BUG BIZ
Pest Management and Insect Identification Series
LSU AgCenter Research · Extension · Teaching

Air Potato Leaf Beetle

Scientific name: *Lilioceris cheni* Gressitt and Kimoto (Coleoptera: Chrysomelidae)

Introduction

Air potato, *Dioscorea bulbifera* L. (Dioscoreales: Dioscoreaceae), is a fast-growing perennial vine native to Asia and Africa. It has been introduced into the southeastern United States on multiple occasions and has become established in Hawaii, Florida, Georgia, Alabama, Mississippi, Louisiana and Texas. Currently air potato is registered as a noxious weed in Florida and Alabama (USDA 2015). In Louisiana, populations of *D. bulbifera* have been recorded in 13 parishes (Figure 1). The air potato vine quickly grows to cover large areas and outcompetes native vegetation. It proliferates freely from vegetative bulbils formed in the leaf axils and is difficult to remove, requiring repeated mechanical and herbicidal treatments.

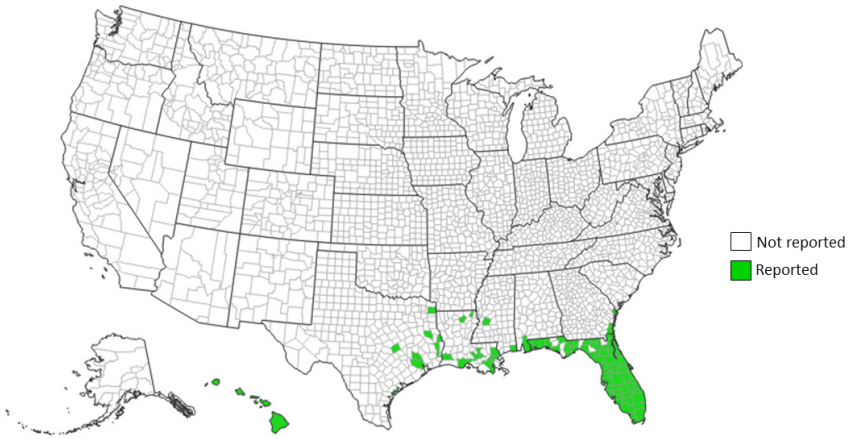

Figure 1. Distribution of air potato (Dioscorea bulbifera) in the United States. Source: EDDMapS.org

A successful biological control program against *D. bulbifera* was initiated in Florida in 2011 using the air potato leaf beetle, *Lilioceris cheni* (Rayamajhi et al., 2014). Extensive laboratory and open field studies showed *L. cheni* to be extremely host-specific, feeding and developing only on *D. bulbifera* and not on related species of *Dioscorea* found in Florida including *D. floridana, D. villosa,* and *D. sansibarensis* (Lake et al., 2015). Rearing and release of L. cheni on public and private lands is currently conducted by the United States Department of Agriculture (USDA), the Florida Department of Agriculture and Consumer Services (FDACS) and the University of Florida. Establishment of the beetle has been confirmed across Florida. Based on its success in Florida, there is reason to believe that *L. cheni* will be an effective biocontrol agent against *D. bulbifera* in Louisiana.

Air Potato Identification

Dioscorea bulbifera is a perennial vine that can be easily identified by its heart-shaped leaves with symmetrical, arching veins that spread radially from the leaf center (Figure 2). The leaves grow alternately on the stem. The plant grows into dense mats by climbing vertical surfaces including fence posts and tree limbs, shading the plants beneath it and crowding out or outcompeting other plant species (Figure 3). Although *D. bulbifera* flowers in its native range, it most commonly spreads by asexual propagation through the formation of aerial bulbils in the leaf axils in the United States (Figure

Figure 2. Heart-shaped leaves of D. bulbifera. Photo by Lori Moshman, Louisiana State University.

4). These aerial bulbils form from late summer through fall, and drop to the ground when the plant dies back in late fall through winter. In southern Louisiana, the vines begin to senesce in mid- to late-October (Figure 5). In spring and summer, new plants grow from bulbils that have dropped to the ground the previous year. Unlike species of *Dioscorea* (such as *D. alata*) which are grown for their edible tubers, bulbils of *D. bulbifera* are bitter tasting.

Two other exotic *Dioscorea* species are known to be present in Louisiana, *D. oppositifolia* (=*D. batatus*) and *D. alata* (Thomas & Allen, 1999). A native species, *Dioscorea villosa*, is also present (Pemberton & Witkus, 2010). The invasive air potato may be distinguished from *D. oppositifolia* by the leaf shape, which in *D. oppositifolia* is constricted and arrow-like, compared to the wide, heart-shaped leaves of *D. bulbifera* (Figure 6). *Dioscorea alata*, or winged yam, has larger and more triangular leaves than air potato and its stem is square compared with the round stems of air potato. The leaves of *D. alata* are opposite, whereas the leaves of *D. bulbifera* are alternate. Leaves of *Dioscorea villosa,* or wild yam, may be narrower than those of *D. bulbifera* (Figure 6), and never form aerial bulbils (Langeland & Meisenburg, 2008, Overholt et al., 2008).

