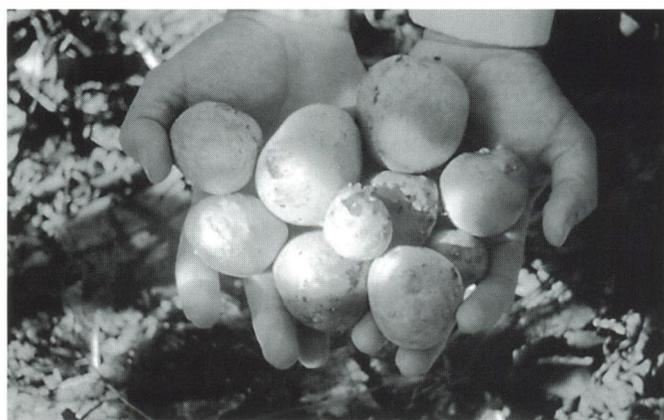


# Diagnosis: *Dioscorea*

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In 1905, the United States Department of Agriculture sent aerial bulbils of air-potato, *Dioscorea bulbifera*, to Henry Nehrling, a Florida nurseryman well-known for the introduction, promotion, and dissemination of plants for the Florida nursery trade. Although a highly regarded plantsman, it was Nehrling who introduced bishopwood, *Bischofia javanica*, into Florida, and he was also a strong advocate of Brazilian pepper, *Schinus terebinthifolius*, as a landscape plant. In those early years, the full impact of invasive exotic plants on Florida's natural environment had not



Got it by the bulbils.... At Kendall Indian Hammocks Park in Miami, volunteers recently collected 1,500 pounds of air-potato bulbils during a three hour public workday. Even pea-sized bulbils are capable of sprouting, so it is of utmost importance that resource managers monitor sites regularly for reinfestation. Photo by Roger Hammer.

yet been realized. There was little or no concern that some exotic plants may have the ability to severely disrupt entire ecosystems. The sentiment was, if Brazilian pepper was such a nice landscape plant, and a few of them showed up in the piney woods down the street, then that was just fine.

By 1944, however, Nehrling was sounding the alarm. In reference to air-potato, he wrote, "With the exception of the Kudzu Vine, I have never seen a more aggressive and dangerous weed in Florida" (Nehrling, 1944). The vines had grown so prolifically that his sons collected 8,000 bulbils that were sold to a nurseryman in New York for a penny apiece. Today, *Dioscorea bulbifera* is firmly entrenched in the flora of Florida and is, indeed, one of the most aggressive weeds ever introduced. It forms dense colonies in hardwood forests — its preferred habitat — and



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To date, three species of *Dioscorea* have escaped cultivation in Florida. The most pestiferous and wide-ranging species is air-potato, *Dioscorea bulbifera*, found from the central panhandle throughout peninsular Florida. Photo by Roger Hammer.



into Alabama and "observed growing in a garden in Mobile...the *Dioscorea bulbifera*: this...curious plant bears a large kidney shaped root one, two or three at the bottom of the leaves, several feet from the ground, as they climb up poles or supports set by their roots; these roots when boiled or roasted are esteemed a pleasant wholesome food, and taste like the ordinary Yam." This early account of air-potato cultivation in the United States indicates that it was introduced by the earliest European colonists prior to the African slave trade.

*Dioscorea bulbifera* is considered by some authorities to be native to both Asia and Africa, while others insist that it was introduced into Africa from Asia. Some taxonomists have even separated the African form as *D. latifolia*. Although globally widespread, it only ranks fourth or fifth in worldwide yam production. Wild forms are often bitter and poisonous, adding credence to the Spanish name *mata gallina*, "hen killer."

*D. bulbifera* is a glabrous vine that climbs by twining, and can reach heights of 30 feet or more. This species twines to the left (the twining direction is a key to identifying some species) and produces alternate, orbicular leaves that range from 4 to 10 inches wide or more. The heart-shaped leaves are cordate at the base with a well-developed, elongated leaf

tip. Prominent veins give the leaves a quilted appearance. Flowers are produced in summer but this species apparently does not flower each year in Florida. The small, dioecious, green to white flowers are borne on long racemes from the leaf axils and produce a pleasant odor that attracts bees and wasps. Seeds are wind dispersed but it has not been demonstrated that *D. bulbifera* produces viable seed in Florida. It does, however, occasionally set fruit in Florida (R. Hammer, pers. obs.).

*D. bulbifera* produces both

can completely enshroud the tree canopy in a single growing season.

Worldwide, species of *Dioscorea* (the true yams) are an economically important food crop, yielding some 20 million metric tons of tubers per year. Two thirds of this harvest comes from West Africa where it is a staple carbohydrate called "fufu." Yam production, however, is now declining due to increased cultivation of the potato, *Solanum tuberosum*, sweet potato, *Ipomoea batatas*, and cassava, *Manihot esculenta*. Although yams are not grown commercially in Florida, they are sometimes cultivated as a dooryard crop, especially in and around the Miami area. In West Africa, yams are also collected or cultivated to manufacture steroidal hormones for use as an oral contraceptive (Mabberly, 1996).

