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Biological Control of Air Potato Vine, *Dioscorea bulbifera,* with *Lilioceris cheni*, the Air Potato Beetle in Florida

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The Florida Department of Agriculture and Consumer Services Division of Plant Industry (FDACS-DPI) present a natural alternative, biological control, to the management of an invasive species of air potato *Dioscorea bulbifera*, considered one of the most aggressive weeds ever introduced into Florida.

Many invasive species wreak havoc on native landscapes because no natural enemies are present to control them. Fortunately, there is a leaf-eating beetle, *Lilioceris cheni*, whose sole goal is to search for and feed on *Dioscorea bulbifera*. The air potato beetle, which is native to tropical and subtropical Asia, has undergone extensive host range testing and has proven to be host specific, capable of surviving only on *D. bulbifera.* Both larvae and adults are voracious feeders of air potato leaf tissue. A single individual is capable of consuming approximately 30 square feet of plant material in its lifetime.

The air potato biological control program is a collaborative project between DPI, United States Department of Agriculture's Agricultural Research Service Invasive Plant Research Laboratory (USDA-ARS-IPRL), and the University of Florida's Institute of Food and Agricultural Services Biological Control Research and Containment Facility (UF-IFAS-BCRCF). The program involves research and mass rearing and release of the beetles throughout Florida. Limited releases were conducted in summer of 2012. Beetles induced varying levels of damage to air potato plants and successfully overwintered to the following spring. Widespread FDACS-DPI releases began in spring of 2013. To date, DPI has released approximately 125,000 beetles in 40 counties. Beetles were initially being released on city, county, state, and federal parks, preserves, forests, and other public and conservation lands. As large populations built on these lands, beetles began dispersing into surrounding residential and commercial areas. Dispersing beetle populations are now being supplemented by direct releases in residential and commercial settings.

Air potato is an invasive, high climbing vine capable of out-competing native vegetation and displacing other organisms. It forms dense blankets which smother native trees and understory plant species. It is a rapid climber, capable of more than 8 inches of growth per day. Air potato is listed as a noxious weed by the Florida Department of Agriculture and a Category I invasive plant by the Florida Exotic Pest Plant Council. The vines primary means of spread is through the production of aerial bulbils, known as "air potatoes".

Air potato has a wide native range including much of Asia, tropical Africa, and northern Australia. Florida establishment was noted in 1905 once vines began forming thick coverings. Since then, it has spread throughout Florida as well as Hawaii, and other southern states.

Current air potato management methods have proven temporary and ineffective. Chemical control is costly and requires repeated basal and foliar sprays over several years. Damage or death to non target plants often occurs during these treatments. Additionally, new vines may continue to sprout from underground tubers when herbicide treatments cease. Mechanical control of air potato is labor intensive and time consuming. Temporary removal is possible when vines and bulbils are hand collected and destroyed. Eradication however, requires the removal of underground tubers which can be difficult to access and completely remove.

A biological control program against air potato was initiated by the USDA-ARS-IPRL in Ft. Lauderdale following the 2002 discovery of a chrysomelid beetle in Nepal and later in China. Beetles where imported into quarantine where they were extensively studied. Permission for release was granted from the USDA Animal and Plant Health Inspection Service (APHIS).

Lilioceris cheni is a large (8-9 mm) brown to red-orange Asian leaf beetle (Coleoptera: Chrysomelidae). Adult females deposit bunches of eggs on the undersides of young leaves. Prior to oviposition, females nip leaf veins causing the edges to curl abaxilly into a cup-like shape as the leaves expand. These “cups” enclose the eggs providing protection as well as a suitable incubation microhabitat.

Beetle development from egg lay to adult emergence requires approximately 28 days. Females lay an average of over 2,000 eggs during their lifetime but are capable of producing over 4,000. Eggs are pale white upon lay but turn yellowish as the embryo develops. Eggs hatch within 4 days. Larvae pass through four instars requiring an average of 8 days total. Larvae feed gregariously on the underside of leaves and on the growing tips of vines which inhibits plant growth. Mature larvae leave the plant and enter the substrate where they secrete a whitish foam like material which hardens to form a cocoon. Adults emerge approximately 16 days later and begin feeding. Mating occurs about 10 days after emergence and oviposition begins 5 days following mating. Adults live for an average of 6 months.

Air potato vines begin to senesce during late fall forcing adult beetles to survive without leaves for extended periods of time. During this period beetles diapause in the substrate and under debris until the following spring when vines begin to regrow from underground tubers.

Program information, publications, and beetle request forms can be found online:
http://bcrcl.ifas.ufl.edu/airpotatobiologicalcontrol.shtml

For further information regarding this project please contact Dr. Eric Rohrig with the Division of Plant Industry at Eric.Rohrig@freshfromflorida.com .