Origin of Air Potato Identified

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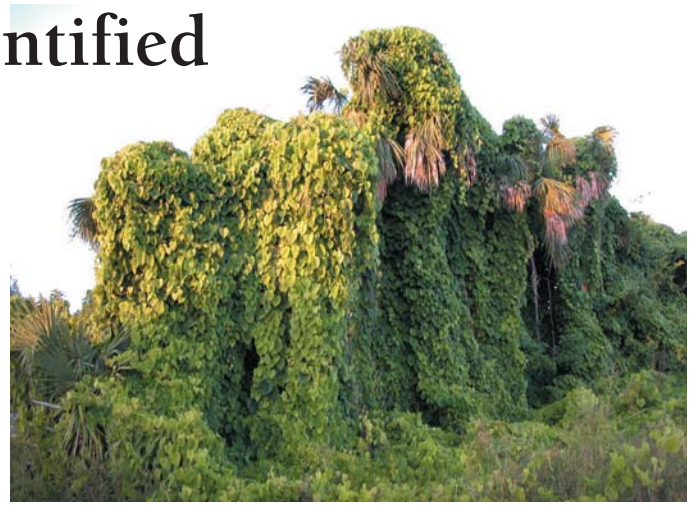

Air potato engulfing cabbage palm in Glades County

If you are reading this magazine, you're probably all too familiar with the devastation caused to Florida's natural areas by alien invasive plants. One of the most destructive is air potato, ***Dioscorea bulbifera***, a vining member of the yam family that rapidly climbs into tree canopies and smothers native vegetation. Air potato invades a variety of natural habitats, including hammocks and pinelands, and its presence is now felt in at least 23 Florida counties, extending from the panhandle to the southern peninsula (Langeland and Craddock Burks 1998).

One promising strategy for combating invasive plants is classical biological control - the introduction into Florida of insect herbivores that feed on air potato in its native home range. A major advantage of classical biological control is its sustainability. Once an effective agent is established, it provides permanent control, often without any further inputs. However, classical biological control is a long-term endeavor, and must be undertaken with great care; it often takes several years to identify and introduce safe and effective natural enemies. One reason that the process is so lengthy is the requirement for host specificity. It must be demonstrated that candidate biological control agents feed only on the target plant, and thus, pose little threat to native or economically important plants. For air potato, this is a particularly important issue because there are two native yams in Florida: ***Dioscorea villosa*** and ***D. floridana***. The screening for non-target effects is done under highly secure quarantine conditions, and demand for these types of facilities in Florida has surpassed space availability. Fortunately, the University of Florida Institute for Food and Agricultural Sciences (UF/IFAS) and United States Department of Agriculture's Agricultural Research Service (USDA/ARS) both recognized the need for additional quarantine space several years ago, and are in the process of constructing new facilities in Fort Pierce and Fort Lauderdale. This will greatly expand opportunities for conducting research on classical biological control of both invasive plants and exotic insect pests.

The best biological control agents of air potato, those most suited to eating this weed and least likely to feed on the native species, are likely to be found on plants that are genetically similar to those found in Florida. Air potato is not known to reproduce sexually in Florida, and thus has probably undergone little genetic change since arriving in the state. This means that it is still genetically similar to the original source in its native range, and probably still vulnerable to biological control agents present in the source population. Unfortunately, we haven't known the source of Florida's air potato until very recently.

In 1905, the United States Department of Agriculture sent aerial bulbils of air potato to Henry Nehrling, a nurseryman based in Gotha, Orange County, Florida. The origin of the bulbils sent to Mr. Nehrling is unknown. There is speculation that ***D. bulbifera*** was introduced into the United States with slave ships coming from Africa in the 'early days of slavery' (Coursey, 1967). Yams store well, which made them ideal for long sea voyages.

Air potato is widely distributed in Asia and tropical Africa, where it occurs in wild populations and is a minor agricultural crop. The center of origin of the genus ***Dioscorea*** is thought to be Asia, although a secondary center of yam species diversity exists in West Africa. Centers of diversity of a genus (areas with lots of different species) are usually found where the genus evolved. The interesting thing about yams is that there are two centers of diversity - one in Asia and another in Africa. ***Dioscorea bulbifera*** is the only member of the genus that occurs in the wild in both Asia and Africa. Thus, determining the geographic source of Florida's air potato becomes problematic.

Recently, the University of Florida (UF) and the University of Miami (UM) joined forces to solve the mystery of the origin of Florida air potato. Previous work by Japanese scientists (Terauchi et al., 1991) showed that air potatoes from Asia and Africa are quite different at the molecular level, and could be readily distinguished by examining their chloroplast DNA. Using this technology, and with financial support from the Florida Exotic Pest Plant Council to Caronia Wallace, an undergraduate at the University of Miami, it has been determined that Florida air potato is most likely of African origin.

Now that we are fairly certain of the Florida air potato's origin, efforts are underway to explore for natural enemies. On a trip to Africa in June 2003, a collaboration was established with the Crops Research Institute in Ghana and Makerere University in Uganda. Florida's Department of Environmental Protection recently awarded a grant to UF/IFAS and UM to support the work in Ghana and Uganda, and to allow further genetic studies to narrow the search in Africa for genotypes similar to those found in Florida.

For more information about air potato biological control, please contact Bill Overholt at waoverholt@mail.ifas.ufl.edu.

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This research was supported by the Florida Agricultural Experiment Station and a grant from the Florida Exotic Pest Plant Council, and approved for publication as Journal Series No. T-00646.