship inoculum of at least one pathogen to Hawaii Department of Agriculture.

Accomplishment: Both *Coccodiella miconiae* and the gall-forming *Ditylenchus* sp. were successfully imported to Hawaii in November 2006 for quarantine evaluation at the Hawaii Department of Agriculture.

Detailed results and photo documentation are reported in the attached thesis of Anna Dietrich:

Dietrich, A. 2006. Evaluation of Pathogens from Costa Rica for Biological Control of *Miconia calvescens* in Hawaii; Diplomarbeit im Studiengang Biologie, Leibniz Universität Hannover.