Distribution

Lilioceris cheni is a native herbivore of *D. bulbifera* in Nepal, India, Laos, Thailand and China. Based on a survey conducted in 2015, *L. cheni* is present across Florida (W.A. Overholt, personal communication).

Description

Eggs: Eggs are small, white and laid in loosely clustered groups on leaf undersides. Clusters may contain anywhere between 10 to 100 eggs. The eggs turn yellow as they complete development and larvae hatch after four days (Figure 7).

Larvae: First instars are yellow with a dark head capsule and dark legs. Their body may darken to a dull orange or red color as they grow. There are four larval instars. Larvae are often covered with a sticky secretion, and may commonly be seen with frass sticking to their bodies. Mature larvae often have a pronounced hump where the abdomen begins (Figure 8).

Pupae: Pupae are about 7mm long and are found in the soil. When ready to pupate, mature fourth instars migrate into the soil and form a cocoon made of salivary secretions and soil particles (Figure 9).

Adults: Adult beetles are about 9mm long. Their elytra are often shiny and bright red, but may also range from dull brown to orange. The head, thorax, abdomen and legs are black. The overall body shape is rectangular (Figure 10).

Life Cycle, Biology, and Ecology

Adults lay eggs on leaf undersides in small, loosely packed clusters. Larvae hatch in four days and begin feeding on the leaf undersides. The larvae feed gregariously and quickly skeletonize leaves, preferring to feed on young, tender growth (Figure 11). Larvae and adults also will feed on aerial bulbils if they are present on the plant. When the larvae are mature they migrate to the soil and form a cocoon, where they remain for 12 to 16 days before emerging as adults (Center & Overholt, 2012). Adults typically mate and begin ovipositing 10 and 15 days after emergence, respectively. In the field, *L. cheni* has multiple overlapping generations and may be expected to go through four or five generations in the course of a growing season. *Lililoceris cheni* continues to feed as adults and have been observed to survive six months or longer. When the plant dies back in winter, adults bury

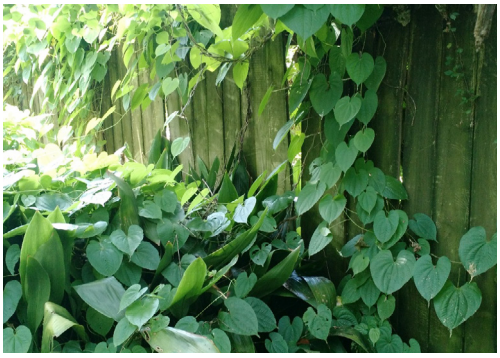

Figure 3. Local infestation of air potato in Baton Rouge, LA. Vines can climb fences and smother neighboring vegetation. Photo by Lori Moshman, Louisiana State University.

Figure 4. Aerial bulbil developing in leaf axil. Length is approx. 2.3 cm. Photo by Lori Moshman, Louisiana State University.

Figure 5. Leaves turn yellow to brown as vines begin senescing. October 22, 2015, Baton Rouge, LA. Photo by Lori Moshman, Louisiana State University.

Figure 6. Specimens of D. oppositifolia (=D. batatus), D. alata, and D. villosa. Images courtesy of LSU Herbarium.

themselves in leaf litter and remain inactive (diapause). Adults reemerge in spring when the plant resumes growth and females start laying the new generation of eggs. *Lilioceris cheni* currently has no known predators, parasites, or diseases in the United States.

Host

The only host of *L. cheni* in the United States is *D. bulbifera*. Extensive host-specificity studies have shown that larvae cannot complete development on any related *Dioscorea* species or on any economically important cultivated plant species (Lake et al., 2015).

Importance

Feeding by *L. cheni* on *D. bulbifera* kills the growing tips of the vine and skeletonizes leaves. This prevents the plant from spreading and drastically reduces its photosynthetic area. Vines of *D. bulbifera* have significant nutrient stores in their underground tubers and can continue to produce new growth after the aboveground leaves are consumed. Feeding by *L. cheni* reduces the plant's aboveground biomass and can lead to a decrease in reserves over time. In southern Florida release sites, significant damage to air potato infestations has been reported in as little as three months following release (Center & Overholt, 2012). Biological control of air potato using *L. cheni* has the potential to provide long-term suppression of air potato and a major reduction in the physical and chemical efforts required to remove infestations. Reduction of the above-ground growth of air potato will, over time, allow native plants to reestablish and increase the local species diversity in infested areas.

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Figure 7. Eggs of Lilioceris cheni. Photo by Rodrigo Diaz, LSU AgCenter.

Figure 8. Mature larva. Photograph by Rodrigo Diaz, LSU AgCenter.

Figure 9. Cocoon (left) made of foam-like saliva and debris. Pupa (right) was removed from its cocoon. Photos by Rodrigo Diaz, LSU AgCenter.

Figure 10. Adult L. cheni on air potato leaf. Photo by Rodrigo Diaz, LSU AgCenter.

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Figure 11. L. cheni larvae skeletonizing a leaf. Note the frass sticking to their bodies. Photo by Rodrigo Diaz, LSU AgCenter.

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