

## BIOLOGICAL CONTROL OF *MELALEUCA QUINQUENERVIA* IN FLORIDA'S NATURAL AND MAN-MADE LANDSCAPES

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**Abstract.** *Melaleuca quinquenervia* is an invasive tree found throughout central and south Florida's natural and man-made landscapes. Melaleuca forms dense monocultures that out-compete native species. Integrated pest management is an effective strategy to partially or fully control melaleuca. This strategy involves the combined use of control techniques including the utilization of *Oxyops vitiosa* (Melaleuca weevil) and *Boreioglycaspis melaleucae* (Melaleuca psyllid) as biological control agents. In 2001, Gioeli and Neal established a melaleuca biological control agent honeypot at the St. Lucie County Cooperative Extension Office. The purpose of this honeypot was to provide an easily accessible supply of melaleuca biological control agents for distribution to landscapers and the general public. An internet-based ordering system was developed. The public could order these biological control agents via the website and pay a minimal shipping and handling fee or personally harvest the biological control agents for free. During 2003, 39 participants collected or received one or both of these biological control agents to assist them with their melaleuca integrated pest management strategy. The effectiveness of this program will be evaluated in mid-2004, thereby giving the redistributed biological control agents an opportunity to build their population levels. Overall, program participants have indicated a high level of satisfaction with this program and they have indicated they are pleased to have easy access to these agents.

*Melaleuca quinquenervia* is an invasive plant species originating from Australia. It is commonly referred to as melaleuca or paperbark tree. Its white papery bark closely resembles birch and its white flower clusters closely resemble bottlebrush. Melaleuca was brought to South Florida in the early 1900s for use as an ornamental tree and soil stabilizer (Laroche, 1999). Unfortunately, at the time of its introduction to the Florida landscape, no one realized that this tree's invasive characteristics would enable it to out-compete native vegetation and spread uncontrollably throughout the South Florida landscape. These invasive characteristics include a lack of natural limiting factors (such as animals that might feed on melaleuca) and its high level of seed production. One mature melaleuca tree can have millions of seeds readily available for dispersal at any given time. Current estimates indicate that melaleuca infests up to twenty percent of the natural areas south of Lake Okeechobee and is commonly found in natural and man-made landscapes in urban and suburban areas.

Melaleuca is listed as a noxious weed by federal and state agencies. This listing makes it illegal to possess, sell, cultivate or transport melaleuca in Florida. These agencies have spent \$35 million to control melaleuca utilizing traditional weed control practices such as chemical, mechanical and cultural control (TAME Melaleuca, 2004). Alternative control methods were necessary.

One alternative method of control is the use of insects and other natural agents to biologically control melaleuca as part of an integrated pest management (IPM) approach. This approach required an in-depth search for potential melaleuca biological control agents in Australia and importation of these potential agents to Florida for scientific examination, including risk assessment. The goal of the melaleuca biological control program is to provide a level of control which results in diminished economic and environmental injury caused by melaleuca. After sixteen years of study, *Oxyops vitiosa* (melaleuca weevil) and *Boreioglycaspis melaleucae* (melaleuca psyllid) have been approved by the USDA for use as melaleuca biological control agents (Cuda et al., 2003; Winertter et al., 2003).

The melaleuca weevil and psyllid were successfully released into natural areas throughout South Florida by the USDA Agricultural Research Service, the Florida Department of Environmental Protection and the South Florida Water Management District. Although these agents are impacting melaleuca, it may take several years for them to reach their full potential. The purposes of the St. Lucie County Cooperative Extension's Melaleuca Biological Control Agent Distribution Program are to make these agents available to the general public and to enlist the assistance of the general public in agent distribution.

### Materials and Methods

Several steps were undertaken by Gioeli and Neal to initiate this program including the establishment of insect rearing capabilities, harvest methods, ordering and distribution methods, creating educational publications, and evaluating the effectiveness of the program. In 2001, Neal collected an initial supply of fifty melaleuca weevils from the USDA insectory in Fort Lauderdale and released them in a 0.25 acre stand of melaleuca trees at the St. Lucie County Cooperative Extension Office. Six months later, melaleuca weevils had spread to adjoining melaleuca stands and were readily available for harvest. In 2003, Gioeli received an initial supply of 2500 melaleuca psyllids from the USDA insectory in Fort Lauderdale. Unfortunately, the first supply of psyllids died in transit due to moisture buildup in the plastic vials. The second attempt to relocate the psyllids was successful. Small strips of paper towel were placed in the vials to absorb any moisture accumulation. The psyllids were released on the same 0.25 acre stand of melaleuca trees at the St. Lucie County Cooperative Extension Office. Six months later, ample amounts of waxy flocculence secreted by psyllid instars were evidence that the psyllids were thriving. They had spread to adjoining melaleuca stands and were ready for harvest.