To date, three non-native species of *Dioscorea* have escaped cultivation in Florida. The most pestiferous and wide-ranging species is air-potato, *D. bulbifera*, found from the central panhandle throughout peninsular Florida. The white yam, *D. alata*, has escaped locally in central and southern Florida, and *D. sansibarensis* is currently known from only four locations in Miami-Dade and Collier counties. Three other species, *Dioscorea floridana*, *D. quaternata*, and *D. villosa* have native ranges that include northern and north-central Florida, and *D. glauca* and *D. hirticaulis* are native to the United States outside of Florida. Native species do not produce aerial bulbils.

There is an interesting account of *D. bulbifera* mentioned in *The Travels of William Bartram* (Bartram, 1791). On November 13, 1777, the renowned naturalist/botanist sailed

## The RX

**Chemical control of *Dioscorea* has had limited success in Florida. Basal stem treatment with 10% GARLON 4 has been successful but some field personnel report that the underground tubers may resprout months later. This might be that the stem was not treated with enough herbicide to fully translocate into the tuber.**



The white yam, *Dioscorea alata*. Note that this species has winged stems and opposite leaves. Photo by Roger Hammer.

*Dioscorea sansibarensis*. Note the unusual shape of the immature leaves. When mature, these leaves may reach more than 20 inches across. Photo by Roger Hammer.



underground tubers and aerial bulbils. The bulbils are usually smooth-skinned and light grayish-brown, but may be somewhat warty-skinned and dark brown in color (these different textured and colored bulbils may represent the African and Asian "forms"). Aerial bulbils grow rapidly from the leaf axils and are produced until the plant reaches maturity, eventually falling to the ground as the plant dies back due to shortened day lengths in fall or early winter. In springtime, the tubers and bulbils sprout and utilize the old, dead stems from the previous year's growth as trellises to climb back into the tree canopy.

Resource managers find it most effective to remove bulbils from forests in wintertime after they have fallen from the stems, and again in springtime when they begin to sprout. This is a perfect task for volunteers since a large work force is often necessary to impact heavy infestations. At Kendall Indian Hammocks Park in Miami, volunteers recently collected 1,500 pounds of air-potato bulbils during a three hour public workday. Even pea-sized bulbils are capable of sprouting, so it is of utmost importance that resource managers monitor sites regularly for reinfestation.

The second most common species in Florida is the white yam, *D. alata*, which can be recognized by its winged stems that twine to the right. In shade, the wings along the stem may be pink. *D. alata* is native to Southeast Asia and Indo-Malaysia and ranks second or third in worldwide yam production. It is of considerable economic importance in the western hemisphere, especially in the Caribbean, and is cultivated as a dooryard crop in South Florida.

The leaves of *D. alata* are heart-shaped but more elongated than those of *D. bulbifera*. The leaves are opposite, although they may be alternate on young, vigorous stems. When stems touch damp soil they often root and develop

underground tubers at the point of contact. The underground tubers of this species may be large and can reach over 50 kg. (110 pounds) in weight. Aerial bulbils are also produced and sprout readily on the ground or in leaf litter.

The third exotic species in Florida, *D. sansibarensis*, is a robust, smooth-stemmed vine that twines to the left. It is native to East Africa and produces small, often purplish, smooth-skinned aerial bulbils that are poisonous to eat. It was first discovered in Miami-Dade and Collier counties by Keith Bradley of the Institute for Regional Conservation. It has been reported from Matheson Hammock, Snapper Creek Preserve, and Ross Hammock in Miami-Dade County, and one location along Tamiami Trail (US 41) just east of the Oasis Ranger Station in the Big Cypress National Preserve (BICY) in Collier County. Tony Pernas, resource manager at BICY has eradicated the plant from that location, and crews from Miami-Dade Park & Recreation Department's Natural Areas Management section are actively trying to eradicate the species from the three Miami-Dade sites.

The leaves of *D. sansibarensis* are orbicular when mature and may reach more than 50 cm. (20 inches) across. The leaves are cordate at the base and produce a long tail-like projection on the leaf tip. Young leaves look much different, with a wide, pointed projection off each side of the leaf. Stems can be over an inch thick and may climb high into the tree canopy before producing leaves. This species was first discovered in 1995, which brings up the question of how did it get here? One possibility is Santeria, an Afro-Cuban religion of African descent practiced in the Caribbean and elsewhere in the western hemisphere, including Miami. In a paper on the origins of yam production (Alexander & Coursey, 1969), it was noted that *D. sansibarensis* "freely produces small tubers, as well as bulbils which, in wild forms, contain an alkaloid and are highly toxic. It is a very large-growing species, believed, in many parts of Africa, to possess magical properties." Could it be that this species was brought to Florida for voodoo rituals associated with Santeria? While this could explain the Miami-Dade populations, the plant found climbing up a cabbage palm in the Big Cypress National Preserve is puzzling.

At least one other species, *Dioscorea elephantipes*, native to South Africa, is cultivated in Florida as a botanical curiosity but has yet to escape cultivation. In a mail-order catalog, one California nursery offers "young seedlings" of *D. elephantipes* for \$5.00 along with *D. bulbifera*, and *D. montanum* (seedlings of the latter sell for \$65.00!). Worldwide, there are some 600 species of *Dioscorea*, so it may be just a matter of time before additional species are found competing with Florida's native flora.

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