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Devising standardized melaleuca biological control agent harvest methods was the second step undertaken in the establishment of this program. For the melaleuca weevil, a funnel trap collector was devised. This was essentially a one quart paint mixing container modified with a funnel on the top lid. When threatened or disturbed, the melaleuca weevil's instinct is to fall from the melaleuca branches. They can be caught when the funnel trap collector is placed underneath the weevil and the weevil is tapped, causing it to fall into the funnel trap. For the melaleuca psyllid, an aspiration method was devised. Cressida Silvers, USDA Project Manager for TAME Melaleuca, informed Gioeli that the psyllids are attracted to the colors orange and yellow. Orange buckets and aspirators were purchased. Gioeli simply had to walk through the melaleuca stand with the orange bucket, occasionally tap melaleuca branches, and aspirate the psyllids off the orange buckets they land in.

Devising standardized melaleuca biological control agent ordering and distribution methods were the third and fourth steps undertaken in the establishment of this program. A web-based ordering system was established. Customers visit the melaleuca biological control agent ordering program website, download an order form and send the order form, along with shipping and handling fees, to Gioeli. Customers select their agents of choice on the order form. Customers who visit with Gioeli in person can harvest the agents for free after a brief training program designed to teach participants how to utilize the collection equipment. Mail orders are typically filled Tuesday – Thursday. The melaleuca weevils are shipped in plastic vials and the psyllids are shipped in disposable plasticware. Cold packs are placed in the shipping containers. All orders are shipped via next business morning FedEx.

Creating melaleuca biological control agent publications was the fifth step undertaken in the establishment of this program. Gioeli serves on The Area-wide Management Evaluation (TAME) Melaleuca Technology Transfer Workgroup. This workgroup created publications including "A Century of Melaleuca Invasion in South Florida" and "Natural Enemies of Melaleuca." In addition, Gioeli created a fact sheet describing the release methods for both the weevil and the psyllid. Each mail order customer receives the TAME Melaleuca publications as well as the release instructions.

Creating a system of evaluating the success of the Melaleuca Biological Control Agent Distribution Extension Program was the last step undertaken in the establishment of this program. Gioeli sends each program participant a survey one day after their order is shipped via FedEx. Participants are asked if their biological control agents arrived alive, if they had problems releasing their agents and if the participants are satisfied with the program. Beginning in Fall 2004, Gioeli will distribute a new survey to all program participants to assess the effectiveness of the releases throughout South Florida. By then, substantial populations of these biological control agents should be available and the public should be able to notice a difference in the general health of their melaleuca trees. Leaf scarification caused by the melaleuca weevil

should be evident. The presence of the psyllid should be evident as a distinctive webbing of waxy flocculence on new growth and flowers should occur. Leaf drop will result from both the weevil and psyllid.

## Results and Discussion

Thirty nine people participated in the Melaleuca Biological Control Agent Distribution Extension Program in 2003-04. Fifteen of the participants were surveyed. All fifteen participants indicated that their biological control agents arrived alive. One participant's response indicated that his order of melaleuca weevils was dropped off by FedEx and outside for twenty four hours before he found them. All of these weevils survived—even given these harsh environmental conditions. Another survey participant's response indicated that his order of melaleuca psyllids arrived, but there was 50% mortality. Temperature may have been a factor, so additional steps to insulate the psyllids during shipping were instituted. There has been no substantial psyllid mortality occurring during shipping after the additional step was taken.

Surveyed participants were also asked if they had difficulty releasing their melaleuca weevils or psyllids. All participants indicated that they experienced no difficulties releasing their agents. They also indicated that the enclosed publication instructing participants how to release their agents was effective.

The final survey question asked participants to describe their level of satisfaction with this program. All participants expressed a high level of satisfaction and are recommending the program to others. Two surveyed participants were frustrated that their University of Florida/IFAS County Extension Offices did not offer this program locally and indicated that they would like their County Extension Agents to start a local distribution program.

By Fall 2004, the populations of melaleuca weevils and psyllids redistributed through this program should be having a substantial impact on the general health of melaleuca trees. Gioeli will work with Dr. Bill Overholt of the University of Florida Indian River Research and Education Center to devise a system to assess the environmental and economic impacts of this distribution program. Preliminary reports indicate that program participants are already seeing substantial control of their melaleuca trees.

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